Nutan Maharashtra Vidya Prasarak Mandal's

NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING AND TECHNOLOGY

Under Administrative Support - PimpriChinchwad Education Trust

ESTD : 1996

Approved by AICTE | Accredited by NAAC | Affiliated to SPPU

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Mechanical Engineering

Course Outcomes (COs) 2015 Pattern

SE Mechanical Engineering(2015 Pattern) SEM-III				
SN	**Course Code**	**Course Name**	**Course Outcomes (COs)**	
1	207002	Engineering Mathematics – III	CO1	Solve higher order linear differential equations and its applications to model and analyze mass spring systems.
			CO2	Apply Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications
			CO3	Apply Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering
			CO4	Apply probability and probability distribution theory in testing and quality control.
			CO5	Perform Vector differentiation & integration, analyze the vector fields and Apply to fluid flow problems
			CO6	Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations
2	202041	Manufacturing Processes-I	CO1	Analyze foundry practices like pattern making, mold making, core making and inspection of defects.
			CO2	Analyze hot and cold working, rolling, forging, extrusion and drawing processes.
			CO3	Analyze and interpret different plastic molding processes, extrusion and drawing processes.
			CO4	Analyze and conclude different welding and joining processes and its defects.
			CO5	Analyze and conclude design and analyze different sheet metal working processes.

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			CO6	Analyze the constructional details and working of centre lathe.
3	202042	Mechanical EngineeringAided Machine Drawing	CO1	Understand the importance of CAD in the light of allied technologies such as CAM, CAE, FEA, CFD, PLM.
			CO2	Understand the significance of parametric technology and its application in 2D sketching.
			CO3	Understand the significance of parametric feature-based modeling and its application in 3D machine components modeling.
			CO4	create 3D assemblies that represent static or dynamic Mechanical Systems
			CO5	ensure manufacturability and proper assembly of components and assemblies.
			CO6	communicate between Design and Manufacturing using 2D drawings.
4	202043	Thermodynamics	CO1	Apply various laws of thermodynamic to various processes and real systems.
			CO2	Apply the concept of Entropy, calculate heat, work and other important thermodynamic properties for various processes.
			CO3	Estimate the performances of thermodynamic gas power cycle, gas refigration cycle and availability in each case.
			CO4	Estimate the condition of steam and performance of vapour pressure cycle and vapour compression cycle.
			CO5	Estimate the stoichiometric air required for combustion, performance of steam generators, natural draught and boiler.
			CO6	Use psychrometric chart and estimate various essential properties related to psychrometry and processess.
5	202044	Material Science	CO1	COMPARE crystal structures and ASSESS different lattice parameters
			CO2	CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.
			CO3	CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials.
			CO4	Detect the defects in crystal and its effect on crystal properties
			CO5	Evaluate the different properties of material by studying different test
			CO6	Recognize how metals can be strengthened by cold-working and hot working

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6	202051	Strength of Materials	CO1	Apply knowledge of mathematics, science for engineering applications
			CO2	Design and conduct experiments, as well as to analyze and interpret data
			CO3	Design a component to meet desired needs within realistic constraints of health and safety
			CO4	Identify, formulate, and solve engineering problems
			CO5	Practice professional and ethical responsibility
			CO6	Use the techniques, skills, and modern engineering tools necessary for engineering practice
SE Mechanical Engineering (2015 Pattern)				
SEM-IV				
1	202045	Fluid Mechanics	CO1	Use of various properties in solving the problems in fluids APPLY the laws of fluid statics and concepts of buoyancy
			CO2	IDENTIFY the types of fluid flow and terms associated in fluid kinematics
			CO3	APPLY of Bernoulli's equation for solutions to problms in fluid flow
			CO4	DETERMINE velocity profile and shear stress distribution in internal flow
			CO5	ESTIMATE friction and losses in internal flows and CONSTRUCT mathematical correlation considering dimensionless parameters
			CO6	DESCRIBE boundary layer formation in an external flow ANALYZE the drag and lift forces on immersed bodies
2	202047	Soft Skills	CO1	Improved communication, interaction and presentation of ideas.
			CO2	Right attitudinal and behavioral change
			CO3	Developed right-attitudinal and behavioral change
			CO4	Develop students overall personality
			CO5	Improve his writing and documentation skills
			CO6	Learn to improve their communication skills as well as personality
3	202048	Theory of Machines – I	CO1	Identify mechanisms in real life applications.
			CO2	Solve the mechanisms to get force acting.
			CO3	Distinguish & Select the brakes, clutches for the different applications.
			CO4	Perform kinematic analysis of simple mechanisms.

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			CO3	propose the capability to identify and select suitable special purpose motor and its speed control method for given industrial application
			CO4	relate Arduino IDE an open source platform and its basic programming features
			CO5	construct Program Arduino IDE using conditional statements
			CO6	write Interfacing programs using sensors with Arduino IDE
07	202053	Machine Shop – I	CO1	use the machine tools required for milling machine operations
			CO2	performed manufacture of spur gear through milling machine process using indexing head
			CO3	Are you able to use the machine tools required for surface grinding operations
			CO4	perform surface grinding operation using table grinder
			CO5	manufacture the sheet metal components using dies and press
			CO6	understand the procedure of plastic processing

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			CO5	Perform kinematic analysis of simple mechanisms to find out the relative velocty and acceleration.
			CO6	Estimate the value of velocity & acceleration for mechanisms involving sliding pair.
4	202049	Engineering Metallurgy	CO1	Describe how metals and alloys formed and how the properties change due to Microstructure .
			CO2	Apply core concepts in Engineering Metallurgy to solve engineering problems .
			CO3	Conduct experiments, as well as to analyze and interpret data .
			CO4	select materials for design and construction
			CO5	Possess the skills and techniques necessary for modern materials engineering practice .
			CO6	Recognize how metals can be strengthened by alloying, cold-working, and heat treatment .
			CO7	Describe how metals and alloys formed and how the properties change due to Microstructure .
5	202050	Applied Thermodynamics	CO1	Classify various types of Engines, Compare Air standard, Fuel Air and Actual cycles and make out various losses in real cycles.
			CO2	Discuss Theory of Carburetion, Modern Carburetor, Stages of Combustion in S. I. Engines and Theory of Detonation, Pre-ignition and factors affecting detonation.
			CO3	Discuss Fuel Supply system, Types of Injectors and Injection Pumps, Stages of Combustion in CI Engines, Theory of Detonation in CI Engines and Comparison of SI and CI Combustion and Knocking and Factors affecting, Criteria for good combustion chamber and types.
			CO4	Carry out Testing of I. C. Engines and analyze its performance.
			CO5	Describe construction and working of various I. C. Engine systems.
			CO6	Describe construction, working of various types of reciprocating and rotary compressors with performance calculations of positive displacement compressors.
6	203152	Electrical and Electronics Engineering	CO1	discover the capability to identify and select suitable DC motor and its speed control method for given industrial application
			CO2	Recommend and select suitable induction motor and its speed control method for given industrial application

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TE Mechanical Engineering (2015 Pattern) SEM-V				
SN	**Course Code**	**Course Name**	**Course Outcomes (COs)**	
1	302041	**Design of Machine Elements-I**	CO1	Identify and understand failure modes for mechanical elements and design of machine elements based on strength.
			CO2	Design Shafts, Keys and Coupling for industrial applications.
			CO3	Design machine elements subjected to fluctuating loads.
			CO4	Design Power Screws for various applications.
			CO5	Design fasteners and welded joints subjected to different loading conditions.
			CO6	Design various Springs for strength and stiffness.
2	302042	**Heat Transfer**	CO1	Develop the heat conduction equations for steady state one dimensional thermal system without heat generation.
			CO2	Apply the heat conduction equations to thermal systems with heat generation and extended surfaces.
			CO3	Implement the general heat conduction equation to transient heat conduction and selection of the thermal insulation.
			CO4	Apply the knowledge of fluid flow and convection heat transfer to analyse the thermal system.
			CO5	Explain the heat transfer by radiation between the objects with simple geometries.
			CO6	Evaluate the heat transfer performance of heat exchangers and study the phase change phenomenon.
3	302043	**Theory of Machines-II**	CO1	Apply conceptes to design the gear.
			CO2	Perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
			CO3	Analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.

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			CO4	Design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
			CO5	Synthesize a four bar mechanism with analytical and graphical methods.
			CO6	Analyze the gyroscopic couple or effect for stabilization of Ship, Aeroplane and Four wheeler vehicle.
4	302044	**Turbo Machines**	CO1	Apply thermodynamics and kinematics principal to turbine
			CO2	Analysize the performance of turbine
			CO3	Capable to select turbine for given application
			CO4	Predict the perforance using model testing of turbine
			CO5	Understanding the working and mechanism of pump
			CO6	Apply the knowledge of pumps and compressor to optimized its efficiency
5	302045	**Metrology and Quality Contro**	CO1	Understand and ANALYSE the need calibration of measuring instruments, sources of errors,standards of measurements. SELECT suitable measuring instrument and Design the gauge
			CO2	MEASURE the dimensions using Comparator. Gear, thread and surface metrology by SELECTION of suitable instruments
			CO3	DESCRIBE the advancements in metrology for complex geomterical shapes
			CO4	ASSOCIATE the quality concept and its deployment.
			CO5	SELECT and APPLY appropriate Quality Control Technique for given appliaction/problem.
			CO6	DESCRIBE the need and importance of the Total Quality Management tools and Quality Management System
6	302046	**Skill Development**	CO1	Identify the various process used for assembly & disassembly of various machines.
			CO2	APPLY & DEMONSTRATE procedure of assembly & disassembly of various machines.
			CO3	DESIGN & DEVELOP a working/model of machine parts or any new product.
			CO4	Record the assembly and disassembly process of various machines.
			CO5	Develop assembly drawing for various machines.

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			CO6	APPLY geometric and dimensional tolerance, Create BOM for assembly drawing.
			CO6	Apply best practices for secure software development, including coding standards, vulnerability testing, and code review.
TE Mechanical Engineering (2015Pattern) SEM-VI				
1	302047	**Numerical Methods and Optimization**	CO1	Apply numerical methods to find solution of algebraic equations using different methods under different conditions.
			CO2	Develop solution for engineering applications with Simultaneous Equations.
			CO3	Generate Solutions for real life problem using optimization techniques.
			CO4	Estimate solutions for differential equations using numerical techniques.
			CO5	Design and create a model using a curve fitting and regression analysis.
			CO6	Develop solution for engineering applications with numerical integration.
2	302048	**Design of Machine Elements-II**	CO1	Understand and apply principles of gear design to spur gears and industrial spur gear boxes
			CO2	Become proficient in Design of Helical and Bevel Gear
			CO3	Develop capability to analyse Rolling contact bearing and its selection from manufacturer's Catalogue.
			CO4	Learn a skill to design worm gear box for various industrial applications
			CO5	Inculcate an ability to design belt drives and selection of belt, rope and chain drives
			CO6	Achieve an expertise in design of Sliding contact bearing in industrial applications
3	302049	**Refrigeration and Air Conditioning**	CO1	Use fundamental principles and different methods of refrigeration and air conditioning.
			CO2	Discuss various refrigeration cycles and evaluate performance using Mollier charts
			CO3	Compare different refrigerants with respect to properties, applications and environment issues.
			CO4	Apply the basic air conditioning processes on psychometric charts .
			CO5	Calculate cooling load for its applications in comfort and industrial air conditioning.

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			CO6	Discuss various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems
4	302050	Mechatronics	CO1	Identify key elements of mechatronics system and its representation in terms of block diagram.
			CO2	DETERMINE the transfer function by using block diagram reduction technique.
			CO3	do Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.
			CO4	Develop PLC ladder programming and implementation of real life system.
			CO5	Do Time and Frequency domain analysis of system model (for control application).
			CO6	Implement PID control on real time systems.
5	302051	Manufacturing - Process-II	CO1	Analyze concepts of metal cutting like single point cutting tool, machinability.
			CO2	Analyze and interpret different machine tools and their application.
			CO3	Analyze and interpret different finishing tools and processes like honing, buffing, lapping and burnishing.
			CO4	Analyze and conclude advanced machining processes like discharge machining, LASER beam machining, abrasive jet machining, etc.
			CO5	Analyze and interpret the concepts of CNC technology and programming.
			CO6	Analyze and conclude variety of operations of jigs and fixtures.
6	302052	Machine Shop-II	CO1	Develop knowledge about the working and programming techniques for various machines and tools.
			CO2	Set and use the tolerances involved in the use of a lathe, drilling, milling, and grinding machines.
			CO3	Develop knowledge about the working and programming techniques for CNC.
			CO4	Design jigs and fixtures and draw different views on sheets.
			CO5	Understand the process planning systems for manufacturing industries.
			CO6	Write a report on an industrial visit to a manufacturing plant.
07	302053	Seminar	CO1	Establish motivation for any topic of interest and develop a thought process for technical presentation

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			CO2	Organize a detailed literature survey and build a document with respect to technical publications.
			CO3	Analysis and comprehension of proof-of-concept and related data.
			CO4	Effective presentation and improve soft skills
			CO5	Make use of new and recent technology (e.g. Latex) for creating technical reports
			CO6	Identify and compare technical and practical issues related to the area of course specialization

BE Mechanical Engineering (2015 Pattern)

SEM-VII

SN	Course Code	Course Name	Course Outcomes (COs)	
1	402041	Hydraulics and Pneumatic	CO1	Understand working principle of components used in hydraulic & pneumatic systems
			CO2	Identify various applications of hydraulic & pneumatic systems
			CO3	Select appropriate components required for hydraulic and pneumatic systems
			CO4	Analyse hydraulic and pneumatic systems for industrial/mobile applications
			CO5	Design a system according to the requirements
			CO6	Develop and apply knowledge to various applications
2	402042	CAD CAM Automation	CO1	Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations
			CO2	Use analytical and synthetic curves and surfaces in part modeling
			CO3	Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
			CO4	Generate CNC program for Turning / Milling and generate tool path using CAM software
			CO5	Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology.

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			CO6	Understand the robot systems and their applications in manufacturing industries.
3	402043	**Dynamics of Machinery**	CO1	Estimate natural frequency for single DOF un-damped & damped free vibratory
			CO2	Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
			CO3	Estimate natural frequencies, mode shapes for 2 DOF un-damped free longitudinal and torsional vibratory systems.
			CO4	Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
			CO5	Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
			CO6	Explain noise, its measurement & noise reduction techniques for industry and day today life problems.
4	402044-A	**Elective I- Finite Element Analysis**	CO1	Understand the different techniques used to solve mechanical engineering problems.
			CO2	Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
			CO3	Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
			CO4	Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
			CO5	Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.
			CO6	Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.

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5	402045-II	Elective II - Automobile Engineering	CO1	compare and select the proper automotive system for the vehicle.
			CO2	Identify the different parts of the automobile
			CO3	Understand the operation of suspensions and breaking systems.
			CO4	analyze the performance of the vehicle.
			CO5	Diagnose the faults of automobile vehicles.
			CO6	Apply the knowledge of EVs, HEVs, and solar vehicles.
6	402045-II	Elective II - Operation Research	CO1	Apply LPP and Decision Theory to solve the problems
			CO2	Apply the concept of transportation models to optimize available resources
			CO3	Decide optimal strategies in conflicting situations
			CO4	Implement the project management techniques
			CO5	Minimize the process time
			CO6	Optimize multi stage decision making problems
07	402045-II	Elective II - Energy Audit and Management	CO1	Compare energy scenario of India and World
			CO2	Carry out Energy Audit of the Residence / Institute/ Organization
			CO3	Evaluate the project using financial techniques
			CO4	Identify and evaluate energy conservation opportunities in Thermal Utilities
			CO5	Identify and evaluate energy conservation opportunities in Electrical Utilities
			CO6	Identify the feasibility of Cogeneration and WHRUse a CFD tool effectively for practical problems and research
08	402046	Project Stage-I	CO1	Identify a real world problem, review literature, suggest its solution and Demonstrate profound technical knowledge of the project.
			CO2	Demonstrate solutions to complex engineering problems utilizing a systems approach and Provide solutions to meet the specified needs of the society.

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			CO3	Create a system and validate its conformance and Perform data analysis, interpret and provide valid conclusions.
			CO4	Assess health, safety and legal relevant to professional engineering practices and Comply the environmental needs and sustainable development.
			CO5	Justify ethical principles in engineering practices and Perform multi-disciplinary task as an individual and / or team member to manage the project/task.
			CO6	Comprehend the Engineering activities with effective presentation and report and Interpret the findings with appropriate technological / research citation.
BE Mechanical Engineering (2015 Pattern) SEM-VIII				
1	402047	**Energy Engineering**	CO1	Describe the power generation scenario and the layout components of thermal power plant and Analyze the Rankine cycle
			CO2	Analyze the steam condensers, recognize an environmental impacts of thermal power plant and method to control the same .
			CO3	Recognize the layout, component details of hydroelectric power plant and nuclear power plant
			CO4	Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
			CO5	Emphasize the fundaments of non-conventional power plants
			CO6	Describe the different power plant electrical instruments and basic principles of economics of power generation .
2	402048	**Mechanical System Design**	CO1	Distinguish between component level design and system level design.
			CO2	Summarize the manufactured component based on accepted components & rejected components.
			CO3	Design components of conveyor belt considering all the resistances.

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			CO4	Design mechanical systems for the specifications stated/formulated.
			CO5	Design various components of internal combustion engines.
			CO6	Adapt optimum design principles and select materials for mechanical component.
3	402049	**: Elective III - Industrial Engineering**	CO1	Apply the industrial engineering concept.
			CO2	Analyze and implement different concepts involved in method study.
			CO3	Design and developed different aspects of work system and facilities.
			CO4	apply industrial safety standards, financial management practics.
			CO5	Evaluate the project work based on modeling and simulation.
			CO6	plan, schedule and control project work of organization.
4	402050	**Elective IV- Advanced Manufacturing Processes**	CO1	Classify and analyze special forming processes
			CO2	Analyze and identify applicability of advanced joining processes
			CO3	Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
			CO4	Select appropriate micro and nano fabrication techniques for engineering applications
			CO5	Understand and apply various additive manufacturing technology for product development
			CO6	Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.
5	402050	**Elective IV- Product Design and Development**	CO1	Understand essential factors for product design
			CO2	Design product as per customer needs and satisfaction
			CO3	Understand Processes and concepts during product development
			CO4	Understand methods and processes of Forward and Reverse engineering

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			CO5	Carry various design processes as DFA, DFMEA, design for safety
			CO6	Understand the product life cycle and product data management
6	402051	**Project Work Stage II**	CO1	Identify a real world problem, review literature, suggest its solution and Demonstrate profound technical knowledge of the project.
			CO2	Demonstrate solutions to complex engineering problems utilizing a systems approach and Provide solutions to meet the specified needs of the society.
			CO3	Create a system and validate its conformance and Perform data analysis, interpret and provide valid conclusions.
			CO4	Assess health, safety and legal relevant to professional engineering practices and Comply the environmental needs and sustainable development.
			CO5	Justify ethical principles in engineering practices and Perform multi-disciplinary task as an individual and / or team member to manage the project/task.
			CO6	Comprehend the Engineering activities with effective presentation and report and Interpret the findings with appropriate technological / research citation.

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Course Outcomes (COs) 2015 Pattern

SE Computer Engineering(2015Pattern) SEM-III			
Course Code	**CourseName**	**Course Outcomes**	**Course Outcomes (COs)**
210241	Discrete Mathematics	CO1	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
		CO2	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
		CO3	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
		CO4	Model and solve computing problems using graphs and solve problems using appropriate algorithms.
		CO5	Model and solve computing problems using trees and solve problems using appropriate algorithms.
		CO6	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.
210242	Digital Electronics and Logic Design	CO1	Design and implement Combinational digital circuits using Algebraic simplifications methods.
		CO2	Design and Implement Sequential digital circuits as per the specifications.
		CO3	Construct ASM Chart and demonstrate the digital systems using VHDL
		CO4	Describe different types of Programmable logic devices(PLD's).
		CO5	Illustrate the working of logic families & Apply the knowledge to select the logic families IC packages as per the design specifications.
		CO6	Differentiate between Microprocessor and Microcontroller 8051 to develop a minimum embedded system for simple real world applications

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210243	Data Structures and Algorithms	CO1	Design algorithmic solution for programming problems and analyze time and space complexity of program.
		CO2	Demonstrate the use of Linear Data Structures Using Sequential Organization.
		CO3	Discriminate the use of Linked list for performing various operations such as insertion, deletion, searching, sorting.
		CO4	Comprehend and Apply principles of Stack to solve computational problem.
		CO5	Illustrate and Apply principles of Queue to solve computational problem.
		CO6	Demonstrate and Implement various sorting and searching algorithms.
210244	Computer Organization and Architecture	CO1	Analyze the structure, function, characteristics and arithmetic operations of computer systems.
		CO2	Analyze the function of each element of a memory hierarchy
		CO3	Demonstrate the basic knowledge of I/O devices and Direct Memory Access
		CO4	Identify the elements of modern instructions sets and explain their impact on processor design.
		CO5	Ability to Demonstrate Instruction level parallelism and superscalar processors with Design Issues
		CO6	Evaluate various design of the Basic Processing Unit of a digital computer system
210245	Object Oriented Programming	CO1	Illustrate basic concepts of object-oriented design techniques and principles.
		CO2	Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.
		CO3	Use virtual and pure virtual function and complex programming situations.
		CO4	Implement generic classes and handle exceptions using C++
		CO5	Develop programs for File handling in C++.
		CO6	Exemplify basic principles of Standard Template Library using C++ language.
210249	Soft Skills	CO1	Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
		CO2	Develop concept of communication and speaking skills.
		CO3	Design the effective resume as per industry requirement and Write precise briefs or reports and technical documents
		CO4	To develop and nurture the soft skills of the students

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			through individual and group activities.
		CO5	Develop the way to improve Stress and Time Management
		CO6	To expose students to right attitudinal and behavioral aspects and to build the same through activities.
210250C	Environmental Studies	CO1	To Know why ecosystems and biodiversity matter.
		CO2	To See how human growth affects the environment
		CO3	Identify different kinds of pollution and their solutions.
		CO4	To Understand how we use traditional and alternative resources.
		CO5	Recognize your role in protecting the environment.
		CO6	Connect human activities with environmental damage
SE Computer Engineering(2015 Pattern) SEM-IV			
207003	**Engineering Mathematics III**	CO1	Solve Higher Order Linear Differential Equations
		CO2	Apply Fourier and Z-Transforms in Signal and Image Processing
		CO3	Utilize Statistical Methods for Data Analysis and Prediction
		CO4	Perform Vector Differentiation and Integration
		CO5	Analyze Conformal Mappings and Perform Contour Integration
		CO6	Model and Solve Practical Engineering Problems Using Differential Equations and Transforms
210251	**Computer Graphics**	CO1	Apply fundamental concepts and practical skills in computer graphics
		CO2	Develop the competency related to Computer Vision and Windowing and clipping
		CO3	Implement and use classic and modern algorithms of computer graphic to 3-D geometry, 3D modelling and 3D object Representation
		CO4	Demonstrate graphics programming skills for different animation techniques & virtual reality.
		CO5	Acquire practical skills on additional advanced concepts of hidden surfaces & lines.
		CO6	Gain knowledge of various concepts of Curves and Fractals
210252	**Advanced Data Structures**	CO1	Demonstrate basic terminologies of tree data structure and implement tree traversal techniques.
		CO2	Represent graph with adjacency matrix and implement graph traversal methods, greedy algorithm for computing minimum spanning tree.
		CO3	Illustrate advanced data structures to solve complex problems in various domains.
		CO4	Design symbol tables, OBST and AVL tree.

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		CO5	Describe and implement Indexing technique and various search Trees.
		CO6	Demonstrate different File Organization structures like Sequential file organization, Direct Access File, Indexed sequential file organization and Linked Organization.
210253	**Microprocessor**	CO1	Classify Processor Architectures and exhibit assembly language programming skills in applications.
		CO2	Illustrate advanced features of 80386 microprocessor.
		CO3	Understand different addressing mechanisms in 80386 microprocessor.
		CO4	Compare and contrast different protection levels in processor.
		CO5	Use multitasking features in applications.
		CO6	Differentiate between microprocessor and microcontrollers.
210254	**Principles of Programming Languages**	CO1	Make use of basic principles of programming languages.
		CO2	Develop a program with Data representation and Computations.
		CO3	Develop programs using Object Oriented Programming language : Java.
		CO4	Develop application using inheritance, encapsulation, and polymorphism.
		CO5	Demonstrate Multithreading for robust application development.
		CO6	Develop a simple program using basic concepts of Functional and Logical programming paradigm.
210258D	Stress Relief: Yoga and Meditation	CO1	To Understand different perspectives on life and issues.
		CO2	Strengthen your immune system
		CO3	Learn about yoga and Hindu scriptures.
		CO4	Improve your concentration.
		CO5	Boost self-awareness and mindfulness.
		CO6	Reduce stress through practice.

TE Computer Engineering(2015Pattern) SEM-V			
310241	**Theory of Computation**	CO1	Construct finite automata and its variants to solve computing problems.
		CO2	Write regular expressions for the regular languages and

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			finite automata.
		CO3	Identify types of grammar, design and simplify Context Free Grammar.
		CO4	Design and analyze Turing machines for formal languages.
		CO5	Construct Pushdown Automata machine for the Context Free Language.
		CO6	Understand decidable and undecidable problems, analyze complexity classes.
310242	**Database Management Systems (DBMS)**	CO1	Design E-R Model for given requirements and convert the same into database tables.
		CO2	Use database techniques such as SQL & PL/SQL
		CO3	Use modern database techniques such as NOSQL.
		CO4	Explain transaction Management in relational database System.
		CO5	Describe different database architecture and analyses the use of appropriate architecture in real time environment
		CO6	Use advanced database Programming concepts
310243	**Software Engineering & Project Management**	CO1	Design a process model for a developing a software project.
		CO2	Classify software applications and identify unique features of various domains.
		CO3	Design test cases of a software system.
		CO4	Illustrate basics of IT Project management.
		CO5	Execute a project considering the risk management for Planning and scheduling.
		CO6	Apply quality attributes in software development life cycle.
310244	**Information Systems & Engineering Economics**	CO1	Understand the importance of various forms of an Information Systems and its application to an organisation.
		CO2	Learn the role of vendor management and understand ethical, social and privacy issues in IT governance.
		CO3	Study Information System Development and Project Management.
		CO4	Understand engineering economic analysis in decision making for earning and evaluating.
		CO5	Analyze the effects of inflation , economic equivalence of

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			the project and calculate the present worth of a project
		CO6	Adapt perfect decisions for investment in business projects to reduce the tax.
310245	**Computer Networks** (CN)	CO1	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
		CO2	Demonstrate design issues, flow control and error control
		CO3	Illustrate the working of MAC network protocols & its IEEE standards.
		CO4	Analyze data flow between TCP/IP model using Network Layer & demonstrate different addressing schemes routing and switching algorithms.
		CO5	Analyze data flow between TCP/IP model using Transport Layer & implement client-server applications using sockets
		CO6	Analyze data flow between TCP/IP model using Application Layer & illustrate role of application layer protocols.
310249 A	Cyber Security	CO1	Understanding the CIA triad—Confidentiality, Integrity, Availability—and how they protect information
		CO2	Learning how encryption (Symmetric and Asymmetric) secures data, along with digital signatures and authentication methods.
		CO3	Exploring email security protocols like PGP, MIME, S/MIME, and secure online transactions with SET.
		CO4	Identifying the need for IDS, methods to detect threats, and understanding firewall architectures and their types.
		CO5	Studying how trusted systems and access control mechanisms regulate who can access or modify information.
		CO6	Understanding various hacking techniques, threats, and countermeasures used to defend against cyber attacks.
TE Computer Engineering(2015Pattern)			
SEM-VI			
310250	**Design & Analysis of Algorithms**	CO1	Formulate the problem on design and analysis of algorithms
		CO2	Analyze the asymptotic performance of algorithms
		CO3	Decide and apply algorithmic strategies to solve given problem
		CO4	Find optimal solution by applying various methods
		CO5	Write mathematical modelling of algorithms for problem solving.
		CO6	Solve problems for multi-core or distributed or concurrent/Parallel/Embedded environments
310251	**Systems Programming & Operating System** (SP & OS)	CO1	Understand the basic concepts of System Software. Analyze and implement Pass and Phase concepts for assembler design
		CO2	Analyze and synthesize macro processor design using efficient data structures.

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		CO3	Study of language translator and tools viz. LEX & YACC to implement lexical analysis and syntax analysis.
		CO4	Study and Implement operating system functions to improve performance of operating system.
		CO5	Summarize the programming model for memory management and simulate the algorithms for performance analysis.
		CO6	Study and implement the I/O management and file management.
310252	**Embedded Systems & Internet of Things** (ES & IoT)	CO1	Use fundamentals of IoT and embedded system which includes essential design strategy, process modelling & communications API's
		CO2	Apply & design different designing methodology for implementation of IOT applications
		CO3	Develop comprehensive approach towards building small low cost embedded IoT system
		CO4	Analyse IOT Protocols for making IoT devices communication.
		CO5	Design cloud based IoT Systems
		CO6	Learn real world application scenarios of IoT along with its societal and economic impact using case studies
310253	**Software Modeling and Design**	CO1	Analyse & Design the problem statement (SRS) and choose proper design technique for web-based/ desktop application
		CO2	Design and analyse an application using UML modelling as fundamental tool.
		CO3	Exemplify the concept of object-oriented development, and create a dynamic behavioural model for the system using appropriate modern tool
		CO4	Use Architectural design for real world software application
		CO5	Apply different design patterns to understand reusability in Object Oriented design
		CO6	Adopt and apply appropriate modern testing tool for testing web-based/desktop application

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310254	**Web Technology**	CO1	Implement and analyze behaviour of web pages using HTML and CSS
		CO2	Apply the Client Side technologies for web development
		CO3	Analyze Server Side technologies Servlet and JSP
		CO4	Apply the Server Side technologies PHP and AJAX for web development
		CO5	Apply the Client and Server Side framework Angular JS and Structs.
		CO6	Analyze the Web services and Content Management System.
310255	**Seminar & Technical Communication**	CO1	To explore the basic principles of communication and active, empathetic listening, speaking and writing techniques
		CO2	Establish motivation for any topic of interest and develop a thought process for technical presentation.
		CO3	Organize a detailed literature survey and build a document with respect to technical publications
		CO4	Analysis and comprehension of proof-of-concept and related data for seminar
		CO5	Effective presentation and improve soft skills
		CO6	To expose the student to new technologies ,researches, products , algorithms, services
310259 D	Leadership and Personality Development	CO1	Understanding your strengths and weaknesses and learning how to introduce yourself confidently
		CO2	Improving speaking, listening, and overcoming communication barriers.
		CO3	Boosting self-esteem and having a positive attitude.
		CO4	Learning how to lead, work in groups, and build teams.
		CO5	Managing stress and handling conflicts effectively.
		CO6	Using time wisely and being more organized.

BE Computer Engineering(2015 Pattern) SEM VII			
410241	High Performance Computing	CO1	Understand various Parallel Paradigm
		CO2	Design and Develop an efficient parallel algorithm to solve given problem
		CO3	Illustrate data communication operations on various parallel architecture

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		CO4	Analyse and measure performance of modern parallel computing systems
		CO5	Apply CUDA architecture for parallel programming
		CO6	Analyze the performance of HPC applications
410242	Artificial Intelligence and Robotics	CO1	Identify and apply suitable Intelligent agents for various AI applications
		CO2	Design smart system using different informed search / uninformed search or heuristic approaches.
		CO3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
		CO4	Apply the suitable algorithms to solve AI problems
		CO5	Build the Concept of Logic and Reasoning with respect to AI
		CO6	Explore various application areas in which Robotics can be used
410243	Data Analytics	CO1	Inculcate Big data primitives, life cycle phases with different mathematical models .
		CO2	Analyse apply different Statistic methods for Business Analytic
		CO3	Develop problem solutions using association rule & regression methods
		CO4	Apply different classification Algorithm
		CO5	Analyze the requirements, problems, and strategies for various data visualisation methods used in analytical techniques.
		CO6	Analyse use of different Advanced Analytics-Technology and Tools for big data analytics
410244(D)	Data Mining and Warehousing (Elective I)	CO1	Compare various data pre-processing and cleaning techniques
		CO2	Compare various data warehousing techniques
		CO3	Apply algorithmic techniques to measure data similarity and dissimilarity in data engineering
		CO4	Apply basic, intermediate and advanced techniques to mine the data in data mining
		CO5	Explore and analyze the hidden patterns in the data
		CO6	Optimize the mining process by choosing best data mining technique
410245(B)	Software Testing and Quality Assurance (Elective II)	CO1	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
		CO2	Design and develop project test plan, test cases, test data, and conduct test operations.

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		CO3	Apply recent automation tool on various software for testing.
		CO4	Discuss basics of Selenium tool, IDE, web driver and selenium grid.
		CO5	Apply different approaches of quality management, assurance, and quality standard to software system.
		CO6	Apply and analyze effectiveness of software quality tools.
410247	Laboratory Practice II	CO1	Express the analysis and design of an application
		CO2	Specify functional semantics of an application
		CO3	Select and use appropriate architectural styles and software design patterns
		CO4	Design and develop project test plan, design test cases, test data, and conduct test operations
		CO5	Apply recent automation tool for various software testing for testing software
		CO6	Apply and analyse effectiveness Software Quality Tools
410248	Project Work Stage I		
410249	Audit Course 5	CO1	Understanding the difference between starting your own business (entrepreneur) and innovating within a company (intrapreneur).
		CO2	How to come up with business ideas.
		CO3	Writing and planning for a business.
		CO4	Steps to start a company and protect ideas.
		CO5	Finding money to start and grow a business.
		CO6	Growing and managing a business successfully.
BE Computer Engineering(2015 Pattern) SEM VII			
410250	Machine Learning	CO1	Analyze human learning aspects and relate it with machine learning concepts.
		CO2	analyze and apply different preprocessing methods to prepare training data set for machine learning
		CO3	Design and implement Linear regression and Logistic regression machine learning algorithm.
		CO4	Analyse and implement Naïve Bayes and Support Vector Machine
		CO5	Implement different learning models And Learn Meta classifiers
		CO6	analyze and apply different Clustering Techniques and learn deep learning concepts

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410251	Information and Cyber Security	CO1	Gauge the security protections and limitations provided by today's technology.
		CO2	Identify information security and cyber security threats.
		CO3	Analyse threats in order to protect or defend it in cyberspace from cyber-attacks..
		CO4	Build appropriate security solutions against cyber-attacks
		CO5	Explore Concepts of Intrusion Detection Systems
		CO6	Aware about different concepts in Cyber security area
410252	**Embedded Systems & Internet of Things (ES & IoT)(** Elective III)	CO1	Use fundamentals of IoT and embedded system which includes essential design strategy, process modelling & communications API's
		CO2	Apply & design different designing methodology for implementation of IOT applications
		CO3	Develop comprehensive approach towards building small low cost embedded IoT system
		CO4	Analyse IOT Protocols for making IoT devices communication.
		CO5	Design cloud based IoT Systems
		CO6	Learn real world application scenarios of IoT along with its societal and economic impact using case studies
410253	Elective IV	CO1	Learn basics of cloud computing, PaaS, IaaS and IDaaS.
		CO2	Discuss cloud file system, cloud storage and security in cloud.
		CO3	Study implementation levels of virtualization, virtualization of CPU, memory and IO devices and virtualization for data.
		CO4	Study and create various amazon web services.
		CO5	Explore ubiquitous Clouds and the Internet of Things.
		CO6	Explore future trends of cloud computing.
410256	Project Work Stage II		
4102 57A	Entrepreneurship Development	CO1	Understanding the basics of data, information, and knowledge, and their role in decision-making.
		CO2	Learning about BI concepts, cycles, architecture, and identifying opportunities and benefits of BI
		CO3	Exploring DSS concepts, techniques, applications, and how BI contributes to DSS
		CO4	Understanding the basics of data warehouse design, technology, and distributed data warehouses.
		CO5	Learning how to prepare and clean data, handle outliers, and use data analytics techniques.
		CO6	Planning and managing BI infrastructure, ensuring scalability, availability, and maintaining BI systems.

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Under Administrative Support - Pimpri Chinchwad Education Trust

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Department of Electronics & Telecommunication Engineering

Bachelor Of Engg 2015 Pattern - Course Outcome

Sr No.	Year /Sem	Subject Name	Subject Code	Course Outcome
01	2nd / III	Signals & Systems	204181	1. Identify, classify basic signals and perform operations on signals. 2. Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between two signals 3. Analyze and resolve the signals in frequency domain using Fourier Series 4. Analyze and resolve the signals in frequency domain using Fourier Transform. 5. Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms. 6. Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
02	2nd / III	Electronic Devices & Circuits	204182	1. Illustrate various configration of JFET and its application as an amplifier 2. Analyze MOSFETs for DC circuits. 3. Analyze small signal model of MOSFET for AC circuits and its role in VLSI. 4. Review various circuits using MOSFET. 5. Illustrate topologies of feedback amplifiers and different oscillators. 6. Design an adjustable voltage regulator circuits.
03	2nd / III	Electrical Circuits and Machines	204183	1. Analyze basic AC , DC circuit for voltage, current and power by using KVL, KCL and network theorems. 2. Illustrate the basic knowledge of transformers,their types and design different types of transformer. 3. Describe the constructional details, characteristics, features and application areas of various types of DC motors. 4. Describe the constructional details, characteristics, features and application areas of various types of AC motors. 5. Describe the constructional details, characteristics, features and application areas of BLDC,reluctance

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				and universal motors. 6. Describe the constructional details, characteristics, features and application areas of stepper, servo and single phase induction motors.
04	2nd / III	**Data Structures and Algorithms**	**204184**	1. Discuss the computational efficiency of the principal algorithms such as sorting & searching. 2. Develop the programs that use arrays & pointers in C 3. Implement stacks & queues for various applications. 4. Describe how arrays, records, linked structures are represented in memory and use them in algorithms. 5. Identify various terminologies and traversals of trees and use them for various applications. 6. Identify various terminologies and traversals of graphs and use them for various applications.
05	2nd / III	**Digital Electronics**	**204185**	1. Realize Boolean expression using logic gates and Design Combinational circuits for a given functions using logic gates 2. Design and implement synchronous and Asynchronous sequential circuits 3. Analyze the various design steps in finite state machines and implement it 4. Analyze the various logic families with their characteristics and Summarize the types of memory devices. 5. Design the combinational logic circuits using Programmable Logic Devices. 6. Illustrate the architecture and instruction set of microcontroller and its use for basic operations.
06	2nd / IV	**Engineering Mathematics III**	**207005**	1. Solve higher order linear differential equation using appropriate techniques for modelling and analyzing electrical circuits and control systems. 2. Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems. 3. Determine Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing. 4. Perform vector differentiation, analyze the vector fields and apply to electro-magnetic fields & wave theory. 5. Perform vector integration, analyze the vector fields and apply to electro- magnetic fields & wave theory. 6. Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.
07	2nd / IV	**Integrated Circuits**	**204187**	1. Describe the internal structure of Op-Amp and define its characteristics. 2. Identify and Analyze linear applications of Op-Amp.

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				3. Identify and Analyze nonlinear applications of Op-Amp. 4. Analyze different converters using OP-AMP 5. Apply the functionalities of PLL to Frequency synthesizer, multiplier, FM, and AM demodulators and design of various oscillators. 6. Design active filters using op-amps.
08	2nd / IV	Control Systems	204188	1. Identify and use models of physical systems in forms suitable for use in the analysis and design of control systems 2. Perform time domain analysis and identify the order of control systems required for stability analysis. 3. Apply Routh-Hurwitz Criterion and Root Locus Technique to find the stability of the control system. 4. Apply Bode Plots, Polar Plots and Nyquist Plots to perform frequency domain analysis of control systems required for stability analysis. 5. Illustrate and solve system equations in state variables in physical and phase variable form by using Laplace transform. 6. Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.
09	2nd / IV	Analog Communication	204189	1. Illustrate and analyze the fundamental concepts and various types of AM systems. 2. Distinguish and analyze the AM receivers 3. Analyze and identify the fundamental concepts and various types of FM systems. 4. Distinguish and analyze the FM receivers 5. Analyze and evaluate noise in AM communication systems. 6. Describe and analyze analog pulse modulation techniques and sampling theorem.
10	2nd / IV	Object Oriented Programming	204190	1. Describe and apply the principles of object oriented programming. 2. Apply the concepts of data encapsulation, constructors, inheritance and polymorphism in C++. 3. Describe and apply the basic program constructs in Java 4. Apply the concepts of classes and objects to write programs in Java. 5. Develop the programs in JAVA using arrays, vectors and strings concepts based on inheritance, packages and interfaces. 6. Describe and use the concepts in Java to develop user friendly program.
		Employability Skill Development		1. Develop & express essential communication skills (writing, verbal and non-verbal) 2. Identify,develop and implement analytical abilities. 3. Identify,develop and implement analytical abilities. 4. Develop the skill for correct usage of English grammar in writing. 5. Develop & implement presentation skill

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				and be ready for facing interviews. 6. Develop team and lead it for problem solving.
11	3rd / V	**Digital Communication**	**304181**	1. Analyze the performance of a different types of digital communication techniques. 2. Analyze the baseband digital transmission systems 3. Describe the random process and noise with their spectral densities 4. Describe Coherent Detection of binary signals in presence of noise using filters in baseband receivers. 5. Analyze different pass band digital transmission systems with their power spectra 6. Develop team and lead it for problem solving.
12	3rd / V	**Digital Signal Processing**	**304182**	1. Analyze the basics of discrete time signal processing. 2. Analyze the discrete time signal using DFT. 3. Analyze the LTI systems using Z transform 4. Design and Implement IIR filters for different real world signals 5. Describe and analyze different methods of FIR filters 6. Apply Maxwell's equations to analyze behaviour of uniform plane wave propagation.
13	3rd / V	**Electromagnetics**	**304183**	1. Descibe the basic mathematical concepts related to electromagnetic vector fields and basic laws of Electromagnetics. 2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density. 3. Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density. 4. Describe and Analyze the concepts related to Faraday's law, induced emf and Maxwell's equations. 5. Analyze the parameters of transmission lines and illustrate the concept of smith chart. 6. Apply Maxwell's equations to analyze behaviour of uniform plane wave propagation.
14	3rd / V	**Microcontrollers**	**304184**	1. Describe the MCS-51 architecture and its features with instructions. 2. Interface the IO peripherals to MCS 51 microcontroller and study of hardware and software tools. 3. Interface the IO peripherals and sensors to MCS 51 microcontroller and design of DAS 4. Illustrate the basic PIC Microcontroller Architecture and features 5. Interface the IO peripherals to 8 bit PIC microcontroller 6. Design of 8 bit microcontroller based system using serial protocols.
15	3rd / V	**Mechatronics**	**304185**	1. Describe and Identify the key elements of mechatronics system and its representation in terms of block diagram 2. Describe the principle of sensors and transducers and analyze their characteristics

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				3. Describe the concept of hydraulic system and actuators. 4. Illustrate the concept of Pneumatic Systems 5. Illustrate the electrical actuators and electron mechanical actuators. 6. Prepare case study of the mechatronics system.
		Signal Processing and Communications Lab		1. Simulate & Verify the sampling theorem, aliasing effect ,DFT properties of discrete time signal. 2. Simulate a pole zero plot for a given transfer function and find convolution of discrete time signal. 3. Simulate discrete time signal using DCT & IDCT. 4. Analyze the digital modulation techniques and different types of line code. 5. Analyze PN sequence, DSSS techniques and detection of digital base band signal in presence of noise. 6. Simulate the digital modulation techniques and random processes.
		Microcontrollers and Mechatronics Lab		1. Implement fundamental programming concepts of 8 bit microcontrollers 2. Interface peripherals to the 8 bit microcontrollers. 3. Design microcontroller based system using serial protocols. 4. Implement mechatronics system like servo motor position control, flow control, velocity measurement. 5. Analyze the concept of Hydraulic Systems and Pneumatic Systems. 6. Implement various data acquisition and control systems interfacing sensors and actuators.
16	**3rd / VI**	**Power Electronics**	**304186**	1. Describe Construction and switching characteristcs of power devices. 2. Illustrate working and analyze wavefoms of different AC-DC Power Converters . 3. Describe working of inverters for different types of loads. 4. Classify and describe different types of DC-DC converters. 5. Describe the fundamental principles of data communication and networking. 6. Apply flow and error control techniques in communication networks.
17	**3rd / VI**	**Information Theory, Coding and Communication Networks**	**304187**	1. Illustrate the concept of different source coding techniques in communication system 2. Illustrate the concept of channel coding techniques in communication system 3. Design a data compression scheme using cyclic codes. 4. Design channel coding schemes for communication system 5. Describe the fundamental principles of data communication and networking. 6. Apply flow and error control techniques in communication networks.

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18	3rd / VI	**Business Management**	**304188**	1. Describe Management Science aspects useful in business. 2. Describe Quality Aspects for Systematically Running the Business. 3. Describe the concepts of financial & project management 4. Describe the recents trends in Human resource development 5. Develop project management aspects and promote entrepreneurship. 6. Describe marketing concepts online and offline.
19	3rd / VI	**Advanced Processors**	**306189**	1. Describe the ARM family microprocessor architectures and its features. 2. Describe the ARM7 based microcontroller LPC2148 architecture and its features. 3. Interface the advanced peripherals to ARM7 based microcontroller LPC2148 4. Interface real world peripherals with ARM7 based microcontroller LPC2148 5. Describe the DSP processor architectures and its features 6. Describe DSP Processors and resources for signal processing applications.
20	3rd / VI	**System Programming and Operating Systems**	**304190**	1. Design assembler and macro processor . 2. Design compiler, linker and loader. 3. Describe fundamentals of operating system abstractions such as processes, threads, files and analyze important process scheduling algorithms 4. Analyze the concept of concurrency , deadlock detection and preventation algorithms 5. Describe memory management and analyze different page replacement algorithms. 6. Describe I/O management, file management and disk scheduling algorithms.
		Power and ITCT Lab		1. Design and Implement source coding techniques for data compression. 2. Design and Implement channel coding techniques and their efficiency. 3. Apply fundamental concepts of data communication and networking. 4. Analyse voltage and current relationship for power devices. 5. Explore output voltage waveforms for converters, inverters and controllers 6. Implement line and load regulation of SMPS
		Advanced Processors and System Prograaming. Lab		1. Interface the advanced peripherals to ARM7 based microcontroller LPC2148 2. Design of embedded system for real world applications using ARM7 based microcontroller LPC2148 3. Implement DSP algorithms using DSP development board and CCS. 4. Implement Lexical Analyzer,Assembler,Macro pass-I 5. Describe and Implement different job scheduling algorithm, Banker's algorithm and page

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				replacement algorithm. 6. Illustrate case study for Android mobile operating system.
		Employability Skills and Mini Project		1. Plan, execute and develop a Mini Project with team 2. Implement electronic hardware by learning PCB artwork design, soldering techniques and testing and troubleshooting etc 3. Describe PCB artwork design using an appropriate EDA tool 4. Test the project with hardware and software simulation 5. Prepare a technical report based on the Mini project 6. Describe a technical seminar based on the Mini Project work carried out
21	**4th / VII**	**VLSI Design& Technology**	**404181**	1. Develop effective HDL codes for digital design. 2. Apply knowledge of real time issues in digital design. 3. Model digital circuit with HDL, simulate, synthesis and prototype in PLDs. 4. Design CMOS circuits for specified applications. 5. Analyze various issues and constraints in design of an ASIC. 6. Apply knowledge of testability in design and Build In Self Test (BIST) circuit.
22	**4th / VII**	**Computer Networks & Security**	**404182**	1. Define and Describe the fundamental underlying principles of computer networking 2. Describe and analyze the hardware, software, components of a network and their interrelations 3. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies 4. Illustrate the basic concept of installation and configuration for different networking applications. 5. Illustrate and identify the deficiencies in existing protocols, and then go onto select new and better protocols. 6. Describe and Analyze the aspects of Cryptography & Network Security.
23	**4th / VII**	**Radiation & Microwave Techniques**	**404183**	1. Apply the fundamentals of electromagnetics to derive free space propagation equation and distinguish various performance parameters of antenna. 2. Analyze various radiating elements and arrays. 3. Apply the knowledge of waveguide fundamentals in design of transmission lines. 4. Explore construction and working of principles passive microwave devices/components. 5. Explore construction and working of principles active microwave devices/components. 6. Know the various microwave systems, devise set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability

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24	4th / VII	Elective I (Digital Image and Video Processing)	404184	1. Develop and implement basic mathematical operations on digital images. 2. Analyze and solve image enhancement and image restoration problems. 3. Identify , design and prdedict image processing techniques for object segmentation and recognition. 4. Represent objects and region of the image with appropriate method. 5. Apply 2-D data compression techniques for digital images. 6. Describe video signal representation and different algorithm for video processing.
25	4th / VII	Elective II (Electronics Product Design)	404185	1. State and explain design flow of design of electronics product. 2. Illustrate hardware design process and testing methods. 3. Illustrate software development and testing methods 4. Summarize printed circuit boards and different parameters 5. Illustrate steps of product debugging & testing 6. Describe special design considerations and importance of documentation.
26	4th / VIII	Mobile Communication	404189	1. Describe the Switching techniques for voice and Data and control of swtching system. 2. Describe and analyze the concept of telecommunication traffic system and signalling techniques. 3. Explore the concept of cellular system and Propagation Mechanism. 4. Explore the architecture of GSM. 5. Illustrate the concept of GSM Channels and Services with Multiple Access Techniques 6. Illustrate the concept of evolution of Mobile Generation and distinguish between different generations of mobile technologies

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Information Technology

Course Outcomes (COs) 2015 Pattern

SE [IT] 2015 Pattern				
SN	Course Code	Course Name	Course Outcomes (COs)	
1	214441	Discrete Structures	CO1	Understand Fundamental Concepts of Discrete Structures
			CO2	Apply Discrete Mathematics to Computing Problems
			CO3	Develop Skills in Mathematical Proofs and Logical Reasoning
			CO4	Analyze types of relations and functions to provide solution to computational problems.
			CO5	Analyze and Apply Advanced Topics in Discrete Mathematics
			CO6	Use mathematical propositions and proof techniques to check the truthfulness of a real life situation.
2	214442	Computer Organization & Logic Design	CO1	Understand the fundamental concepts of computer organization and architecture, including data representation, instruction sets, and computer components.
			CO2	Analyze and design the functional units of a computer system, including the CPU, memory hierarchy, and input/output systems.
			CO3	Evaluate and compare different computer architectures and systems, including RISC and CISC architectures, for their efficiency and effectiveness.
			CO4	Apply knowledge of computer organization to optimize performance through techniques such as pipelining, caching, and virtual memory.
			CO5	Implement and simulate basic computer organization and architecture concepts using tools and software to understand their practical applications.
			CO6	Acquire knowledge about instruction level parallelism & parallel organization of multiprocessors & multi core systems.
3	214444	Fundamentals of Data Structures	CO1	Understand and apply fundamental data structures such as arrays, stacks, queues, and linked lists.
			CO2	Analyze and implement advanced data structures like trees and graphs.
			CO3	Evaluate the performance of various data structures and algorithms.
			CO4	Apply data structures to solve complex problems and develop efficient algorithms
			CO5	Design and implement data structures in programming languages and tools.complexity.
			CO6	Students will be able to use algorithmic foundations for solving problems

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				and programming
4	214445	Problem Solving and Object Oriented programming	CO1	Understand and apply fundamental problem-solving techniques and algorithms.
			CO2	Develop and implement object-oriented programming concepts such as classes, objects, inheritance, and polymorphism.
			CO3	Analyze and design solutions for complex problems using object-oriented principles.
			CO4	Apply design patterns and best practices in object-oriented programming to create robust and maintainable software.
			CO5	Implement and test object-oriented solutions using programming languages and development tools.
			CO6	Develop programs that appropriately utilize key object-oriented concepts.
5	214443	DIGITAL ELECTRONICS AND LOGIC DESIGN	CO1	Conduct experiments to validate concepts and principles of digital electronics.
			CO2	Design and implement digital circuits using logic gates, flip-flops, and combinational and sequential circuits.
			CO3	Analyze and troubleshoot digital circuits and systems through hands-on experiments.
			CO4	Apply digital design techniques to develop and test practical digital systems and devices.
			CO5	Document and present experimental findings and digital design projects effectively.
			CO6	Use logic function representation for simplification with K-Maps and analyze as well as design Combinational logic circuits using SSI & MSI chips.
7	214447	PROGRAMMING LABORATORY	CO1	Develop and implement programs using fundamental programming concepts and techniques.
			CO2	Apply debugging and testing strategies to identify and fix errors in software.
			CO3	Design and implement algorithms to solve computational problems.
			CO4	Utilize programming tools and environments effectively for software development
8	214448	Object Oriented programming Lab	CO1	Develop and implement object-oriented programs using concepts such as classes, objects, inheritance, and polymorphism.
			CO2	Apply object-oriented principles to design and implement software solutions for real-world problems.
			CO3	Analyze and debug object-oriented code to ensure functionality and performance.
			CO4	Utilize modern integrated development environments (IDEs) and tools for object-oriented programming.
			CO5	Document and present object-oriented programming projects and solutions effectively.
			CO6	Abstract data and entities from the problem domain, build object models and design software solutions using object-oriented principles and strategies.
9	214449	Communication Skills	CO1	Differentiate various programming paradigms and apply basic concepts of OOP.
			CO2	Identify classes, objects, methods, and handle object creation, initialization, and destruction to model real-world problems.
			CO3	Identify relationship among objects using inheritance and polymorphism.
			CO4	Handle different types of exceptions and perform generic programming.
			CO5	Use file handling for real world application.
			CO6	Apply appropriate design patterns to provide object-oriented solutions.

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1	207003	Engineering Mathematics III	CO1	Apply advanced techniques of differential equations to solve complex engineering problems.
			CO2	Utilize vector calculus to analyze and solve problems related to fluid dynamics and electromagnetism.
			CO3	Implement numerical methods to approximate solutions for algebraic and transcendental equations.
			CO4	Employ linear algebra techniques for solving systems of linear equations and performing eigenvalue analysis.
			CO5	Apply probability and statistics to model and analyze real-world engineering data and problems.
			CO6	Analyze conformal mappings, transformations and perform contour integration of complex functions required in Image processing, Digital filters and Computer graphics.
2	214450	Computer Graphics	CO1	Understand and apply basic concepts of computer graphics, including graphical primitives, transformations, and rendering techniques.
			CO2	Implement algorithms for 2D and 3D graphics, including line drawing, clipping, and filling algorithms.
			CO3	Analyze and apply various techniques for 3D modeling, including viewing, projection, and shading models.
			CO4	Design and develop interactive graphics applications and interfaces.
			CO5	Evaluate and implement advanced graphics techniques, such as texture mapping, lighting, and animation
			CO6	Develop the competency to understand the concepts related to Computer Vision and Virtual reality.
3	214451	Processor Architecture and Interfacing	CO1	Understand and describe the basic architecture and functioning of different types of processors.
			CO2	Analyze and implement various processor interfacing techniques and memory organization.
			CO3	Design and develop interfacing circuits for input/output devices and peripheral hardware.
			CO4	Evaluate and troubleshoot processor and interfacing systems to ensure proper functionality.
			CO5	Apply concepts of assembly language programming to develop and debug low-level software for processors.
			CO6	Students will be able to explain memory management and multitasking of 80386 microprocessor.
4	214452	Data Structures & Files	CO1	Understand and apply fundamental data structures such as arrays, linked lists, stacks, and queues to solve problems.
			CO2	Analyze and implement advanced data structures like trees, graphs, and hash tables for efficient data manipulation.
			CO3	Develop and use algorithms for searching, sorting, and managing data in various file formats and structures.
			CO4	Apply file handling techniques for creating, reading, writing, and managing files in different formats.
			CO5	Design and implement solutions using appropriate data structures and file management techniques to address real-world problems.
			CO6	Ability to apply and implement learned algorithm design techniques and data structures to solve problems.
5	214453	Foundations of Communication and Computer Network	CO1	Understand and explain fundamental concepts of communication systems, including analog and digital communication techniques.
			CO2	Analyze and design communication networks, focusing on the principles and protocols of data communication and networking.
			CO3	Apply various network protocols and standards to implement and troubleshoot network communication systems.

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			CO4	technologies using simulation tools and practical experiments.
			CO5	Design and develop solutions for real-world communication and networking problems using appropriate technologies and methodologies.
			CO6	Use concepts of data communication to solve various related problems
6	214454	Processor Interfacing Laboratory	CO1	Understand and implement basic interfacing techniques with microprocessors and peripheral devices.
			CO2	Design and conduct experiments to interface various hardware components with processors, including input/output devices.
			CO3	Analyze and troubleshoot interfacing problems and develop solutions using appropriate tools and techniques.
			CO4	Utilize laboratory tools and software to create and test microprocessor-based projects and systems.
			CO5	Document and present findings from laboratory experiments, including design, implementation, and results analysis.
7	214455	Data Structure and Files Laboratory	CO1	Implement and demonstrate fundamental data structures such as arrays, linked lists, stacks, and queues through practical lab exercises.
			CO2	Apply and analyze advanced data structures like trees, graphs, and hash tables in solving complex problems.
			CO3	Develop algorithms for searching, sorting, and managing data, and evaluate their performance through experimentation.
			CO4	Utilize file handling techniques to create, read, write, and manipulate data in various file formats.
			CO5	Document and present the results of laboratory experiments, including design, implementation, and analysis of data structures and file management systems.
			CO6	Ability to apply and implement learned algorithm design techniques and data structures to solve problems
8	214456	Computer Graphics Laboratory	CO1	Implement basic graphics algorithms such as line drawing, circle drawing, and filling techniques using a graphics library.
			CO2	Develop and apply algorithms for 2D transformations, including translation, rotation, scaling, and reflection.
			CO3	Create and manipulate 3D graphics using projection techniques, and apply transformations in 3D space.
			CO4	Design and implement interactive graphical applications, including user interface components and event handling.
			CO5	Evaluate and optimize graphical rendering techniques, including texture mapping, shading, and lighting effects.
			CO6	Apply the logic to develop animation and gaming programs

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TE [IT] 2015 Pattern				
SN	**Course Code**	**Course Name**	**Course Outcomes (COs)**	
1	314441	Theory of Computation	COs1	Construct finite state machines to solve problems in computing
			COs2	Write mathematical expressions for the formal languages
			COs3	Apply well defined rules for syntax verification.
			COs4	Construct and analyze Push Down, Post and Turing Machine for formal languages.
			COs5	Express the understanding of the decidability and computational complexity
			COs6	To express the understanding of computational complexity.

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2	314442	Database Management Systems	COs1	To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation
			COs2	To provide a strong formal foundation in database concepts, technology and practice
			COs3	To be familiar with the basic issues of transaction processing and concurrency control.
			COs4	To understand how analytics and big data affect various functions now and in the future
			COs5	Make use of concept of I/O management and File system.
			COs6	Do Programming in PL/SQL including stored procedures, stored functions, cursors and packages.
3	314443	Software Engineering & Project Management	COs1	To identify unique features of various software application domains and classify software applications.
			COs2	To choose and apply appropriate lifecycle model of software development.
			COs3	To describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.
			COs4	To analyze software requirements by applying various modeling techniques.
			COs5	To list and classify CASE tools and discuss recent trends and research in software engineering.
			COs6	To understand IT project management through life cycle of the project and future trends in IT Project Management.
4	314444	Operating System	COs1	Fundamental understanding of the role of Operating Systems.
			COs2	To understand the concept of a process and thread.
			COs3	To apply the concepts of process/thread scheduling.
			COs4	To apply the concept of process synchronization, mutual exclusion, and deadlock.
			COs5	To realize the concept of I/O management and File system.
			COs6	To understand the various memory management techniques.
5	314445	Human-Computer Interaction	COs1	To explain importance of HCI study and principles of user-centred design (UCD) approach.
			COs2	To develop understanding of human factors in HCI design.
			COs3	To develop understanding of models, paradigms, and context of interactions.
			COs4	To design effective user-interfaces following a structured and organized UCD process.
			COs5	To apply cognitive models for predicting human-computer-interactions.
			COs6	Design and Implement realtime IoT applications.
6	314446	Software Laboratory-I	COs1	To install and configure database systems.
			COs2	To analyze database models & entity relationship models.
			COs3	To design and implement a database schema for a given problem-domain.
			COs4	To understand the relational and document type database systems.
			COs5	To populate and query a database using SQL DML/DDL commands.

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1	314450	Computer Network and Technology	COs1	To know responsibilities, services offered, and protocol used at each layer of the network.
			COs2	To understand different addressing techniques used in the network.
			COs3	To know the difference between different types of networks.
			COs4	To know the different wireless technologies and IEEE standards.
			COs5	To use and apply the standards and protocols learned for application development.
			COs6	To understand and explore recent trends in the network domain.
2	314451	Systems Programmin g	COs1	To learn independently modern software development tools and create novel solutions for language processing applications.
			COs2	To design and implement assemblers and macro processors.
			COs3	To use tool LEX for generation of Lexical Analyzer.
			COs4	To use YACC tool for generation of syntax analyzer.
			COs5	To generate output for all the phases of the compiler.
			COs6	To apply code optimization in the compilation process.
3	314452	Design and Analysis of Algorithms	COs1	To calculate computational complexity using asymptotic notations for various algorithms.
			COs2	To apply Divide & Conquer as well as Greedy approach to design algorithms.
			COs3	To practice principle of optimality.
			COs4	To illustrate different problems using Backtracking.
			COs5	To compare different methods of Branch and Bound strategy.
			COs6	To explore the concept of P, NP, NP-complete, NP-Hard and parallel algorithms.
4	314453	Cloud Computing	COs1	To understand the need of Cloud based solutions.
			COs2	To understand Security Mechanisms and issues in various Cloud Applications.
			COs3	To understand current challenges and trade-offs in Cloud Computing.
			COs4	To understand current challenges and trade-offs in Cloud Computing.
			COs5	To find challenges in cloud computing and delve into it to find effective solutions.
			Cos6	To understand emerging trends in cloud computing.
5	314454	Data Science & Big Data Analytics	COs1	To understand Big Data primitives.
			COs2	To learn and apply different mathematical models for Big Data.
			COs3	To demonstrate their Big Data learning skills by developing industry or research applications.
			COs4	To analyze each learning model coming from different algorithmic approaches and its performance under different datasets.
			COs5	To understand needs, challenges, and techniques for big data visualization.
			COs6	To learn different programming platforms for big data analytics.

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6	314455	Software Laboratory-IV -	COs1	To implement small size network and its use of various networking commands.
			COs2	To understand and use various networking and simulation tools.
			COs3	To configure various client/server environments to use application layer protocols.
			COs4	To understand the protocol design at various layers.
7	314456	Software Laboratory-V	COs1	To design and implement two pass assembler for hypothetical machine instructions.
			COs2	To design and implement different phases of compiler (Lexical Analyzer, Parser, Intermediate code generation).
			COs3	To use the compile generation tools such as "Lex" and "YACC".
			COs4	To apply algorithmic strategies for solving various problems.
			COs5	To compare various algorithmic strategies.
			COs6	To analyze the solution using recurrence relation.
8	314457	Software Laboratory-VI	COs1	To apply Big data primitives and fundamentals for application development.
			COs2	To explore different Big data processing techniques with use cases.
			COs3	To apply the Analytical concept of Big data using R/Python.
			COs4	To visualize the Big Data using Tableau.
			Cos5	To design algorithms and techniques for Big data analytics.
			Cos6	To design Big data analytic application for emerging trends.

BE[IT[2015 Pattern]				
SN	**Course Code**	**Course Name**	**Course Outcomes (COs)**	
1	414453	Information and Cyber Security	COs1	Be able to use basic cryptographic techniques in software and system design.
			COs2	Apply methods for authentication, access control, intrusion detection and prevention.
			COs3	Able to apply the scientific method to digital forensics and perform forensic investigations.
			COs4	To develop computer forensics awareness.
2	414455	Machine Learning and Applications	COs1	Model the learning primitives.
			COs2	Build the learning model.
			COs3	Tackle real-world problems in the domain of Data Mining and Big Data Analytics, Information Retrieval, Computer Vision, Linguistics, and Bioinformatics.
3	414454	Software Design and Modeling	COs1	Understand object-oriented methodologies, basics of Unified Modeling Language (UML).
			COs2	Understand analysis process, use case modeling, domain/class modeling.
			COs3	Understand interaction and behavior modeling.
			COs4	Understand design process and business, access, and view layer class design.
			COs5	Get started on study of GRASP principles and GoF design patterns.

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		Computing	COs2	Explain smart devices and services used in Ubicomp
			COs3	Describe the significance of actuators and controllers in real-time application design.
			COs4	Use the concept of HCI to understand the design of automation applications.
			COs5	Classify Ubicomp privacy and explain the challenges associated with Ubicomp privacy.
			COs6	Get the knowledge of ubiquitous and service-oriented networks along with Ubicomp management.
3	414463	Elective-III (Internet of Things (IoT))	COs1	Explain what is the Internet of Things.
			COs2	Explain architecture and design of IoT.
			COs3	Describe the objects connected in IoT.
			COs4	Understand the underlying Technologies.
			COs5	Understand the platforms in IoT.
			COs6	Understand cloud interface to IoT.
	414464	Elective-IV (Parallel Computing)	COs1	Understand fundamentals in parallel computing.
			COs2	Understand and learn the importance of technologies including different hardware structures used in parallel computing
			COs3	Understand challenges and opportunities in parallel computing.
7		Computer Laboratory-IX	COs1	Understand basics of Social Media Analytics
			COs2	Correlate Network Measures for Social Media Data
			COs3	Visualize mining in social media data
			COs4	Discuss the Social Similarities
		Computer Laboratory-X	COs1	Demonstrate knowledge of the core concepts and techniques in distributed systems.
			COs2	Learn how to apply principles of state-of-the-art distributed systems in practical application.
			COs3	Design, build, and test application programs on distributed systems.
8	414467	Project Work	COs1	Learn teamwork.
			COs2	Be well aware about the Implementation phase.
			COs3	Get exposure to various types of testing methods and tools.
			COs4	Understand the importance of documentation.

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			COs6	various types of application development.
4	414456	Wireless Communications(Elective-I)	COs1	Understand the basics of propagation of radio signals.
			COs2	Understand the basic concepts of basic Cellular System and the design requirements.
			COs3	Have an understanding of the basic principles behind radio resource management techniques such as power control, channel allocation, and handoffs.
			COs4	Gain insights into various mobile radio propagation models and how the diversity can be exploited to improve performance.
			COs5	Gain knowledge and awareness of the technologies for how to effectively share spectrum through multiple access techniques i.e. TDMA, CDMA, FDMA, etc.
			COs6	Have an in-depth understanding of the design consideration and architecture for different Wireless Systems like GSM, CDMA, GPRS, etc.
5	414457	ELECTIVE II : BUSINESS INTELLIGENCE	COs1	This course focuses on how to design and build a Business Intelligence solution.
			COs2	Students will also learn how to design and build a data warehouse within the context of student BI projects.
			COs3	Students can develop their own projects within collaborative teams or be assigned an existing data source to develop a project.
			COs4	To ensure success during the implementation phase, students will plan for and gather business requirements, as well as design the data warehouse in order to develop an effective BI plan.
6		Computer Laboratory -VII	COs1	The students will be able to implement and port controlled and secured access to software systems and networks.
			COs2	The students will be able to build learning software in various domains.
7		Computer Laboratory -VIII	COs1	Draw, discuss different UML 2.0 diagrams, their concepts, notation, advanced notation, forward and reverse engineering aspects.
			COs2	Identify different software artifacts used to develop analysis and design model from requirements.
			COs3	Develop use case model.
			COs4	Develop, implement analysis model and design model.
8	414460	Project Phase-I	COs1	To show preparedness to study independently in the chosen domain of Information Technology and programming languages and apply their acquired knowledge to a variety of real-time problem scenarios.
			COs2	To function effectively as a team to accomplish a desired goal.
			COs3	An understanding of professional, ethical, legal, security, and social issues and responsibilities related to Information Technology Project.
BE [Information Technology] 8th Sem 2015 Pattern				
1	414461	Distributed Computing System	COs1	Understand the principles and desired properties of distributed systems based on different application areas.
			COs2	Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
			COs3	Recognize the inherent difficulties that arise due to distributed-ness of computing resources
			COs4	Identify the challenges in developing distributed applications.
2	414462	Ubiquitous	COs1	Demonstrate the knowledge of design of Ubicomp and its applications.

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