Course Outcome (CO) [1st Year Theory New Syllabus] Session 2018-19, 2019-20

Department	Basic Science & Humanities
Course Code	BS-PH-101
Title of Course	Physics-I
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	L + T 3 + 1
Total Contact Hours	44
Course Out Come	**CO1:** Ability to know the basic concepts of mechanics and oscillation. **CO2:** Elaborate the concept of optics and introduction to the principle of laser. **CO3:** Ability to understand electromagnetism, dielectric and magnetic properties of materials. **CO4:** Familiarize with the basic laws of quantum mechanics introduction to Schrodinger wave equation. **CO5:** Understand the basic concept of Statistical mechanics.

Department	Basic Science & Humanities
Course Code	BS-M-101
Title of Course	Mathematics -IA
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	L + T 3 + 1
Total Contact Hours	40
Course Out Come	**CO1**: Apply the concept integral calculus to determine curvature and evaluation of different types of improper integrals. **CO2:** Understand the domain of applications of mean value theorems, limit and maxima-minima to engineering problems. **CO3:** Understand the concept of determinant and learn different types of matrices, concept of rank, system of linear equations, methods of matrix inversion. **CO4:** Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science. **CO5:** Learn and apply the concept of Eigen values, Eigen vectors,

	diagonalization of matrices and orthogonalization in inner product spaces for understanding physical and engineering problems

Department	EE
Course Code	**ES EE 101**
Title of Course	**Basic Electrical & Electronic Engineering –1 (Group A+Group B)**
Nature of Course	Compulsory
Type of Course	Theory
Contact Hours	3L+1T
Total Contact Hours	41
Course Out Come	**CO1:** Ability to explain the fundamentals of Physics. **CO2:** Ability to explain the basic knowledge of Electrical and Electronics Engineering. **CO3:** Ability to apply DC network theorem and Kirchhoff's law on different electrical circuits. **CO4:** Ability to determine AC fundamentals like generation of ac voltages, waveforms, average and RMS values, peak factor, form factor, series and parallel resonance circuits. **CO5:** Ability to explain principles of electromagnetism and associated laws. **CO6:** Ability to identify various semiconductors and ability to design and analyse different electrical circuits using different semiconductors.

Course Outcome (CO) [1st Year Practical New Syllabus] Session 2018-19, 2019-20

Department	Basic Science & Humanities
Course Code	BS-PH-191
Title of Course	Physics-I Laboratory
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3P
Total Contact Hours	30
Course Out Come	**CO1**: Ability to understand the general property of matters like viscosity, Young's Modulus and Modulus of Rigidity. **CO2**: Ability to know optical property. **CO3**: Ability to learn electrical property. **CO4**: Ability to understand Quantum Physics with the help of experiments like Energy band gap of semiconductor, Planck constant and Characteristics of Solar Photovoltaic cell. **CO5**: Ability to learn Electricity and Magnetism with the help of experiments like Hall Effect of semiconductors, Specific charge of electron

Department	EE
Course Code	**ES EE191**
Title of Course	**Basic Electrical &Electronic Engineering– 1(Lab)(Group A+Group B)**
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	40
Course Out Come	**CO1:** Ability to perform different experiments of Basic Electrical and Electronics Engineering. **CO2:** Ability to perform different experiments to verify network theorems.

Department	ME
Course Code	**ES ME191**
Title of Course	Engg. Drawing & computer graphics
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	30
Course Out Come	**CO1:** Use the drawing instruments effectively and able to dimension the given figures. **CO2:** Appreciate the usage of engineering curves in tracing the paths of simple machine components. **CO3:** Able to draw the basic views related to projections of Lines, Planes.

Department	Basic Science & Humanities
Course Code	BS-CH-201
Title of Course	Chemistry-1
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	L3 + T1
Total Contact Hours	42
Course Out Come	CO1: Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. CO2: Rationalise bulk properties and processes using thermodynamic considerations. CO3: **:** Distinguish the range of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques. CO4: Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity. CO5: List major chemical reactions that are used in the synthesis of molecules.

Department	Basic Science & Humanities
Course Code	BS-M-201
Title of Course	Mathematics -IIA
Nature of Course	Compulsory

Type of Course	Lecture
Contact Hours	L + T 3 + 1
Total Contact Hours	40
Course Out Come	**CO1:** Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment. **CO2:** Understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set. **CO3:** Apply statistical tools for analysing data samples and drawing inference on a given data set.

Department	IT
Course Code	ES-CS201
Title of Course	Programming for Problem Solving
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	36
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Programming for

	Problem Solving CO2: a) Directly apply the fundamental concepts of Programming to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using Programming for Problem Solving. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of Programming for Problem Solving CO4: a) Compare and contrast in details between the fundamental concepts of Algorithm and Programming and thereafter b) describe an overview level interconnected map of concepts/terminologies of Programming for Problem Solving. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of Programming for Problem Solving. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Programming.

Department	Basic Science & Humanities
Course Code	HM HU 201
Title of Course	English
Nature of Course	Compulsory
Type of Course	Lecture

Contact Hours	2L + 0T
Total Contact Hours	25
Course Out Come	CO1: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking Skills.

Department	Basic Science & Humanities
Course Code	BS-CH-291
Title of Course	Chemistry-1 Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	P 3
Total Contact Hours	30
Course Out Come	**CO1:** Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. **CO2:** Rationalise bulk properties and processes using thermodynamic considerations. **CO3:** Distinguish the range of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques. **CO4:** Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity. **CO5:** List major chemical reactions that are used in the synthesis of molecules.

Department	IT
Course Code	ES-CS291
Title of Course	Programming for Problem Solving
Nature of Course	Professional core courses
Type of Course	Practical
Contact Hours	4+4
Total contact hours	36
Credit	2
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of algorithm and correct program. CO2: a) Directly apply the fundamental concepts of Programming to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using correct syntax. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of arrays, strings. CO4: a) Compare and contrast in details between the fundamental concepts of structures and thereafter b) describe an overview level interconnected map of concepts/terminologies of self-referential structures. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of simple text files. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Programming.

Department	ME
Course Code	**ES ME291**
Title of Course	Engg. Drawing & computer graphics
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	30
Course Out Come	**CO1:** Use the drawing instruments effectively and able to dimension the given figures. **CO2:** Appreciate the usage of engineering curves in tracing the paths of simple machine components. **CO3:** Able to draw the basic views related to projections of Lines, Planes.

Department	Basic Science & Humanities
Course Code	HM HU 291
Title of Course	Language Laboratory
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	2P
Total Contact Hours	19

Course Out Come	CO1: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking Skills.

Department	IT
Course Code	ESC 301
Title of Course	Analog and digital electronics
Nature of Course	Compulsory
Type of Course	Theory
Contact Hours	3
Total contact hours	30
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Programming for Problem Solving CO2: a) Directly apply the fundamental concepts of Programming to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using Programming for Problem Solving. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of Programming for Problem Solving CO4: a) Compare and contrast in details between the fundamental concepts of Algorithm and Programming and thereafter b) describe an overview level interconnected map of concepts/terminologies of Programming for Problem

	Solving. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of Programming for Problem Solving. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Programming.

Department	IT
Course Code	PCC-CS301
Title of Course	Data Structure & Algorithm
Nature of Course	Professional core courses
Type of Course	Lecture
Contact Hours	3
Total contact hours	36
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Data Structure & Algorithm. CO2: a) Directly apply the fundamental concepts of Data Structure & Algorithm to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using different data. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems

	using the concept of solving problem. CO4: a) Compare and contrast in details between the fundamental concepts of dynamic and static data structures and thereafter b) describe an overview level interconnected map of concepts/terminologies of dynamic and static data structures. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of principal algorithms for sorting, searching, and hashing. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Data Structure & Algorithm.

Department	Information Technology
Course Code	PCC-CS302
Title of Course	Computer Organization
Nature of Course	Theory
Type of Course	COMPULSORY
Contact Hours	3+1=4
Total contact hours	36
Credit	3
Course Outcomes	CO1 a) Define, b) explain in detail, and thereafter c) state the necessity/importance of basic organization of computer, role of operating system and compiler/assembler, instruction cycle, instruction format, addressing modes, commonly used number systems, overflow and underflow, design of adders, design of ALU, design of memory unit, memory organization, design of control unit. CO2 a) Directly apply basic organization of computer, role of operating system and compiler/assembler, instruction cycle, instruction format, addressing modes, commonly used number systems, overflow and underflow, design of adders, design of ALU, design of memory unit, memory organization, design of control unit to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the above concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems. CO3 a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems requiring computer organization, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems).

	CO4 a) Compare and contrast in details among basic organization of computer, role of operating system and compiler/assembler, instruction cycle, instruction format, addressing modes, commonly used number systems, overflow and underflow, design of adders, design of ALU, design of memory unit, memory organization, design of control unit, and thereafter b) describe an overview level interconnected map of concepts. CO5 a) Identify and thematically explain where and how basic organization of computer, role of operating system and compiler/assembler, instruction cycle, instruction format, addressing modes, commonly used number systems, overflow and underflow, design of adders, design of ALU, design of memory unit, memory organization, design of control unit are utilized in large scale real world systems with computer organization components , and thereafter b) Design the schematics for typical components of large scale known real world systems with computer organization components. CO6 a) Identify unsolved but necessary real world problems with computer organization components and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems.

Department	Basic Science & Humanities (CSE / IT)
Course Code	BSC-301
Title of Course	Mathematics –III (Differential Calculus)
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	L + T 2

Total Contact Hours	40
Course Out Come	**CO1:** Learn to apply the concept of sequence and convergence of infinite series in many approximation techniques in engineering disciplines. **CO2:** Apply the knowledge for addressing the real life problems which comprises of several variables or attributes and identify extremum points if different surfaces of higher dimensions and concept of vector differentiation. **CO3**: Learn the methods for evaluating multiple integral and their applications to different physical problems. **CO4:** Understand different techniques to solve first and second order ordinary differential equations with its formulation to address the modelling of systems and problems of engineering sciences. **CO5**: Learn Basics of Graph Theory which are useful to solve engineering problems.

Department	Basic Science & Humanities
Course Code	HS(MC)-301
Title of Course	Economics for Engineers

Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcome	**CO1**: Ability to understand Economic Decisions Making and considering that students will learn to find out Engineering Costs & Estimation. **CO2**: Ability to learn Cash Flow and also able to calculate Rate of Return Analysis. **CO3**: Ability to know Inflation and Price Change, Present Worth Analysis. **CO4**: Ability to learn depreciation and able to analysis the requirement of replacement.

Department	IT
Course Code	ECS-391
Title of Course	Analog & Digital Electronics Lab
Nature of Course	Professional core courses
Type of Course	Practical
Contact Hours	4
Total contact hours	6 MONTH DURATION
Credit	2
Course Outcomes	CO1: Learn to design a Class A amplifier, phase-Shift Oscillator trigger. CO2: Apply concept to solve different kind of digital and analogue circuits. CO3: To be exposed to advanced applications engineering and natural sciences to solve real life problems.

Department	IT
Course Code	PCC-CS391
Title of Course	Data Structure & Algorithm Lab
Nature of Course	Professional core courses
Type of Course	Practical
Contact Hours	4+4
Total contact hours	6 month duration
Credit	2
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Data Structure & Algorithm. CO2: a) Directly apply the fundamental concepts of Data Structure & Algorithm to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using different data. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of solving problem. CO4: a) Compare and contrast in details between the fundamental concepts of dynamic and static data structures and thereafter b) describe an overview level interconnected map of concepts/terminologies of dynamic and static data structures. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of principal algorithms for sorting, searching, and hashing. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Data Structure & Algorithm.

Department	Information Technology
Course Code	PCC CS 392
Title of Course	Computer Organization Lab
Nature of Course	Practical
Type of Course	Program Core
Contact Hours	3
Total contact hours	33
Credit	2
Course Outcomes	CO1 a) Define, b) explain in detail, and thereafter c) state the necessity/importance of IC-chips like Multiplexer , Decoder, Encoder, Comparator, Truth Table verification and clarification from Data-book, design of adder/ Subtractor composite unit, Design of BCD adder, Design of a 'Carry-Look-Ahead' Adder circuit, use of multiplexer unit to design a composite ALU, use of ALU chip for multibit arithmetic operation, implementation read write operation using RAM IC, Cascading two RAM ICs for vertical and horizontal expansion CO2 a) Directly apply IC-chips like Multiplexer , Decoder, Encoder, Comparator, Truth Table verification and clarification from Data-book, design of adder/ Subtractor composite unit, Design of BCD adder, Design of a 'Carry-Look-Ahead' Adder circuit, use of multiplexer unit to design a composite ALU, use of ALU chip for multibit arithmetic operation, implementation read write operation using RAM IC, Cascading two RAM ICs for vertical and horizontal expansion to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the above concepts to solve (design andimplement) elementary model problems on the idealistic components of real-world systems with computer organization components. CO3 a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems requiring computer organization, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems). CO4 a) Compare and contrast in details among IC-chips like Multiplexer , Decoder, Encoder, Comparator, Truth Table verification and clarification from Data-book, design of adder/ Subtractor composite unit, Design of BCD adder, Design of a 'Carry-Look-Ahead' Adder circuit, use of multiplexer unit to design a composite ALU, use of ALU chip for multibit arithmetic operation, implementation read write operation using RAM IC, Cascading two RAM ICs for vertical and horizontal expansion, and thereafter b) describe an overview level interconnected map of concepts. CO5

	a) Identify and thematically explain where and how IC-chips like Multiplexer , Decoder, Encoder, Comparator, Truth Table verification and clarification from Data-book, design of adder/ Subtractor composite unit, Design of BCD adder, Design of a 'Carry-Look-Ahead' Adder circuit, use of multiplexer unit to design a composite ALU, use of ALU chip for multibit arithmetic operation, implementation read write operation using RAM IC, Cascading two RAM ICs for vertical and horizontal expansion are utilized in large scale real world systems with computer organization components, and thereafter b) Design the schematics for typical components of large scale known real world systems. CO6 a) Identify unsolved but necessary real world problems requiring computer organization and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems.

Department	IT
Course Code	PCC-CS-393
Title of Course	IT WORKSHOP
Nature of Course	Professional core courses
Type of Course	Practical
Contact Hours	4
Total contact hours	6 MONTH DURATION
Credit	2
Course Outcomes	CO1: To master an understanding of scripting & the contributions of scripting languages. Design real life problems and think creatively about solutions . CO2: Apply a solution in a program using R/Matlab/Python. CO3: To be exposed to advanced applications of mathematics, engineering and natural sciences to program real life problems.

Department	IT
Course Code	PCC-CS401
Title of Course	DISCRETE MATHEMATICS
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3+1
Total contact hours	6 MONTH DURATION
Credit	4
Course Outcomes	CO1: a) Define , explain in detail use mathematically correct terminology and notation . b) Construct correct direct and indirect proofs. CO2: Directly apply the fundamental concepts of mathematics to solve (implement) the most elementary/simplest model problems. CO3: a) Analyze , b) know Syntax, Semantics, Validity and Satisfiability, Graphs and Trees .

Department	**Information Technology**
Course Code	**PCC-CS-402 Semester: 4th B.Tech.**
Title of Course	**Computer Architecture.**
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	40
Credit:	3
CO1	a) Define, b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Computer Components, performance metrics, pipeline, hazards, memory organisation, ILP, bus sub-systems, multiprocessors parallelism.
CO2	Can identify and illustrate the working principles of Computer Components, performance metrics, pipeline, hazards, memory organisation, ILP, bus sub-systems, multiprocessors parallelism.

CO3	Can analyse the architectural aspects of a simple computing system, identify appropriate computational components and estimate the desired system design parameters. Will be able to find output and debug errors on pipeline, storage, interconnection design issues.
CO4	Can differentiate and compare between Computer Components independently and be able to interconnect these components by appropriate interfaces.
CO5	Be able to devise a given problem into independent modules and identify appropriate architectural Components and then to devise the system by integrating the modules by providing appropriate interfaces.
CO6	Can identify, estimate, design and implement appropriate computing system for Unknown real world problems.

Department	IT
Course Code	PCC-CS403
Title of Course	Formal Language & Automata Theory
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	6Month Duration
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of automata theory. CO2: Be able to construct finite state machines and the equivalent regular expressions. CO3: Be able to construct pushdown automata and the equivalent context free grammars. CO4: Be able to construct Turing machines and Post machines. Be able to prove the equivalence of languages described by Turing machines and Post machines

Department	Information Technology
Course Code	PCC-CS404
Title of Course	Design and Analysis of Algorithm
Nature of Course	Theory
Type of Course	Program Core
Contact Hours	3
Total contact hours	36
Credit	3
Course Outcomes	CO1 a) Define, b) explain in detail, and thereafter c) state the necessity/importance of characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms, of the subject design and analysis of algorithms. CO2 a) Directly apply characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the above fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems. CO3 a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world algorithms, and thereafter b) Compute the output of given model algorithmic subroutines (and also identify errors in the design and implementation of given model algorithmic subroutines). CO4 a) Compare and contrast in details among characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms, and thereafter b) describe an overview level interconnected map of concepts/terminologies of design and analysis of algorithms. CO5 a) Identify and thematically explain where and how characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms, are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems. CO6 a) Identify unsolved but necessary real world problems having algorithmic

	component/s and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems.
Department	Basic Science & Humanities
Course Code	BSC-401
Title of Course	Biology
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	2L + 1T
Total Contact Hours	33
Course Out Come	**CO1**: Describe how biological observations of 18th Century that lead to major discoveries. **CO2**: Convey that classification per section is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological. **CO**3: Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring. **CO4**: Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine. **CO5**: Classify enzymes and distinguish between different mechanisms of enzyme action. **CO6**: Identify DNA as a genetic material in the molecular basis of information transfer. **CO7**: Analyse biological processes at the reductionistic level. **CO8:** Apply thermodynamic principles to biological systems. **CO9**: Identify and classify microorganisms.

Department	IT
Course Code	MC401
Title of Course	Environmental sciences
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	6 month duration
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance to understand the natural environment and its relationships with human activities. CO2: Be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk. CO3: Be able to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
Department	IT
Course Code	PCC-CS 492
Title of Course	Computer Architecture Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	4+4
Credit	2
Course Outcomes	CO1: a) Define ,b) explain fundamental concepts of VHDL. CO2: a) Directly apply the fundamental concepts of VHDL to solve different gates. CO3: a) Analyze (the design and implementation of idealistic components of real world systems.

Department	Information Technology
Course Code	PCC-CS494
Title of Course	Design and Analysis of Algorithm
Nature of Course	Practical
Type of Course	Compulsory
Contact Hours	3
Total contact hours	36
Credit	3
Course Outcomes	CO1 a) Define, b) explain in detail, and thereafter c) state the necessity/importance of characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms, of the subject design and analysis of algorithms. CO2 a) Directly apply characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the above fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems. CO3 a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world algorithms, and thereafter b) Compute the output of given model algorithmic subroutines (and also identify errors in the design and implementation of given model algorithmic subroutines). CO4 a) Compare and contrast in details among characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms, and thereafter b) describe an overview level interconnected map of concepts/terminologies of design and analysis of algorithms. CO5 a) Identify and thematically explain where and how characteristic of algorithm, analysis of algorithm, fundamental algorithmic strategies, graph and tree algorithms, depth first search, breadth first search, shortest path algorithms, minimum spanning trees, network flow algorithms, tractable and intractable problems, approximation algorithms and randomized algorithms, are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems.

	CO6 a) Identify unsolved but necessary real world problems having algorithmic component/s and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems.

Department	IT
Course Code	ESC501
Title of Course	Signals & Systems
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	6 monthS
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of signal and system. CO2: a) Directly apply the fundamental concepts of continuous and discrete system to solve (design and implement) elementary model problems. CO3: know Fourier, Laplace and z- Transforms.

Department	IT
Course Code	PCC-CS501
Title of Course	Compiler design
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	6 month
Credit	3
Course Outcomes	CO1: Understand the fundamental and functional architecture of a compiler. CO2: Understanding principle flow of execution through different phases (modules). CO3: Designing small programs for each independent but correlated module.

	CO4:Designing and solving grammatical problems. CO5:Developing a new grammar. CO6:Developing a mini sample compiler.

Department	IT
Course Code	PCC-CS502
Title of Course	Operating system
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	6 month
Credit	3
Course Outcomes	CO1: Understand functional architecture of an operating system CO2:Develop algorithms for subsystem components CO3:Design device drivers and multi threading libraries for a tiny OS CO4:Develop application programs using UNIX system calls CO5:Design and solve synchronization problems CO6:Understand standard UNIX and FAT file systems

Department	IT
Course Code	PCC-CS503
Title of Course	Object oriented programming
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: Define, explain in detail and thereafter state the necessity/importance of the fundamental concepts of JVM, java byte-code, classes, functions,

	data and objects of object oriented paradigm. CO2: Can define, declare and use different kinds of constructors, function overloading, inheritance, abstract classes and methods, interface, package, multi threading, Exception handling, java applet. CO3: Can analyse simple problems, identify appropriate components and write program to solve simple problems. Will be able to find output and debug errors. CO4: : Can differentiate and compare between Arrays, String, class, object, Function, Recursion, function overloading, function overriding ,exception, error ,multi threading, multi tasking independently and be able to interconnect these components by appropriate interfaces. CO5: Be able to devise a given problem into independent modules and then to solve by integrating the modules by providing appropriate interfaces. CO6: Can Write Java Programs for Unknown real world problems

Department	IT
Course Code	HSMC-501
Title of Course	Introduction to industrial management
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: Define, explain in detail and thereafter state the necessity/importance of the fundamental concepts of industrial behaviour. CO2: Analyse Critical Path Method (CPM) and Programme Evaluation Review Technique (PERT).

	CO3: Can analyse Materials Management.

Department	Information Technology
Course Code	PEC-IT 501A. Semester: 5th B.Tech.
Title of Course	Theory of Computation
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	40 Credit: 3
CO1	a) Define, b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Digital circuits, STD, FSM, Finite Automata, DFA, NFA, Optimization, Equivalence, Moore & Melay machines, Regular expressions, grammar, context free languages, context free grammar, pumping lemma, Push down automata, optimization of CFL, Turing machine.
CO2	Can identify and illustrate the working principles of Digital circuits, STD, FSM, Finite Automata, DFA, NFA, Optimization, Equivalence, Moore & Melay machines, Regular expressions, grammar, context free languages, context free grammar, pumping lemma, Push down automata, optimization of CFL, Turing machine.
CO3	Can analyse the computational aspects of a simple computing system, identify appropriate computational components and estimate the desired system design parameters. Will be able to find output and debug errors on Digital circuits, STD, FSM, Finite Automata, DFA, NFA, Optimization, Equivalence, Moore & Melay machines, Regular expressions, grammar, context free languages, context free grammar, pumping lemma, Push down automata, optimization of CFL, Turing machine.
CO4	Can differentiate and compare between computational Components independently and be able to explain the inter-connection these components by appropriate interfaces.
CO5	Be able to devise a given problem into independent modules and identify appropriate computational components and then to devise the system by integrating the modules by providing appropriate interfaces.
CO6	Can identify, estimate, design and implement appropriate computational system for Unknown real world problems.

Department	Information Technology
Course Code	PEC-IT501B
Title of Course	Artificial Intelligence
Nature of Course	Theory
Type of Course	Program Elective Elective
Contact Hours	3
Total contact hours	34
Credit	3
Course Outcomes	CO1 a) Define, b) explain in detail, and thereafter c) state the necessity/importance of the overview of Artificial Intelligence, intelligent agents, problem solving, search techniques, heuristic search strategies, adversarial search, knowledge and reasoning, predicate logic, representing knowledge using rules, probabilistic reasoning, planning, natural language processing, learning and expert systems. CO2 a) Directly apply intelligent agents, problem solving, search techniques, heuristic search strategies, adversarial search, knowledge and reasoning, predicate logic, representing knowledge using rules, probabilistic reasoning, planning, natural language processing, learning and expert systems to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the above concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems with AI components. CO3 a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems with AI components, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems). CO4 a) Compare and contrast in details among intelligent agents, problem solving, search techniques, heuristic search strategies, adversarial search, knowledge and reasoning, predicate logic, representing knowledge using rules, probabilistic reasoning, planning, natural language processing, learning and expert systems, and thereafter b) describe an overview level interconnected map of concepts of AI. CO5 a) Identify and thematically explain where and how intelligent agents, problem solving, search techniques, heuristic search strategies, adversarial search, knowledge and reasoning, predicate logic, representing knowledge using rules, probabilistic reasoning, planning, natural language processing, learning and expert systems are utilized in large scale real world systems with AI components, and thereafter b) Design the schematics for typical components of large scale known real world systems with AI components. CO6 a) Identify unsolved but necessary real world problems with AI components and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems.

Department	IT
Course Code	PEC-IT501C
Title of Course	Advanced Computer Architecture
Nature of Course	Program Elective Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define, b) explain in detail, and thereafter c) state the necessity/importance of the fundamental logic gates of computer. CO2: a) Directly apply the fundamental concepts of the elements of computer design for programmer. CO3: a) Analyse (identify parts, their interconnections) the design and implementation of idealistic components of real-world systems. CO4: a) Compare and contrast in details between different types of architecture. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of different architecture. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems for computer architecture.

Department	IT
Course Code	PEC-IT501D
Title of Course	Computer Graphics
Nature of Course	Program Elective Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the

	necessity/importance of the fundamental concepts of Computer Graphics. CO2: a) Directly apply the fundamental concepts of Computer Graphics to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using different scan conversion algorithm. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of Computer Graphics. CO4: a) Compare and contrast in details between the fundamental concepts of transformation & viewing and thereafter b) describe an overview level interconnected map of concepts/terminologies of Computer Graphics. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of Transformation & viewing, Curves, Hidden surfaces and Color &shading models. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Computer Graphics.

Department	IT
Course Code	MCCS501
Title of Course	CONSTITUTION OF INDIA
Nature of Course	Professional core courses mandatory
Type of Course	Theory
Contact Hours	3
Total contact hours	6 MONTHS
Credit	0
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Union Government and its Administration . CO2: Know the structure of the Indian Union: Federalism, Centre- State relationship

	CO3: Analyze Local Administration District's Administration head. CO4: Describe role of Election Commission Election Commission.

Department	IT
Course Code	MCCS501
Title of Course	Essence of indian knowledge tradition
Nature of Course	Professional core courses mandatory
Type of Course	Theory
Contact Hours	3
Total contact hours	6 MONTHS
Credit	0
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Union Government and its Administration . CO2: Know the structure of the Indian Union: Federalism, Centre- State relationship CO3: engineering students, except those studying in IITs and NITs, will now be studying humanities, social sciences including management, environmental sciences, Indian Constitution and essence of Indian traditional knowledge, from the next academic session.

Department	IT
Course Code	PCC CS591
Title of Course	Compiler Design
Nature of Course	Professional core courses
Type of Course	Practical
Contact Hours	4
Total contact hours	6 months

Credit	2
Course Outcomes	CO1: Understand the fundamental and functional architecture of a compiler. CO2: Understanding principle flow of execution through different phases (modules). CO3: Designing small programs for each independent but correlated module. CO4:Designing and solving grammatical problems. CO5:Developing a new grammar. CO6:Developing a mini sample compiler.

Department	Information Technology
Course Code	PCC CS 592
Title of course	Operating System Lab
Nature of course	Compulsory
Type of course	Practical
Contact hours	4
Total contact hours	6 MONTHS
Credit	2
Course Outcomes	CO1: Understand gcc compiler, and Makefiles CO2: Understand the high-level structure of the Linux kernel both in concept and source code CO3: Acquire a detailed understanding of one aspect (the scheduler) of the Linux kernel

Department	IT
Course Code	PCC CS 593
Title of Course	OBJECT ORIENTED PROGRAMMING
Nature of Course	Professional core courses
Type of Course	Theory
Contact Hours	4
Total contact hours	6 MONTHS
Credit	2
Course Outcomes	CO1: Define, explain in detail and thereafter state the necessity/importance of the basic control Structures, strings and function for Object Oriented programming. Classes,objects, members of a class and the relationships among them needed for a finding the solution to specific problem. CO2: Directly apply the concept of constructors, function overloading, reusability using inheritance, interfaces and packages,different exception handling mechanisms and concept of user interface components to design GUI in Java using Applet & AWT along with response to events CO3: Can analyse simple problems, identify appropriate components and write program to solve simple problems. Will be able to find output and debug errors. CO4: : Can differentiate and compare between Arrays, String, class, object, Function, Recursion, function overloading, function overriding ,exception, error ,multi threading, multi tasking independently and be able to interconnect these components by appropriate interfaces. CO5: Be able to devise a given problem into independent modules and then to solve by integrating the modules by providing appropriate interfaces. CO6: Can Write Java Programs and develop complex Graphical user interfaces for Unknown real world problems using Applet &AWT along with response of events, Java Swing.

Department	Information Technology
Course Code	PCC-CS601
Title of cours	Database Management Systems
Nature of course	Regular
Type of course	Lecture
Contact hours	3:0:0=3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: Understand functional components of the DBMS. CO2: Devise queries using Relational Algebra, Relational Calculus and SQL. CO3: Design database schema. CO4:Develop E-R model CO5:Evaluate and optimize queries. CO6: Understand transaction processing, concurrency control and recovery techniques.

Department	Information Technology
Course Code	PCC-CS 602
Title of course	Computer Networking
Nature of course	Compulsory
Type of course	Lecturer
Contact hours	3+0=3
Total contact hours	6 months
Course Outcomes	CO1: a) Define, b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Layers, switching, active components, multiplexing, multiple access, data transmission, Digital, Optical, Satellite and mobile communications CO2: Analyze MAC layer protocols and LAN technologies CO3: Design applications using internet protocols CO4: Implement routing and congestion control algorithms CO5: Develop application layer protocols

DEPARTMENT	Information Technology
COURSE CODE	PEC-IT601A
TITLE OF COURSE	Advanced algorithm
NATURE OF COURSE	Elective
TYPE OF COURSE	Lecture
CONTACT HOURS	3 Lecture
TOTAL CONTACT HOURS	36
COURSE OUTCOMES	CO1: Define, explain in detail and thereafter state the necessity/importance of the fundamental concepts of basic of distributed system. CO2: Differentiate between different types of faults and fault handling techniques in order to implement fault

	tolerant systems. CO3: Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constraints.

DEPARTMENT	Information Technology
COURSE CODE	PEC-IT601B
TITLE OF COURSE	Distributed Systems.
NATURE OF COURSE	Elective
TYPE OF COURSE	Lecture
CONTACT HOURS	3 Lecture
TOTAL CONTACT HOURS	36
Credit	3
COURSE OUTCOMES	CO1: Define, explain in detail and thereafter state the necessity/importance of the fundamental concepts of basic elements , standard protocols used in distributed systems, distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc CO2: Can define, declare and use knowledge of the core architectural aspects of distributed systems , different models in distributed systems and implement distributed programs using sockets and RPC/RMI. CO3: Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constraints and security issues of distributed system. CO4: Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems. CO5: Be able to devise a given problem into independent modules and then to solve by integrating the modules by providing appropriate interfaces. CO6: Can identify, estimate, design and implement appropriate computing system for Unknown real world problems using concept of building large-scale distributed applications.

Department	IT

Course Code	PEC- IT 601 C
Title of Course	Software Engineering
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3
Total Contact Hours	36
Course Outcomes	CO1: Define Software Engineering and explain in detail and thereafter state the necessity/importance of the fundamental concepts of SDLC, COCOMO Model, Context diagram, DFD, System design, Decision tree, Decision table ,coding & documentation, Structured and Object Oriented programming, Testing ,validation and verification metrics ,software project management and object oriented design in UML. CO2: Directly apply the fundamental concepts of Software Engineering to solve (implement) the most elementary/simplest model problems, and thereafter Design & develop the software projects .Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using Software Engineering. CO3: Analyze and Identify requirements and prepare models using different SDLC.Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of Software Engineering for an organization/institute. CO4: Compare and contrast in details between the fundamental concepts of Software Engineering and thereafter describe an overview level interconnected map of concepts/terminologies of Software Engineering. CO5: Identify risks, manage the change to assure quality in software projects and explain where and how the Models are utilized in large scale real world systems, and thereafter Design the schematics for typical components of large scale known real world systems using the concept of Software Engineering. CO6: Identify unsolved but necessary real world problems of Software Engineering and thereafter demonstrate and evaluate real time projects with respect to software engineering principles.

Department	Information Technology
Course Code	PEC-IT 601D. Semester: 6th B.Tech.
Title of Course	Image Processing
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	40 Credit: 3
CO1	a) Define, b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Image representation, processing, filtering, segmentation, restoration, projection, feature extraction, ehancements, transformation, smoothing, masking, colouring etc.
CO2	Can identify and illustrate the working principles of image processing methods - Image representation, processing, filtering, segmentation, restoration, projection, feature extraction, ehancements, transformation, performance parameters, smoothing, masking, colouring etc.
CO3	Can analyse the technical aspects of a simple image processing software, identify appropriate computational components/methods and estimate the desired system design parameters. Will be able to find output and debug errors on problems related to Image representation, processing, filtering, segmentation, restoration, projection, feature extraction, ehancements, transformation, performance parameters, smoothing, masking, colouring.
CO4	Can differentiate and compare between image processing techniques/components independently and be able to apply these techniques/components by appropriate interfaces.
CO5	Be able to devise a given image processing problem into independent modules and identify appropriate techniques/ components and then to develop/implement the system by integrating the modules by providing appropriate interfaces.
CO6	Can identify, estimate, design, implement and use appropriate image processing system for real world image processing needs.

Department	IT
Course Code	PEC-IT602A
Title of Course	Parallel and Distributed Algorithm
Nature of Course	Professional core courses
Type of Course	Elective
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: Define Parallel & Cluster Computing. CO2: a) Directly apply the fundamental concepts of Computation speed, Parallel & Cluster Computing Problem Solving. CO3: Synchronous Computations, load balancing, distributed termination examples .
Department	IT
Course Code	PEC-IT602B
Title of Course	Data Warehousing and Data MininG
Nature of Course	Elective
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Data Warehousing; Data Mining . CO2: Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns . CO3: Methodologies for stream data processing and stream data systems.

Department	IT
Course Code	PEC-IT602C
Title of Course	Human Computer Interaction
Nature of Course	Elective
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms . CO2: Design rules . CO3: Cognitive models –Socio-Organizational issues and stake holder requirements .

Department	IT
Course Code	PEC-IT602D
Title of Course	Pattern Recognition
Nature of Course	Elective
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of pattern recognition. CO2: a) Directly apply the fundamental concepts of pattern recognition to solve (implement) the most elementary/simplest model problems. CO3: a) Analyze Maximum-Likelihood estimation Gaussian mixture models.

Department	IT
Course Code	OEC-IT601A
Title of Course	Numerical Methods
Nature of Course	Open elective courses(new 2019(0))
Type of Course	Elective
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Truncation and rounding errors, Fixed and floating point arithmetic, Propagation of errors. CO2: Discuss Interpolation. CO3: Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.

Department	IT
Course Code	OEC-IT601 B
Title of Course	Human Resource Development and Organizational Behavior
Nature of Course	Open Elective
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Challenges and Opportunities for OB. CO2: Historical Background, Fundamental Concepts of OB, Challenges . CO3: Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision .

Department	Information Technology
Course Code	PCC-CS691
Title of cours	Database Management Systems Labs
Nature of course	Regular
Type of course	Lecture
Contact hours	3:0:0=3
CREDIT	2
Total contact hours	6 MONTHS
Course Outcomes	CO1: Design and Implement a database schema CO2: Devise queries using DDL, DML, DCL and TCL commands.

	CO3: Develop application programs using PL/SQL CO4:Design and implement a project using embedded SQL and GUI. CO5:Apply modified components for performance tuning in open source software.

Department	Information Technology
Course Code	PCC CS 692
Title of course	Computer Networking Lab
Nature of course	Compulsory
Type of course	Practical
Contact hours	0:3=3
CREDIT	2
Total contact hours	6 MONTHS
Course Outcomes	CO1: Understand and apply different network commands CO2: Develop programs for client-server applications CO3: Perform packet sniffing and analyze packets in network traffic. CO4: Implement error detecting and correcting codes

Department	Information Technology
Course Code	PROJ CS681
Title of course	PROJECT 1
Nature of course	Compulsory
Type of course	Practical
Contact hours	0:6=6
CREDIT	3
Total contact hours	6 MONTHS
Course Outcomes	CO1: Understand and apply different CONCEPTS IN PROJECT

Department	Information Technology
Course Code	PEC-IT701A
Title of course	Internet technology
Nature of course	Elective
Type of course	Lecturer
CREDIT	3
Contact hours	3:0:0=3
Course Outcomes	CO1: Understand advanced networking concepts and internet and web application architectures CO2: Analyze and understand different advanced routing protocols being used in web application development. CO3: Analyze and evaluate different solution available in the field of networking and web application development Co4: Implement solution for different critical network related issue

Department	IT

Course Code	PEC-IT701B
Title of Course	Quantum computing
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define, b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of quantum mechanics. CO2: Develop the skills to gain a basic understanding of quantum physics. CO3: Understand the concepts of photon. CO4: On completion of the course students will be able to knowledge of Vector spaces, Matrices, Quantum state, Density operator and Quantum.

Department	IT
Course Code	PEC-IT701C
Title of Course	Cloud Computing
Nature of Course	Professional Elective Courses
Type of Course	Theory
Contact Hours	3
Credit	3
Course Outcomes	CO1: Cloud Computing and its Basics CO2: Use of Platforms in Cloud Computing Concepts CO3: Cloud Infrastructure and Cloud Management CO4: Concepts of Services and Applications

Department	Information Technology
Course Code	PEC-IT701D
Title of course	Machine learning
Nature of course	Elective
Type of course	Lecturer
CREDIT	3
Contact hours	3:0:0=3
Course Outcomes	CO1: To learn the concept of how to learn patterns and concepts from data without being explicitly programmed CO2: To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances. CO3: Explore supervised and unsupervised learning paradigms of machine learning.

Department	IT
Course Code	PEC-IT702A
Title of Course	Multimedia Technology
Nature of Course	Professional Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Multimedia Technology. CO2: a) Directly apply the fundamental concepts of Multimedia Technology to solve (implement) the most elementary/simplest model problems, and

	thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using Text, Audio, Image and Video. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of Multimedia Technology. CO4: a) Compare and contrast in details between the fundamental concepts of Text, Audio, Image and Video and thereafter b) describe an overview level interconnected map of concepts/terminologies of Multimedia Technology. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of Storage and Access Techniques, Multimedia Database, Document Architecture and Content Management Techniques. CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Multimedia Technology.

Department	IT
Course Code	PEC-IT702B
Title of Course	Neural network and deep learning
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Neural network. CO2: Develop the skills to gain a basic understanding of neural network theory . CO3: a) Understand the concepts of fuzzy sets, knowledge representation using

	fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic Neural network. CO4: a) Compare and contrast in details between the fundamental concepts of Text, Audio, Image and Video and thereafter b) describe an overview level interconnected map of concepts/terminologies of Neural network and deep learning.

Department	IT
Course Code	PEC-IT702C
Title of Course	Soft computing
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of soft computing. CO2: Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory. CO3: a) Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic CO4: a) Compare and contrast in details between the fundamental concepts of Text, Audio, Image and Video and thereafter b) describe an overview level interconnected map of concepts/terminologies of soft computings. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the schematics for typical components of large scale known real world systems using the concept of different soft computing Techniques.

Department	IT
Course Code	PEC-IT702D
Title of Course	Ad hoc and sensor network
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Ad hoc and sensor network. CO2: To analyse the various design issues and challenges in the layered architecture of Ad hoc wireless networks. CO3: a) Understand the concepts of sensor network.

Department	IT
Course Code	PEC-IT702E
Title of Course	Information Theory and Coding
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of To develop an understanding of modern network architectures from a design and performance perspective. CO2: To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). CO3: To provide an opportunity to do network programming 4 To provide a WLAN measurement ideas. PreCO2: To analyse the various design issues and challenges in the layered architecture of Ad hoc wireless networks.

Department	IT
Course Code	PEC-IT702F
Title of Course	Cyber Security
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: To develop an understanding of modern network architectures from a design and performance perspective. CO 2: To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). CO3: To provide an opportunity to do network programming 4 To provide a WLAN measurement ideas. CO2: To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). CO3: To provide an opportunity to do network programming 4 To provide a WLAN measurement ideas. PreCO2: To analyse the various design issues and challenges in the layered architecture of Ad hoc wireless networks.

Department	IT
Course Code	OEC-IT701A
Title of Course	Operation Research
Nature of Course	Open Elective courses(new)
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of LP formulation. CO2: a) Directly apply the fundamental concepts of to solve problems on

	queing theory ,game theory. CO3: Analyse network paths.

Department	IT
Course Code	OEC-IT701B
Title of Course	Introduction to Philosophical Thought
Nature of Course	Open Elective courses(new)
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Carvaka school. CO2: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Buddhism. CO3: Analyse nature of Indian philosophy.

Department	IT
Course Code	OEC-IT701C
Title of Course	Soft Skills & Interpersonal Communication
Nature of Course	Open Elective courses(new)
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Self-Discovery. CO2: Interpersonal Communication improvement. CO3: Analyse Soft Skills.

Department	IT
Course Code	HSMC701
Title of Course	Project management and entrepreneurship
Nature of Course	Open Elective courses(new)
Type of Course	Lecture
Contact Hours	2
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of ENTREPRENEURSHIP. CO2: a) Directly apply the fundamental concepts of to solve problems on queing theory ,game theory. CO3: Analyse network paths.

Department	Information Technology
Course Code	PROJ IT 781
Title of course	PROJECT 2
Nature of course	Compulsory
Type of course	Practical
Contact hours	0:12=12
CREDIT	6
Total contact hours	6 MONTHS
Course Outcomes	CO1: Understand and apply different CONCEPTS IN PROJECT

Department	Information Technology
Course Code	PEC-IT801A
Title of course	SIGNAL AND NETWORK
Nature of course	Professional Elective courses(new)
Type of course	Lecturer
Contact hours	3:0:0=3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: Analyze design and implement combinational logic circuits. CO2: Develop a digital logic and apply it to solve real life problems. CO3: Simulate and implement combinational and sequential circuits

Department	Information Technology
Course Code	PEC-IT801B
Title of course	Cryptography & Network Security
Nature of course	Professional Elective courses(new)
Type of course	Lecturer
Contact hours	3:0:0=3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: Analyze encryption algorithms. CO2: Perform packet sniffing and analyze packets for vulnerabilities CO3: Identify system vulnerabilities of

	communication protocols Co4:Design firewalls Co5:Develop intrusion detection system

Department	IT
Course Code	PEC IT 801 C
Title of Course	Speech and Language Processing
Nature of Course	Professional Elective courses(new)
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Regular Expressions and Automata theory. CO2: Analyze Word Tokenization, Normalization, Sentence Segmentation etc. CO3:. Named Entity Recognition, Multi Word Extraction, Spell Checking – Bayesian Approach,
Department	Information Technology
Course Code	PEC-IT801D
Title of Course	Internet of Things
Nature of Course	Professional Elective courses(new)
Type of Course	Program Elective
Contact Hours	3

Total contact hours	36
Credit	3
Course Outcomes	CO1 a) Define, b) explain in detail, and thereafter c) state the necessity/importance of environmental parameters measurement and monitoring, sensors and its characteristics, smart sensors and its architecture of the subject internet of things (IOT). CO2 a) Directly apply characteristic of environmental parameters measurement and monitoring, sensors and its characteristics, smart sensors and its architecture to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the above fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems with IOT components. CO3 a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems with IOT components, and thereafter b) Compute the output of given model subsystems with IOT components (and also identify errors in the design and implementation of given model subsystems with IOT components). CO4 a) Compare and contrast in details among environmental parameters measurement and monitoring, sensors and its characteristics, smart sensors and its architecture and thereafter b) describe an overview level interconnected map of concepts/terminologies of IOT. CO5 a) Identify and thematically explain where and how environmental parameters measurement and monitoring, sensors and its characteristics, smart sensors and its architecture, are utilized in large scale real world systems with IOT components, and thereafter b) Design the schematics for typical components of large scale known real world systems with IOT components. CO6 a) Identify unsolved but necessary real world problems having IOT components and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems.

Department	IT
Course Code	PEC IT 801 E
Title of Course	Remote Sensig and GIS
Nature of Course	Professional Elective courses(new)
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of the Introduction and Overview of Geographic Information Systems . CO2: Analyze definition of a GIS Regular Expressions and Automata theory. CO3: Concept of Data Quality and Database Concepts Major data feeds to GIS.

Department	IT
Course Code	OEC-IT801A
Title of Course	Big Data Analytics
Nature of Course	Open Elective courses(new)
Type of Course	Theory
Contact Hours	3
Total contact hours	6 months
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of Data analysis. CO2: Understand big data for business intelligence. CO3: Learn business case studies for big data analytics. CO4: Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tools .

Department	Information Technology
Course Code	OEC-IT801B
Title of cours	Cyber Law and Ethics
Nature of course	Open Elective courses(new)
Type of course	Lecture
Contact hours	3:0:0=3
Total contact hours	6 months
Course Outcomes	CO1: Understand of Forgery, Hacking, Software Piracy, Computer Network intrusion. CO2: Security challenges posted by mobile devices, cryptographic security for mobile devices, Attacks on mobile/cellphones, Theft, Virus, Hacking. Bluetooth; Different viruses on laptop. CO3: Analyze the performance of MAC protocols used for wired network and wireless networks.

Department	Information Technology
Course Code	OEC-IT801C
Title of cours	Mobile Computing
Nature of course	Open Elective courses(new)
Type of course	Lecture
Contact hours	3:0:0=3
Total contact hours	6 months
Course Outcomes	CO1: Understand algorithm/protocols, environments and communication systems in mobile computing. CO2: Evaluate the efficiency of mobile IPv4 and IPv6 architectures with agents and proxies.

	CO3: Analyze the performance of MAC protocols used for wired network and wireless networks. CO4: Evaluate the performance of TCP protocols in Wireless Networks with mobile nodes. CO5: Design and analyze the existing routing protocols for multi-hop wireless networks.

Department	Information Technology
Course Code	OEC-IT801D
Title of Course	Bio Informatics
Nature of Course	Theory
Type of Course	Open Elective courses(new)
Contact Hours	3
Total contact hours	48
Credit	3
Course Outcomes	CO1 a) Define, b) explain in detail, and thereafter c) state the necessity/importance of molecular biology. CO2 DNA sequence analysis. CO3 Introduction Probabilistic models used in Computational Biology.

Department	Information Technology
Course Code	OEC-IT801E
Title of course	Robotics
Nature of course	Open Elective courses(new)
Type of course	Lecture

Contact hours	3:0:0=3
Credit	3
Total contact hours	6 months
Course Outcomes	CO1: Understand algorithm/protocols for robotics. CO2: Kinematics of serial robots . CO3: Analyze the performance of robots.

Department	IT
Course Code	OEC-IT802A
Title of Course	E-Commerce & ERP
Nature of Course	Open Elective courses(new)
Type of Course	Lecture
Contact Hours	3
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of E-Commerce & ERP. CO2: a) Directly apply the fundamental concepts of E-Commerce & ERP to solve (implement) the most elementary/simplest model problems, and thereafter b) Directly combine the fundamental concepts to solve (design and implement) elementary model problems on the idealistic components of real-world systems using E-Commerce Technologies. CO3: a) Analyze (identify parts, their interconnections and flow of information) the design and implementation of idealistic components of real world systems, and thereafter b) Compute the output of given model subsystems (and also identify errors in the design and implementation of given model subsystems using the concept of E-Commerce Business Models. CO4: a) Compare and contrast in details between the fundamental concepts of Four C's, E-Payment, E-Marketing and thereafter b) describe an overview level interconnected map of concepts/terminologies of E-Commerce & ERP. CO5: a) Identify and thematically explain where and how the terminologies are utilized in large scale real world systems, and thereafter b) Design the

	schematics for typical components of large scale known real world systems using the concept of Enterprise Resource Planning(ERP). CO6: a) Identify unsolved but necessary real world problems and thereafter b) generate pragmatic detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in E-Commerce & ERP.

Department	IT
Course Code	OEC-IT802B
Title of Course	Micro-electronics and VLSI Design
Nature of Course	Open Elective courses(new)
Type of Course	Lecture
Contact Hours	39
Credit	3
Course Outcomes	CO1: a) Define ,b) explain in detail, and thereafter c) state the necessity/importance of the fundamental concepts of VLSI. CO2: Define CMOS circuits, MOS transistor switches. CO3: Analyze Verification and Testing concept.

DEPARTMENT	Information Technology
COURSE CODE	OEC-IT802C
TITLE OF COURSE	Economic Policies in India
NATURE OF COURSE	Elective
TYPE OF COURSE	Lecture
CONTACT HOURS	3Lecture
TOTAL CONTACT HOURS	36
COURSE OUTCOMES	CO1: Define, explain in detail and Issues in growth, development, and sustainability, Population and economic development, Factors in development, critical evaluation of growth, inequality, poverty and competitiveness, pre- and post- reform eras, Macroeconomic policies and their impact:

	fiscal policy, financial and monetary policies, policies and performance; production and productivity; credit; labour markets and pricing; land reforms; regional variations, production trends,small scale industries; public sector; foreign investment, labour regulation, trends and performance, trade and investment policy. CO2: Can define and understand government policies and will enable informed participation in economic decision making, thus improving their employment prospects and career advancement. CO3: Analyze current economic policy thus improving their chances of getting employed, and be more effective, in positions of responsibility and decision making. CO4: Differentiate and compare between fiscal policy,financial and monetary policies , policies and performance; production and productivity; credit; labour markets and pricing; land reforms; regional variations CO5: Be able to devise a given problem into independent modules and then to solve by integrating the modules by providing appropriate interfaces. CO6 Identify unsolved but necessary real world problems of Economic policies of India and thereafter generate detailed ideas for creation/synthesis of innovative socially necessary products and services to solve such problems in Economic policies of India. .

Department	Information Technology
Course Code	PROJ CS881
Title of course	PROJECT 3
Nature of course	Compulsory
Type of course	Practical
Contact hours	0:12=12
CREDIT	3

Total contact hours	6 MONTHS
Course Outcomes	CO1: Understand and apply different CONCEPTS IN PROJECT