



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Civil Engineering Department

Program Outcomes (POs)

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply reasoning informed by the



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



	contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.





**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Program Specific Outcomes (PSOs)

PSO 1	Able to develop academic aptitude and can apply knowledge of building construction techniques, Structural Designs, Water and wastewater engineering, Geotechnical Engineering and Hydrological and Fluid mechanics to real life situations so as to design and develop techniques required.
PSO 2	Ability to enhance research expertise and use cutting-edge computing tools like Remote sensing and GIS, Matlab, MSP, BIM, StadPro, Etabs and AutoCAD for analysis, design and implementation of these systems for resolving social technical problems.
PSO 3	Ability to utilize multidisciplinary knowledge required for satisfying global industrial requirements and hence develop an attitude for life-long learning.
PSO 4	Ability to have all round personality with skills like leadership, verbal & written communication, team work, sensitivity towards society in order to become ethical & responsible Civil Engineer.

	ZEAL EDUCATION SOCIETY'S ZEAL COLLEGE OF ENGINEERING AND RESEARCH NARHE PUNE -41 INDIA	
---	---	---

Course Outcomes (COs)

S.E. Civil Engineering (2019 Course)

Course Code: 201001

Name of Course: Building Technology and Architectural Planning

CO 1	Identify types of building and basic requirements of building components.
CO 2	Make use of Architectural Principles and Building byelaws for building construction.
CO 3	Plan effectively various types of Residential Building forms according to their utility
CO 4	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
CO 5	Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
CO 6	Understand different services and safety aspects

Course Code: 201002

Name of Course: Mechanics of Structures

CO 1	Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.
CO 2	Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
CO 3	Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
CO 4	Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
CO 5	Analyze axially loaded and eccentrically loaded column
CO 6	Determine the slopes and deflection of determinate beams and trusses.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 201003

Name of Course: Fluid Mechanics

CO 1	Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
CO 2	Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow
CO 3	Understand the concept of Dimensional analysis using Buckingham's π theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
CO 4	Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
CO 5	Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
CO 6	Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged body.

Course Code: 207001

Name of Course: Engineering Mathematics III

CO 1	. Solve Higher order linear differential equations and its applications to modelling and analysing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.
CO 2	Solve System of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems.
CO 3	Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
CO 4	Perform Vector differentiation & integration, analyze the vector fields and apply to fluid flow problems.
CO 5	Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 207003

Name of Course: Engineering Geology

CO 1	Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions.
CO 2	Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
CO 3	Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
CO 4	Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects
CO 5	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
CO 6	Explain geological hazards and importance of ground water and uses of common building stones.

Course Code: 201008

Name of Course: Geotechnical Engineering

CO 1	Identify and classify the soil based on the index properties and its formation process
CO 2	Explain permeability and seepage analysis of soil by construction of flow net
CO 3	Illustrate the effect of compaction on soil and understand the basics of stress distribution
CO 4	Express shear strength of soil and its measurement under various drainage conditions
CO 5	Evaluate the earth pressure due to backfill on retaining structures by using different theories
CO 6	Analysis of stability of slopes for different types of soils



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: ---

Name of Course: Awareness to Civil Engineering Practices Audit Course I

CO 1	Describe functioning/working of different types of industries/sectors in Civil Engineering
CO 2	Describe drawings and documents required and used in different Civil Engineering works.
CO 3	Understand the importance of Code of Ethics to be practiced by a Civil Engineer and also understand the duties and responsibilities as a Civil Engineer.
CO 4	Understand different health and safety practices on the site.

Course Code: -----

Name of Course: Road Safety Management Audit Course I

CO 1	Summarize the existing road transport scenario of our country
CO 2	Explain the method of road accident investigation
CO 3	Describe the regulatory provisions needed for road safety
CO 4	Identify the safety issues for a road and make use of IRC's road safety manual for conducting road safety audit.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



T.E. Civil Engineering (2019 Course)

Course Code: 301007

Name of Course: Advanced Surveying

CO 1	To be able to understand different Triangulation systems and to know working of GPS
CO 2	Ability to perform Hydrographic survey and to be able to provide solution for problems related to it.
CO 3	To be able to apply remote sensing and GIS in the field of Civil Engineering.
CO 4	Ability to handle Triangulation adjustments with modern equipments.
CO 5	To be able to analyze Aerial photographs and its applications in civil engineering
CO 6	Basic understanding in Geodetic Trigonometric levelling survey and application of corrections.

Course Code: 301002

Name of Course: INFRASTRUCTURE Engineering and Construction Techniques

CO 1	Knowledge on the scope of infrastructure engineering in national and global development
CO 2	To be able to recall basics of various components of railway engineering, the types and functions of track, junctions and railway stations
CO 3	To be known to various construction techniques such as dewatering, dredging, slip form etc.
CO 4	To be familiar with tunnelling methods and various operations required in tunnelling
CO 5	Basic introductory knowledge about the types and components of docks and harbour
CO 6	To be able to recall the concepts of construction techniques and its practical application, earth moving equipments



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 301005

Name of Course: FLUID MECHANICS- II

CO 1	Ability to solve practical problems involving fluid flow around submerged objects and also of unsteady flow.
CO 2	To categorize and illustrate open channel flows.
CO 3	To design open channels for uniform flow and write about hydraulic jump.
CO 4	To illustrate impact of jet and centrifugal pump.
CO 5	To design hydropower generation plant and write about performance of hydraulic turbines.
CO 6	To illustrate gradually varied flow in open channel and methods of gradually varied flow computation.

Course Code: 301001

Name of Course: HYDROLOGY AND WATER RESOURCES ENGINEERING

CO 1	Ability to describe precipitation, its measurement and Infiltration, abstraction of precipitation with stream gauging.
CO 2	To be able to classify Irrigation method, Canal revenue assessment methods and analyze delta, duty and irrigation efficiency.
CO 3	Capability for proper evaluation of yield from wells.
CO 4	To be able to explain Runoff, Unit hydrograph and evaluate flood frequency
CO 5	Better skill set for assessment of Reservoir Planning and their Different techniques
CO 6	To be capable of explaining water management and drainage system



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: -----

Name of Course: Structural Design I

CO 1	Ability to recognize different types of steel structures with relevant IS specifications and categories of tension member
CO 2	To be able to design struts & axially loaded column
CO 3	Capable of designing eccentrically loaded column, column base for axial load, uniaxial & biaxial bending
CO 4	Efficiency in design of laterally supported and unsupported beams using single rolled steel sections with & without flange plate
CO 5	Efficient evaluation of design parameters of eccentric connections like beam to beam & beam to column connection & design of welded plate girder
CO 6	To be able to interpret the design & detailing of Roof truss, Purlin & Gantry Girder



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



B.E. Civil Engineering (2015 Course)

Course Code: 401 004

Name of Course: Advanced Concrete Technology

CO 1	To be able to summarize the ingredients of concrete and its effects on concrete characteristics
CO 2	To be able to classify the concrete and state its application in construction
CO 3	Capability to design modern concrete
CO 4	Knowledge on basic fibre reinforced concrete
CO 5	Ability to understand different properties of fresh and hardened fibred reinforced concrete
CO 6	Understanding of precast elements and concept of Ferro cement

Course Code: -----

Name of Course: Advanced Mechanics of Structures

CO 1	Apply moment area and conjugate method to find slope and deflection.
CO 2	Evaluate stresses and strain in thin and thick cylinder.
CO 3	Analyze the beam and trusses by influence line diagram.
CO 4	Analyze the beam for moving load by influence line diagram
CO 5	Understand and analyze beam curved in plan and elevation.
CO 6	Analyze three and two hinged arches for axial thrust, shear and moment.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: -----

Name of Course: Structural Design III

CO 1	To be able to analyze prestress concrete member and cable profile
CO 2	To be able to design post tensioned prestressed concrete section for flexure and shear
CO 3	To be capable to analyze and design frame structure considering application of dynamic forces such as earthquake
CO 4	To analyze and design earth retaining structure for various types of backfill conditions
CO 5	To be able to design slab type and slab beam type of combined footing
CO 6	To be able to analyse and design circular, square and rectangular water tanks resting on ground.

Course Code: 401004

Name of Course: Architecture and Town Planning

CO 1	To be able to classify qualities of Architecture and role of urban planning and Architect.
CO 2	To be able to recall the importance of landscaping with quality of life and livability
CO 3	Knowledge on various levels of town planning.
CO 4	To be able to describe corresponding planning agencies.
CO 5	Justification of legislative mechanism for preparation of development plan.
CO 6	Ability to Apply GIS,GPS,RS in planning.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: -----

Name of Course: Construction Management

CO 1	To be able to apply construction Management Techniques in Civil Engineering Projects
CO 2	Ability to apply construction scheduling & work measurement in Civil Engineering projects
CO 3	Capable to assess Labour laws & Financial Aspects of construction projects
CO 4	To be able to distinguish elements of Risk Management & Value Engineering in constructional projects
CO 5	To be able to recall and decide Material Management & Human Resource Management for construction projects
CO 6	Ability to illustrate of Artificial Intelligence Techniques in Civil Engineering Projects

Course Code: -----

Name of Course: Environmental Engineering-II

CO 1	Outline theory, design and working of sewers Physical, chemical and biological characteristics of sewage effluent discharge standards as per CPCB norms and Oxygen Sag Curve, Streeter -Phelps equation and terminology for self-purification of river.
CO 2	Develop understanding of screen chamber, Grit Chamber and Primary sedimentation tank as per the Manual of CPHEEO.
CO 3	Develop understanding of biological treatments, important microorganisms in waste water & their importance in waste water treatment systems like ASP and TF
CO 4	Outline theory, design behind the oxidation ponds and aerated lagoons
CO 5	Develop understanding of anaerobic digester and UASB reactor its principle and working
CO 6	Develop understanding of preliminary, primary and secondary treatment for industrial wastewater as per the CPCB norms.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 401007

Name of Course: Dams and Hydraulic Structures

CO 1	Ability to elaborate dams with their classification based on various aspects and categorize instruments for dam safety
CO 2	To be able to categorize Gravity dam, Earth dam and other dams
CO 3	Ability to summarize and classify Spillway and Spillway Gates
CO 4	To be able to elaborate Earth dams and Diversion Head Works
CO 5	Capable to design canal and Canal Structures
CO 6	To be able to categorize Cross Drainage works and Rivet Training works.

Course Code: 401 005

Name of Course: TQM & MIS in Civil Engineering

CO 1	To be able to interpret concept of quality in construction by considering quality assurance, quality control & total quality management
CO 2	To be able to apply the basics of Six Sigma constructional projects
CO 3	Capable of applying the basics of ISO & Quality Manual in constructional projects
CO 4	To be able to categorize quality benchmark & certifications with implementation and awards
CO 5	Ability to apply Modern Techniques in TQM Implementation in Civil Engineering projects
CO 6	To be able to explain MIS system for civil engineering projects



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Computer Engineering Department

Program Outcomes (POs)

PO 1	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO 2	Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO 3	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO 4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO 6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO 7	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO 9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO 12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Program Specific Outcomes (PSOs)

PSO 1	Professional Skills The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexities.
PSO 2	Problem-Solving Skills The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO 3	Successful Career and Entrepreneurship The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Outcomes (COs)

S.E. Computer Engineering (2019 Course)

Course Code: 210241

Name of Course: Discrete Mathematics

CO 1	To gain sound knowledge to formulate and solve problems with sets and propositions.
CO 2	To understand use of set, function and relation models to understand practical examples, and interpret the associated operations and terminologies in context.
CO 3	To acquire knowledge of logic and proof techniques to expand mathematical maturity.
CO 4	To learn the fundamental counting principle, permutations, and combinations.
CO 5	To study how to model problem using graph and tree.
CO 6	To learn how abstract algebra is used in coding theory.

Course Code: 210242

Name of Course: Fundamental of Data Structure

CO 1	To demonstrate a detailed understanding of behavior of data structures like array, linked list, stack, and queue by developing programs.
CO 2	To use appropriate algorithmic strategy for better efficiency
CO 3	To summarize data searching and sorting techniques.
CO 4	To discriminate the usage of various structures in approaching the problem solution.
CO 5	To analyze and use effective and efficient data structures in solving various Computer Engineering domain problems.
CO 6	To design the algorithms to solve the programming problems.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 210243	
Name of Course: Object Oriented Programming	
CO 1	To apply constructs- sequence, selection, and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
CO 2	Design object-oriented solutions for small systems involving multiple objects.
CO 3	Use virtual and pure virtual function and complex programming situations.
CO 4	Apply object oriented software principals in problem solving.
CO 5	Analyze the strengths of object oriented programming.
CO 6	Develop the application using object oriented programming language (C++)

Course Code: 210244	
Name of Course: Computer Graphics	
CO 1	Identify the basic terminologies of computer graphics and interpret the mathematical foundation of the concepts of computer graphics.
CO 2	Apply mathematics to develop computer programs for elementary graphics operation.
CO 3	Illustrate the concept of windowing and clipping and apply various algorithm to fill and clip polygons.
CO 4	Understand and apply the core concept of computer graphics, including transformation in two and three dimensions, viewing and projection.
CO 5	Understand the concept of color models lighting, shading models and hidden surface elimination.
CO 6	Create effective programs using concepts of curves, fractals, animation and gaming.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 210245	
Name of Course: Digital Electronics and Logic Design	
CO 1	Recall different number system, codes, logic gates.
CO 2	Simplify boolean expressions using K-map or using Quine Mc-Clusky method.
CO 3	Use and Implement different types of combinational logic circuits and sequential logic circuits using logic gates
CO 4	Differentiate and choose appropriate logic families as per the given design and specifications
CO 5	Design and Implement different types of counters, registers, PLD's
CO 6	Explain organization and architecture of computer system



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



T.E. Computer Engineering (2019 Course)

Course Code: 310241

Name of Course: Database Management Systems

CO 1	Analyze and design Database Management System using ER model
CO 2	Implement database queries using database languages.
CO 3	Normalize the database design using normal forms
CO 4	Apply Transaction Management concepts in real-time situations
CO 5	Use NoSQL databases for processing unstructured data
CO 6	Differentiate between Complex Data Types and analyze the use of appropriate data types

Course Code: 310242

Name of Course: Theory of Computation

CO 1	To introduce students with the mathematical foundations of computation including automata theory.
CO 2	Student will be able to Construct regular expression to present regular language and understand pumping lemma for RE.
CO 3	To make students familiar with the theory of formal languages, context free grammars and will be able to Construct Pushdown Automaton model for the Context Free Language.
CO 4	Student will be able to Devise Turing Machine with their computational function for the different requirements outlined by theoretical computer science and will be able to analyze different classes of problems to study concepts of NP completeness.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 310243	
Name of Course: Systems Programming and Operating System	
CO 1	To get acquainted with the basics of System Programming
CO 2	To acquire knowledge of data structures used in the design of System Software
CO 3	To be familiar with the format of object modules, the functions of linking, reaction , & loading.
CO 4	To comprehend the structures and functions of Operating Systems and process management.
CO 5	To deal with concurrency and deadlock in the Operating System
CO 6	To learn and understand memory management of Operating System

Course Code: 310244	
Name of Course: Computer Networks and Security	
CO 1	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
CO 2	Illustrate the working and functions of data link layer
CO 3	Analyze the working of different routing protocols and mechanisms
CO 4	Implement client server applications using sockets
CO 5	Illustrate role of application layer with its protocols , client server architectures



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



CO 6	Comprehend the basics of Network Security
------	---

Course Code: 310245A	
Name of Course: Internet of Things and Embedded Systems	
CO 1	Understand the fundamentals and need of Embedded Systems for the Internet of Things
CO 2	Apply IoT enabling technologies for developing IoT systems
CO 3	Apply design methodology for designing and implementing IoT applications
CO 4	Analyze IoT protocols for making IoT devices communication
CO 5	Design cloud based IoT systems
CO 6	Design and Develop secured IoT applications



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**





**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



B.E. Computer Engineering (2015 Course)

Course Code: 410241

Name of Course: High Performance Computing

CO 1	To describe different parallel architectures, inter-connect networks, programming models
CO 2	To develop an efficient parallel algorithm to solve given problem
CO 3	To analyze and measure performance of modern parallel computing systems

Course Code: 410242

Name of Course: Artificial Intelligence and Robotics

CO 1	Identify and apply suitable Intelligent agents for various AI applications
CO 2	Design smart system using different informed search / uninformed search or heuristic approaches.
CO 3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
CO 4	Apply the suitable algorithms to solve AI problems

Course Code: 410243

Name of Course: Data Analytics

CO 1	To write case studies in Business Analytic and Intelligence using mathematical models
CO 2	To present a survey on applications for Business Analytic and Intelligence
CO 3	To write problem solutions for multi-core or distributed, concurrent/Parallel environments



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 410244D

Name of Course: Data Mining and Warehousing

CO 1	Discuss Data qualities and types of attributes in a dataset
CO 2	Apply Data preprocessing techniques to mine accurate data.
CO 3	Differentiate between Operational Database Systems and Data Warehouses
CO 4	Demonstrate the hidden patterns in the data
CO 5	Apply Classification algorithms to classify labeled dataset.
CO 6	Use ETL tools to design, implement and execute the data mining processes.

Course Code: 410245 B

Name of Course: Software Testing and Quality Assurance

CO 1	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
CO 2	Design and develop project test plan, design test cases, test data, and conduct test operations
CO 3	Apply recent automation tool for various software testing for testing software
CO 4	Apply different approaches of quality management, assurance, and quality standard to software system
CO 5	Apply and analyze effectiveness Software Quality Tools





**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



E & TC Department

Program Outcomes (POs)

PO 1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems: <ol style="list-style-type: none">1. that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical text book that can be solved using simple engineering theories and techniques;2. that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;3. that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;4. which need to be defined (modelled) within appropriate mathematical framework; and5. that often require use of modern computational concepts and tools, for example, in the design of an antenna or a DSP filter.

	ZEAL EDUCATION SOCIETY'S ZEAL COLLEGE OF ENGINEERING AND RESEARCH NARHE PUNE -41 INDIA	
---	---	---

PO 5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO 1	Identify, design, implement and test Electronics and Communication systems using modern hardware and software tools as per industrial and societal need.
PSO 2	To develop and support system based on Embedded, Signal Processing, Internet of Things, Microwave and Communication.

Course Outcomes (COs)



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



S.E. E & TC Engineering (2019 Course)

Course Code: 207005

Name of Course: Engineering Mathematics III

CO 1	Solve higher order linear differential equation using appropriate techniques for modeling, analyzing of electrical circuits and control systems.
CO 2	Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
CO 3	Obtain 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.
CO 4	Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
CO 5	Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

Course Code: 204181

Name of Course : Electronic Circuits

CO 1	Assimilate the physics, characteristics and parameters of MOSFET towards its application as an amplifier.
CO 2	Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
CO 3	Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies
CO 4	Explain internal schematic of Op-Amp and define its performance parameters.
CO 5	Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
CO 6	Understand and compare the principles of various data conversion techniques and PLL with their application.

Course Code: 204182

Name of Course : Digital Circuits

CO 1	Identify and prevent various hazards and timing problems in a digital design.
------	---



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



CO 2	Use the basic logic gates and various reduction techniques of digital logic circuit.
CO 3	Analyze, design and implement combinational logic circuits.
CO 4	Analyze, design and implement sequential circuits.
CO 5	Differentiate between Mealy and Moore machines.
CO 6	Analyze digital system design using PLD.

Course Code: 204183

Name of Course : Electrical Circuits

CO 1	Analyze the steady state operation of networks fed by DC and AC sources using circuit simplification techniques.
CO 2	Formulate and analyze source driven and source free RL and RC circuits.
CO 3	Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
CO 4	Characterize and select DC machines, induction motor, brushless DC motor and stepper motor for given application.

Course Code: 204184

Name of Course : Data Structures

CO 1	Solve mathematical problems using C programming language.
CO 2	Implement sorting and searching algorithms and calculate their complexity
CO 3	Develop applications of stack and queue using array.
CO 4	Demonstrate applicability of Linked List.
CO 5	Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO 6	Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm

Course Code: 204191

Name of Course : Signals and Systems



CO 1	Identify, classify continuous time and discrete time signals and perform operations on signals.
CO 2	Identify, classify the continuous time and discrete time systems based on their properties in terms of input output relation and in terms of impulse response
CO 3	Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO 4	Analyze the continuous time linear time invariant systems using Laplace Transform.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



CO 5	Compute the probability, CDF, PDF and mean, mean square, variance and standard deviation for given random variables using PDF of a random event.
CO 6	Identify, classify continuous time and discrete time signals and perform operations on signals.
Course Code: 204192	
Name of Course : Control Systems	
CO 1	Determine the mathematical model of Electrical and Mechanical systems in the form of differential equation, transfer function and state space representation; and compute the overall transfer function of systems using block diagram algebra and mason's gain formula.
CO 2	Analyze the first and second order linear time invariant systems from its transient, steady state and frequency domain performance specifications.
CO 3	Investigate the closed loop stability of a system in s-plane from its pole location, Routh stability criterion and root locus.
CO 4	Investigate stability of continuous time linear time invariant systems using graphical tools in frequency domain viz. Bode plot and Nyquist plot.
CO 5	Compare, select and tune controller modes of PID controller.
Course Code: 204193	
Name of Course : Principles of Communication Systems	
CO 1	Determine the fundamental aspects of the communication system.
CO 2	Identify basic mathematical tools for time domain and frequency domain analysis of communication signal and systems.
CO 3	Analysis and design of various modulation and demodulation techniques.
CO 4	Demonstrates an appreciative effect of sampling in continuous-time signals and comparison of Pulse Modulation technique (PAM, PWM, and PPM).
CO 5	Acquaint waveform coding, multiplexing and synchronization techniques in baseband digital transmission. Compare digital representation techniques (PCM, DPCM, DM and ADM).
Course Code: 20194	
Name of Course : Object Oriented Programming	
CO 1	Describe the principles of object oriented programming.
CO 2	Apply the concepts of data encapsulation, inheritance in C++.
CO 3	Understand Operator overloading and friend functions in C++.
CO 4	Apply the concepts of classes, methods inheritance and polymorphism to write

	ZEAL EDUCATION SOCIETY'S ZEAL COLLEGE OF ENGINEERING AND RESEARCH NARHE PUNE -41 INDIA	
---	---	---

	programs C++.
CO 5	Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
CO 6	Describe and use of File handling in C++.

T.E. E & TC Engineering (2019 Course)
--

Course Code: 304181	
Name of Course: Digital Communication	
CO 1	Apply the statistical theory for describing various signals in a communication system.
CO 2	To acquire the basic knowledge of Digital communication including source coding, channel coding, modulation and equalization techniques as per the channel capacity requirements over various channels
CO 3	Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO 4	Understand the working of a spread spectrum communication system and analyze its performance.
CO 5	Analyze a communication system using information theoretic approach.
CO 6	Use error control coding techniques to improve performance of a digital communication system
Course Code: 304182	
Name of Course: Electromagnetic Field Theory	
CO 1	Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
CO 2	Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
CO 3	State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
CO 4	Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.
CO 5	Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, V_{max}/V_{min} , length of transmission line using Smith Chart.
CO 6	Carry out a detailed study, interpret the relevance and applications of Electromagnetics.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 304183

Name of Course: Database Management

CO 1	To understand fundamental concepts of a database from its design to its implementation.
CO 2	To analyze database requirements and determine the entities involved in the system and with one another.
CO 3	To manipulate database using SQL Query to create, update and manage Database
CO 4	Be familiar with the basic issues of transaction processing and concurrency control.
CO 5	To learn and understand Parallel Databases and its Architectures.
CO 6	To learn and understand Distributed Databases and its applications.

Course Code: 304184

Name of Course: Microcontroller

CO 1	Understand the fundamentals of microcontroller, selection of microcontrollers with Applications and write c programming
CO 2	Interface the I/O device as per the need of the application, draw interfacing diagram and write a suitable C program, design a DAS for real time industrial applications
CO 3	Analyze the features of PIC 18F XXXX.
CO 4	Describe the programming details in peripheral support, Selection of the interrupts and ADC channels.
CO 5	Develop interfacing models according to applications.
CO 6	Evaluate the serial communication details and interfaces, select the bus protocol for interfacing devices, and interface input/output devices using buses.

Course Code: 304185 (A)

Name of Course: Digital Signal Processing

CO 1	Select sampling frequency for discretizing the given continuous time signals.
CO 2	Compute discrete Fourier transform using its equation and fast Fourier transform algorithms and analyze discrete time signals in frequency domain using discrete Fourier transform.
CO 3	Analyze discrete time systems using z transform.
CO 4	Design digital Butterworth IIR filter for the given specifications using bilinear transformation and impulse invariance techniques.
CO 5	Design FIR filters for the given specifications using windowing technique and frequency sampling method.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA





Course Code: 304185 (D)	
Name of Course: Computer Network	
CO 1	Design LAN using appropriate networking architecture, topologies, transmission media, and Networking devices.
CO 2	Understand the working of controlling techniques for flawless data communication using data link layer protocols.
CO 3	Learn the functions of network layer, various switching techniques and internet protocol addressing.
CO 4	Explore various interior and exterior, unicasting and multicasting protocols.
CO 5	Analyze data flow using TCP/UDP Protocols, congestion control techniques for QoS.
CO 6	Illustrate the use of protocols at application layer.
Course Code: 304192	
Name of Course: Cellular Networks	
CO 1	Understand fundamentals of wireless communications.
CO 2	Discuss and study OFDM and MIMO concepts.
CO 3	Elaborate fundamentals mobile communication.
CO 4	Describes aspects of wireless system planning.
CO 5	Understand of modern and futuristic wireless networks architecture.
CO 6	Summarize different issues in performance analysis.
Course Code: 304193	
Name of Course: Project Management	
CO 1	Apply the fundamental knowledge of project management for effectively handling the projects.
CO 2	Identify and select the appropriate project based on feasibility study and undertake its effective planning.
CO 3	Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.
CO 4	Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



CO 5	Identify and assess the project risks and manage finances in line with Project Financial Management Process.
CO 6	Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.
Course Code: 304194	
Name of Course: Power Devices & Circuits	
CO 1	To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings.
CO 2	To design triggering / driver circuits for various power devices.
CO 3	To evaluate and analyze various performance parameters of the different converters and its topologies.
CO 4	To understand significance and design of various protection circuits for power devices.
CO 5	To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.
CO 6	To understand case studies of power electronics in applications like electric vehicles, solar systems etc.
Course Code: 304195 (D)	
Name of Course: Embedded Processors(Elective -II)	
CO 1	Understand basics of Embedded C Programming and usage of Embedded C and study different software tools for programming microcontrollers.
CO 2	Get acquainted with various Embedded Processor architectures related to industrial application.
CO 3	Know about the programming of ARM 7 based microcontroller with on chip peripherals and external peripherals.
CO 4	Understand the architectures of ARM Cortex M4 Microcontrollers and its advantages over ARM 7 Microcontrollers.
CO 5	Implement the real world programming of ARM 7 based microcontroller with on chip

	ZEAL EDUCATION SOCIETY'S ZEAL COLLEGE OF ENGINEERING AND RESEARCH NARHE PUNE -41 INDIA	
---	---	---

	peripherals and external peripherals.
CO 6	Recognize the interfacing of real world sensors and standard buses. Will also able to design different case studies.

B.E. E & TC Engineering (2015 Course)
--

Course Code: 404181

Name of Course: VLSI Design and Technology
--

CO 1	Write effective HDL coding for digital design.
CO 2	Apply knowledge of real time issues in digital design.
CO 3	Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO 4	Design CMOS circuits for specified applications.
CO 5	Analyze various issues and constraints in design of an ASIC
CO 6	Apply knowledge of testability in design and build self-test circuit.

Course Code: 404182

Name of Course: Computer Networks & Security
--

CO 1	Understand fundamental underlying principles of computer networking
CO 2	Describe and analyze the hardware, software, components of a network and their interrelations.
CO 3	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO 4	Have a basic knowledge of installing and configuring networking applications.
CO 5	Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.
CO 6	Have a basic knowledge of the use of cryptography and network security.

Course Code: 404183

Name of Course: Radiation and Microwave Techniques
--

CO 1	Formulate Friss Transmission equation and describe different antenna parameters Distinguish between linear, circular, and elliptical polarization.
CO 2	Analyze and Evaluate various linear wire antennas and uniform arrays based on the current distribution and measure antenna parameters.
CO 3	Formulate and solve the wave equation for coaxial wire and Analyze of rectangular wave guide, cavity resonator.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



CO 4	Compute and Analyze the microwave components by using scattering matrix parameters.
CO 5	Describe the working principle and operation of various microwave tubes and solid state devices with their applications.
CO 6	Choose suitable microwave measurement instruments and conduct the required measurements.
CO 7	Carry out experiment as an individual and in a team, understand and write a laboratory record and draw conclusions at a technical level.
Course Code: 404184	
Name of Course: Internet Of Things	
CO 1	Understand the various concepts, terminologies and architecture of IoT systems.
CO 2	Use sensors and actuators for design of IoT.
CO 3	Understand and apply various protocols for design of IoT systems
CO 4	Use various techniques of data storage and analytics in IoT
CO 5	Understand various applications of IoT
Course Code: 404185	
Name of Course: Electronics Product Design	
CO 1	Understand various stages of hardware, software and PCB design.
CO 2	Selection & evolution of Electronics products with respect to Hardware.
CO 3	Understand, perform & analyze of analog, digital and mixed circuit design.
CO 4	Determine product test & test specifications for reliable Electronics product.
CO 5	Design and important considerations of documentation for Electronics Product.
Course Code: 404189	
Name of Course: Mobile Communication	
CO 1	The concepts of switching technique and traffic engineering to design multistage networks.
CO 2	Learn the concept of how a voice call and data is processed with different functions of switching technologies.
CO 3	To apply knowledge of call traffic management to handle queued calls in the network and accordingly customer signaling.
CO 4	Explore cellular communication concepts for evolved communication strategies.
CO 5	Learn the evolution of mobile generations with worldwide communication networks.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



CO 6	Explore GSM and 5G network architecture and future scope with 5G
Course Code:404190	
Name of Course: Broadband Communication Systems	
CO 1	To select various components such as optical source, detector and Fiber for Optical Communication system.
CO 2	Perform Link power budget and Rise Time Budget by proper selection of Components and check its viability.
CO 3	Recognize state of art of active and passive WDM components
CO 4	Calculate Orbital parameters of Satellite Orbits
CO 5	Realize various sub systems in Satellite Communication
CO 6	Design Uplink and Downlink Satellite System
Course Code: 404191	
Name of Course: Audio Video Engineering	
CO 1	To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver, Picture Tubes and Television Camera Tubes.
CO 2	To study the various Color Television systems with a greater emphasis on television standards.
CO 3	To study the advanced topics in Digital Television and High Definition Television.
CO 4	To study audio recording systems such CD/DVD recording, Audio Standards, and Acoustics principles.
Course Code: 404192	
Name of Course: Wireless Sensor Networks (Elective-IV)	
CO 1	Explain various concepts and terminologies used in WSN
CO 2	Describe importance and use of radio communication and link management in WSN
CO 3	Explain various wireless standards and protocols associated with WSN
CO 4	Recognize importance of localization and routing techniques used in WSN
CO 5	Understand techniques of data aggregation and importance of security in WSN
CO 6	Examine the issues involved in design and deployment of WSN



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Information Technology Department

Program Outcomes (POs)

PO 1	Engineering knowledge: Apply the knowledge of mathematics science engineering fundamentals and an mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems engineering problems
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



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



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Program Specific Outcomes (PSOs)

PSO 1	An ability to apply the theoretical concepts and practical knowledge of Information Technology in analysis, design, development and management of information processing systems and applications in the interdisciplinary domain.
PSO 2	An ability to analyze a problem, and identify and define the computing infrastructure and operations requirements appropriate to its solution. IT graduates should be able to work on large-scale computing systems.
PSO 3	An understanding of professional, business and business processes, ethical, legal, security and social issues and responsibilities.
PSO 4	Practice communication and decision-making skills through the use of appropriate technology and be ready for professional responsibilities

Course Outcomes (COs)



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



S.E. IT Engineering (2019 Course)

Course Code: 214441

Name of Course: Discrete Mathematics

CO 1	Formulate and apply formal proof techniques and solve the problems with logical reasoning.
CO 2	Analyze and evaluate the combinatorial problems by using probability theory
CO 3	Apply the concepts of graph theory to devise mathematical models.
CO 4	Analyze types of relations and functions to provide solution to computational problems
CO 5	Identify techniques of number theory and its application
CO 6	Identify fundamental algebraic structures.

Course Code: 214442

Name of Course: Logic Design and Computer Organization

CO 1	Simplify logic expressions using basic binary arithmetic operations.
CO 2	Implement combinational logic functions using binary arithmetic operations.
CO 3	Implement sequential logic functions using ICs and understand the operations of basic memory cell types.
CO 4	Explain the functions & organization of various blocks of CPU.
CO 5	Analyze CPU instruction characteristics and enhancement features of CPU.
CO 6	Describe an assortment of memory types and basic principle of interfacing input, output devices.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 214443

Name of Course: Data Structures and Algorithms

CO 1	Analyze time and space complexity of algorithms.
CO 2	Apply searching and sorting techniques for problem solving.
CO 3	Apply the concepts of data abstraction for given application.
CO 4	Construct algorithms based on techniques like divide and conquer ,brute -force, greedy
CO 5	Implement appropriate algorithm for complex data structures.
CO 6	Use hashing functions to find appropriate data.

Course Code: 214444

Name of Course: Object Oriented Programming

CO 1	Differentiate programming patterns
CO 2	Identify various tools of OOP to model real-world problems.
CO 3	Identify the principles of inheritance and polymorphism for data processing.
CO 4	Apply exception handling in programming.
CO 5	Analyze data space available using different data storage techniques.
CO 6	Design simple patterns to provide object oriented solutions.

Course Code: 214445

Name of Course: Basics of Computer Network

CO 1	Compare OSI and TCP/IP model and understand basics of network communication.
CO 2	Analyze data link layer services, error detection and correction, linear block codes, cyclic Codes, framing and flow control protocols.
CO 3	Compare different access techniques in networking and learn IEEE standards.
CO 4	Implement the concepts of sub-netting, super netting and routing mechanisms in LAN
CO 5	Apply knowledge of IPv4 and IPv6 for implementation in network.
CO 6	Apply services and protocols used at transport layer in web related applications.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 207003

Name of Course: Engineering Mathematics III

CO 1	Apply knowledge of Linear differential equations, essential in modeling and design of computer-based systems.
CO 2	Solve problems of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
CO 3	Apply Statistical methods like correlation & regression analysis and probability theory for data analysis and predictions in machine learning.
CO 4	Apply the concepts of Algebraic & Transcendental equations and System of linear equations using numerical techniques in applications.
CO 5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

Course Code: 214451

Name of Course: Processor Architecture

CO 1	Describe architectural features of processors & Microcontroller
CO 2	Study about architecture, instruction sets and addressing modes of PIC 18
CO 3	Implement PIC interfacing in various embedded system projects
CO 4	Explain Various PIC Interrupts with their types
CO 5	Explain microcontroller based system design for various applications.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 214452

Name of Course: Database Management System

CO 1	Apply fundamental elements of database management systems.
CO 2	Design ER-models to represent simple database application scenarios.
CO 3	Formulate SQL queries on data for relational databases.
CO 4	Improve the database design by normalization & to incorporate query processing.
CO 5	CO5: Apply ACID properties for transaction management and concurrency control.
CO 6	CO6: Analyze various database architectures and technologies.

Course Code: 214453

Name of Course: Computer Graphics

CO 1	Apply knowledge of geometric, mathematical and algorithmic concepts required for elementary graphics operations.
CO 2	To understand and implement the concept of polygon filling, windowing and clipping.
CO 3	To design and implement interactive 2D and 3D computer graphics.
CO 4	Design and develop graphics applications using modern tools like Blender by applying the knowledge of color models.
CO 5	Understand strategic approach to solve problems in the domain of Computer Graphics.
CO 6	Understand strategic approach to solve problems in the domain of Computer Graphics.

Course Code: 214454

Name of Course: Software Engineering

CO 1	Classify various software application domains.
CO 2	Analyze software requirements by using various modeling techniques.
CO 3	Translate the requirement models into design models.
CO 4	Apply planning and estimation to any project.
CO 5	Use quality attributes and testing principles in software development life cycle.
CO 6	Discuss recent trends in Software engineering by using CASE and agile tools.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



T.E. Information Technology Engineering (2019 Course)

Course Code: 314441

Name of Course: Theory of Computation

CO 1	Students will be able to differentiate and give examples for the different types of automata like finite automata, push down automata and turing machine.
CO 2	Write and Identify the properties of regular grammar, regular language, regular expression & their relationship with finite automata.
CO 3	Construct finite automata and its variants(push down automata, Turing machine) to solve computing problems
CO 4	Design and analyze Turing machine to solve problems and Explain the decidability and intractability of computational problems
CO 5	Compare Class P and NP Complexity Problem

Course Code: 314442

Name of Course: Operating Systems

CO 1	Identify the significance of operating system in computing devices.
CO 2	Exemplify the communication between application programs and hardware devices through system calls.
CO 3	Compare and illustrate various process scheduling algorithms.
CO 4	Apply appropriate memory and file management schemes.
CO 5	Illustrate various disk scheduling algorithms.
CO 6	Appreciate the need of access control and protection in an operating system.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 314443

Name of Course: Machine Learning

CO 1	Differentiate various learning approaches, and to interpret the concepts of supervised learning
CO 2	Compare the different dimensionality reduction techniques
CO 3	Apply theoretical foundations of decision trees to identify best split and Bayesian classifier to label data points.
CO 4	Illustrate the working of classifier models like SVM, Neural Networks and identify classifier model for typical machine learning applications
CO 5	Identify the state sequence and evaluate a sequence emission probability from a given HMM
CO 6	Illustrate and apply clustering algorithms and identify its applicability in real life problems.

Course Code: 314444

Name of Course: Human Computer Interaction

CO 1	Describe and apply core theories, models and methodologies from the field of HCI...
CO 2	To develop basics of human factors in HCI design.
CO 3	Analyze one after another the main features of interactive systems, and explain how to gauge the usability of digital environments, tools and interfaces.
CO 4	Demonstrate a thorough understanding and solid knowledge of the principles and techniques of human-computer interaction.
CO 5	Able to draw on a variety of techniques and relevant knowledge and appropriately apply them to new situations and real-life problems.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 314445(A)

Name of Course: Design and Analysis of Algorithm

CO 1	Able to Argue the correctness of algorithms using inductive proofs and ability to understand mathematical formulation, complexity analysis and methodologies to solve recurrence relations for algorithms.
CO 2	Able to Describe important algorithmic design paradigms (divide-and-conquer, greedy method, dynamic-programming and Backtracking, branch and bound) and explain when an algorithmic design situation calls for it.
CO 3	Ability to design algorithms using standard paradigms like: Divide-and-conquer, greedy method, dynamic-programming and Backtracking, branch and bound
CO 4	Compare different methods of Branch and Bound strategy
CO 5	Classify P, NP, NP-complete, NP-Hard problems.

Course Code: 314451

Name of Course: Computer Network and Security

CO 1	To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.
CO 2	Understand the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks and Addressing scheme used in internet
CO 3	Apply and implement various symmetric key cryptography (Private key cryptography) algorithms and asymmetric key cryptography (Public key cryptography) algorithms
CO 4	Understand the remote user authentication, key management and distribution techniques in symmetric and asymmetric key cryptography.
CO 5	Evaluate the message authentication, hash algorithms and digital signature.
CO 6	Analyze various web security approaches and interpret the basic components of security architecture and protocols.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 314452

Name of Course: Data Science and Big Data Analytics

CO 1	To introduce basic need of Big Data and Data science to handle huge amount of data.
CO 2	To analyze the basic mathematics behind the Big data.
CO 3	Describe the different Big data processing technologies.
CO 4	Explain and apply the Analytical concept of Big data using R and Python.
CO 5	To visualize the Big Data using different tools.
CO 6	To understand the application and impact of Big Data.

Course Code: 314453

Name of Course: Web Application Development

CO 1	Students will be able to define the web architecture and summarize task list for building J2EE Applications.
CO 2	Students will be able to demonstrate and develop the applications with JDBC and servlets
CO 3	Students will be able to explain and analyze applications with Java Server Pages.
CO 4	Students will be able to explain and analyze applications with Java Server Pages.
CO 5	Students will be able to explain distributed programming services



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 314454 (C)

Name of Course: Cloud Computing

CO 1	Articulate the concepts ,key technologies, strength and limitation of cloud computing and possible application
CO 2	Identify the architecture and infrastructure of cloud computing including SaaS, PaaS, IaaS, public cloud, private cloud and hybrid cloud.
CO 3	Describe the appropriate cloud computing solutions and recommendations according to application used.
CO 4	Explain the core issues of cloud computing such as security, privacy and interoperability and deal with controlling mechanism for accessing sage cloud service.
CO 5	To Develop an application using Amazon web service OR existing CLOUD



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



B.E. Information Technology Engineering (2015 Course)

Course Code: 414453

Name of Course: Information and Cyber Security

CO 1	Use basic cryptographic techniques in application development.
CO 2	Apply methods for authentication, access control, intrusion detection and prevention.
CO 3	To apply the scientific method to digital forensics and perform forensic investigations
CO 4	To develop computer forensics awareness.
CO 5	Ability to use computer forensics tools.

Course Code: 414454

Name of Course: Machine Learning and Applications

CO 1	Differentiate various learning approaches, and to interpret the concepts of supervised learning
CO 2	Compare the different dimensionality reduction techniques
CO 3	Apply theoretical foundations of decision trees to identify best split and Bayesian classifier to label data points.
CO 4	Illustrate the working of classifier models like SVM, Neural Networks and identify classifier model for typical machine learning applications
CO 5	Identify the state sequence and evaluate a sequence emission probability from a given HMM
CO6	Illustrate and apply clustering algorithms and identify its applicability in real life problems.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 414455

Name of Course: Software Design and Modeling

CO 1	Explain object oriented methodologies, basics of Unified Modeling Language (UML).
CO 2	Apply knowledge of OOPs concepts in Object Oriented Design.
CO 3	Represent using UML notation and interact with the customer to refine the UML diagrams
CO 4	Demonstrate Various design principle and patterns
CO 5	Explain Architectural design and their components.

Course Code: 414456E

Name of Course: Business Analytics and Intelligence

CO 1	To introduce basic the Information Systems and development approaches of Intelligent Systems.
CO 2	Examine and review business processes using information systems.
CO 3	Planned the Framework for business intelligence
CO 4	To enlighten with the Theories, techniques, and considerations for capturing organizational intelligence.
CO 5	Cooperate with business intelligence with business strategy.
CO6	To implement the techniques for implementing business intelligence systems



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 414457C

Name of Course: Software Testing and Quality Assurance

CO 1	Apply the testing strategies and methodologies in projects.
CO 2	Implement test management strategies and tools for testing.
CO 3	Implement Automation testing and software quality metrics using various testing tool
CO 4	Elaborate various terminology of software failures also detection and prevention for them.
CO 5	Select appropriate software quality assurance models & tools used in quality management
CO6	Demonstration about open problems in software testing and maintenance.

Course Code: 414462

Name of Course: Distributed Computing System

CO 1	To apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
CO 2	To gain knowledge of different types of distributed system, working components and fault tolerance of distributed system.
CO 3	To identify the challenges in developing distributed applications.
CO 4	To aware about security and protection mechanism for distributed system.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 414463

Name of Course: Ubiquitous Computing

CO 1	Differentiate various learning approaches, and to interpret the concepts of UbiComp, modeling and smart DEI model
CO 2	To gain knowledge about Smart Devices and Service properties, Smart mobile devices and Users etc.
CO 3	Apply theoretical foundations of programmable and PID type control system, Robots.
CO 4	Illustrate the working of how human actually interacts with the computer using various smart devices.
CO 5	Identify the privacy concept and learn Solove's taxonomy of privacy, legal background, Interpersonal privacy.
CO 6	Illustrate and apply various mediums of communications

Course Code: 414464B

Name of Course: Information Storage and Retrieval

CO 1	Understand the concept of Information retrieval.
CO 2	Deal with storage and retrieval process of text and multimedia data.
CO 3	Evaluate performance of any information retrieval system
CO 4	Design user interfaces. 5.
CO 5	Understand importance of recommender system
CO 6	Understand concept of multimedia and distributed information retrieval.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 414464D

Name of Course: Social Media Analytics

CO 1	Understand the basics of Social Media Analytics.
CO 2	Explain the significance of Data mining in Social media
CO 3	Demonstrate the algorithms used for text mining.
CO 4	Apply network measures for social media data
CO 5	Explain Behavior Analytics techniques used for social media data
CO 6	Apply social media analytics for Face book and Twitter kind of applications.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Robotics & Automation Engineering Department

Program Outcomes (POs)

PO 1	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems
PO 2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO 4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
PO 5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Program Specific Outcomes (PSOs)

PSO 1	Design and Development of robotic systems that are cost effective, environment friendly to solve engineering and societal problems using advanced tools and techniques.
PSO 2	Model, program and build an error free, safe, and productive automation systems for various manufacturing processes.
PSO 3	Apply domain knowledge of robotics and automation to provide solutions in interdisciplinary areas to meet current industrial challenges.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Outcomes (COs)

S.E. Robotics & Automation Engineering (2019 Course)

Course Code:

Name of Course: Engineering Mathematics-III

CO 1	Solve higher order linear differential equations and apply to modeling and analyzing mass spring systems.
CO 2	Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications.
CO 3	Apply statistical methods like correlation, regression analysis in analyzing, interpreting experimental data and probability theory in testing and quality control.
CO 4	Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
CO 5	Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.

Course Code:

Name of Course: Industrial Electronics and Electrical Technology

CO 1	Develop the capability to identify and select suitable DC motor / induction motor
CO 2	Identify special purpose motor and its speed control method for given industrial application.
CO 3	Program Arduino IDE using conditional statements
CO 4	Interfacing sensors with Arduino IDE
CO 5	Analyze Microcontrollers and embedded systems terminologies and sensors

Course Code:

Name of Course: Strength of Material

CO 1	Explain stress and strain at a point as well as the stress-strain relationship for homogeneous, isotropic materials.
CO 2	Construct shear force and bending moment diagram
CO 3	Detect Shear stress and bending stress in a various cross sections of beams.
CO 4	Design the shaft subjected to torsion.
CO 5	Design and analyze the thick and thin cylinders used for industrial applications.
CO 6	Detect the slope and deflection of beam.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



CO 7	Explain and detect the buckling of columns.
------	---

Course Code:	
Name of Course: Manufacturing Technology	
CO 1	Describe and classify metal casting processes
CO 2	Classify and analyze various forming processes
CO 3	Understand special casting and forming processes
CO 4	Classify and describe different types of welding and joining processes
CO 5	Understand various non-conventional machining process.
CO 6	Understand various applications of robots in manufacturing

Course Code:	
Name of Course: Material Science and Engineering Metallurgy	
CO 1	Define the mechanical properties of materials and conduct destructive and non-destructive tests to evaluate and test the properties of materials.
CO 2	Draw and explain equilibrium diagrams for various alloy systems.
CO 3	Work with Iron-Iron carbide equilibrium diagram and apply this knowledge for classification of steels from microstructure observations.
CO 4	Select proper Heat Treatment, Surface Hardening technique & Isothermal Treatments for the steels considering properties and service requirements.
CO 5	Distinguish different Alloy Steels and Cast Irons based on chemical compositions and microstructures.
CO 6	Familiarize with different types of non-ferrous alloys and Composites with their need scope and applications.

Course Code:	
Name of Course: Industrial Engineering and Management	
CO 1	Describe Principles and Types of Management
CO 2	Interpret Theories of Motivations and leadership
CO 3	Develop Entrepreneurship skills
CO 4	Apply various Tools and techniques of Industrial Engineering for Productivity improvement
CO 5	Apply Method study and examine the recorded facts and propose new method
CO 6	Apply Work Measurement techniques to determine standard time



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code:	
Name of Course: Control System Engineering	
CO 1	Model a physical system and express its internal dynamics and input-output relationships by means of block diagrams, mathematical model and transfer functions.
CO 2	Understand and explain the relationships between the parameters of a control system and its stability, accuracy, transient behavior.
CO 3	Identify the parameters that the system is sensitive to. Determine the stability of a system and parameter ranges for a desired degree of stability.
CO 4	Plot the Bode, Nyquist, Root Locus diagrams for a given control system and identify the parameters and carry out the stability analysis.
CO 5	Determine the frequency response of a control system and use it to evaluate or adjust the relative stability
CO 6	Design a P, PD, PI, or PID controller based on the transient and steady state response criteria.

Course Code:	
Name of Course: Design of Machine Elements	
CO 1	Understand the basic principles and process of machine design
CO 2	Understand the theories of failures and Factor of safety to design mechanical component.
CO 3	Analyze the stress and strain on mechanical components such as shaft, power screws, mechanical springs, gears, and bearings.
CO 4	Understand, identify and quantify failure modes for mechanical parts such as shaft, power screws, mechanical springs, gears, and bearings.
CO 5	Demonstrate knowledge on basic machine elements used in design of machine elements to withstand the loads and deformations for a given practical application.

Course Code:	
Name of Course: Metrology and Quality Assurance	
CO 1	Describe and work with various linear and angular measuring devices.
CO 2	Design limit gauges and work with special measuring devices for gear, screw thread and surface finish measurements.
CO 3	Distinguish various comparators and use profile projector.
CO 4	Use various control charts and various quality assurance tools.
CO 5	Get knowledge of various quality standards and their implementations in industries.
CO 6	Implement TQM and TPM concepts in practice



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Artificial Intelligence & Data Science Department

Program Outcomes (POs)

PO1	Engineering knowledge : Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	Design /Development of Solutions : Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	Environment and Sustainability Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	Individual and Team Work : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication Skills: Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project Management and Finance : Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	Life-long Learning : Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Program Specific Outcomes (PSOs)

PSO1	Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, networking, artificial intelligence and data science for efficient design of computer-based systems of varying complexities.
PSO2	Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO3	Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Outcomes (COs)

S.E. Artificial Intelligence & Data Science Engineering (2020 Course)

Course Code: 210241

Name of Course: Discrete Mathematics

CO 1	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.
CO 2	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
CO 3	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
CO4	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
CO5	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
CO6	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
CO7	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 210242

Name of Course: Fundamentals of Data Structures

CO 1	Design the algorithms to solve the programming problems, identify appropriate algorithmic strategy for specific application, and analyze the time and space complexity.
CO 2	Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identify the appropriate data structure in approaching the problem solution.
CO 3	Demonstrate use of sequential data structures- Array and Linked lists to store and process data.
CO4	Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
CO5	Compare and contrast different implementations of data structures (dynamic and static).
CO 6	Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.

Course Code: 210243

Name of Course: Object Oriented Programming(OOP)

CO 1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
CO 2	Design object-oriented solutions for small systems involving multiple objects.
CO 3	Use virtual and pure virtual function and complex programming situations.
CO4	Apply object-oriented software principles in problem solving.
CO5	Analyze the strengths of object-oriented programming.
CO6	Develop the application using object oriented programming language(C++).



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 210244

Name of Course: Computer Graphics

CO 1	Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
CO 2	Apply mathematics to develop Computer programs for elementary graphic operations.
CO 3	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
CO4	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
CO5	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
CO6	Create effective programs using concepts of curves, fractals, animation and gaming.

Course Code: 217521

Name of Course: Operating Systems

CO 1	Enlist functions of OS and types of system calls
CO 2	Apply process scheduling algorithms to solve a given problem
CO 3	Illustrate deadlock prevention, avoidance and recovery
CO4	Explain memory management technique
CO5	Illustrate I/O and file management policies
CO6	Describe Linux process management



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 217521

Name of Course: Operating Systems

CO 1	Enlist functions of OS and types of system calls
CO 2	Apply process scheduling algorithms to solve a given problem
CO 3	Illustrate deadlock prevention, avoidance and recovery
CO4	Explain memory management technique
CO5	Illustrate I/O and file management policies
CO6	Describe Linux process management

Course Code: 217522

Name of Course: Data Structures Laboratory

CO 1	Use algorithms on various linear data structure using sequential organization to solve real life problems.
CO 2	Analyze problems to apply suitable searching and sorting algorithm to various applications.
CO 3	Analyze problems to use variants of linked list and solve various real life problems.
CO4	Designing and implement data structures and algorithms for solving different kinds of problems.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 217523

Name of Course: OOP and Computer Graphics Laboratory

CO 1	Understand and apply the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.
CO 2	Analyze the concept of file and apply it while storing and retrieving the data from secondary storages.
CO 3	Analyze and apply computer graphics algorithms for line-circle drawing, scan conversion
CO4	Understand the concept of windowing and clipping and apply various algorithms to fill and clip polygons.
CO 5	Apply logic to implement, curves, fractals, animation and gaming programs.

Course Code: 217525

Name of Course : Business Communication Skills

CO 1	Express effectively through verbal/oral communication and improve listening skills
CO 2	Write precise briefs or reports and technical documents.
CO 3	Prepare for group discussion / meetings / interviews and presentations.
CO4	Explore goal/target setting, self-motivation and practicing creative thinking.
CO 5	Operate effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership qualities.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 217526	
Name of Course: Humanity and Social Science	
CO 1	Aware of the various issues concerning humans and society.
CO 2	Aware about their responsibilities towards society.
CO 3	Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes.
CO4	Able to understand the nature of the individual and the relationship between self and the community.
CO 5	Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.

Course Code: 217528	
Name of Course: Statistics	
CO 1	Identify the use of appropriate statistical terms to describe data
CO 2	Use appropriate statistical methods to collect, organize, display, and analyze relevant data.
CO 3	Use distribution functions for random variables
CO4	Distinguish between correlation coefficient and regression
CO 5	Understand tests for hypothesis and its significance



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 217529

Name of Course: Internet of Things

CO 1	Have a thorough understanding of the structure, function and characteristics of computer Systems and Understand the structure of various number systems and its application in digital design.
CO 2	Develop the skill set to build IoT systems and sensor interfacing
CO 3	Explain the concept of Internet of Things and identify the technologies that make up the internet of things
CO4	Analyze trade-offs in interconnected wireless embedded device networks. Select Appropriate Protocols for IoT Solutions
CO 5	Design a simple IoT system comprising sensors by analyzing the requirements of IoT Application
CO 6	Identify the Application of IoT in automation of Commercial and Real World examples

Course Code: 210252

Name of Course: Data Structures and Algorithms

CO 1	Identify and articulate the complexity goals and benefits of a good hashing scheme for real-world applications.
CO 2	Apply non-linear data structures for solving problems of various domain.
CO 3	Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
CO4	Analyze the algorithmic solutions for resource requirements and optimization
CO 5	Use efficient indexing methods and multiway search techniques to store and maintain data.
CO 6	Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage.



ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA



Course Code: 210253:

Name of Course: Software Engineering

CO 1	Analyze software requirements and formulate design solution for a software.
CO 2	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
CO 3	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
CO4	Model and design User interface and component-level.
CO 5	Identify and handle risk management and software configuration management.
CO 6	Utilize knowledge of software testing approaches, approaches to verification and validation.
CO 7	Construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain efficient, reliable, robust and cost-effective software solutions.

Course Code: 217530

Name of Course: Management Information Systems

CO 1	Explain the concepts of Management Information System and Business intelligence for MIS.
CO 2	Illustrate the need of information systems in global business and ethical issues.
CO 3	List the IT infrastructure components and explain security in the Information System.
CO4	Demonstrate the importance of project management and extend its use in the international information system.
CO 5	Illustrate the concepts of decision support systems for business applications.
CO 6	Relate artificial intelligence and data science for Management Information System.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 217531

Name of Course: Internet of Things Laboratory

CO 1	Understand IOT Application Development using Raspberry Pi/ Beagle board/ Arduino board
CO 2	Develop and modify the code for various sensor based applications using wireless sensor modules and working with a variety of modules like environmental modules.
CO 3	Make use of Cloud platform to upload and analyse any sensor data

Course Code: 217532

Name of Course: Data Structures and Algorithms Laboratory

CO 1	Understand the ADT/libraries, hash tables and dictionary to design algorithms for a specific problem.
CO 2	Choose most appropriate data structures and apply algorithms for graphical solutions of the problems.
CO 3	Apply and analyze nonlinear data structures to solve real world complex problems.
CO4	Apply and analyze algorithm design techniques for indexing, sorting, multi-way searching, file organization and compression.
CO 5	Analyze the efficiency of most appropriate data structure for creating efficient solutions for engineering design situations.



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 217533

Name of Course: Project Based Learning II

CO 1	Identify the real life problem from societal need point of view
CO 2	Choose and compare alternative approaches to select most feasible one
CO 3	Analyze and synthesize the identified problem from technological perspective
CO4	Design the reliable and scalable solution to meet challenges
CO 5	Evaluate the solution based on the criteria specified
CO 6	Inculcate long life learning attitude towards the societal problems

Course Code: 217534

Name of Course: Code of Conduct

CO 1	Understand the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO 2	Aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
CO 3	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
CO4	Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.