



**Bharati Vidyapeeth's  
College of Engineering, Lavale, Pune  
Department of Computer Engineering**

**Program Outcomes (POs)**

**(for Bachelor of Computer Engineering at Savitribai Phule Pune University)**

Learners are expected to know and be able to—

**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 analyse complex Engineering problems reaching substantiated conclusions using firstprinciples 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 modelling 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.

### **PO8 Ethics**

Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.

### **PO9 Individual and Teamwork**

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.

  
Head  
Dept. of Computer Engineering  
Bharati Vidyapeeth's  
College of Engineering,  
Lavale, Pune - 412 115

## **Program Specific Outcomes (PSO)**

A graduate of the Computer Engineering Program will demonstrate-

### **PSO1 Professional Skills-**

The ability to understand, analyse 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.

### **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.

## **Program Educational Objectives(PEO)**

### **PEO1**

To prepare globally competent graduates having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.

### **PEO2**

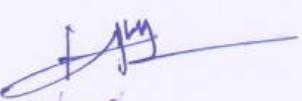
To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural, and environmental issues.

### **PEO3**

To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.

### **PEO4**

To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.



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Sept. of Computer Engineering  
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**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210241: Discrete Mathematics**

**Course Outcomes:**

On completion of the course, student will be able to—

- Solve real world problems logically using appropriate set, function, and relation models and interpret the associated operations and terminologies in context.
- Analyze and synthesize the real world problems using discrete mathematics.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210242: Digital Electronics & Logic Design**

**Course Outcomes:**

On completion of the course, student will be able to—

- Realize and simplify Boolean Algebraic assignments for designing digital circuits using K-Maps.
- Design and implement Sequential and Combinational digital circuits as per the specifications.
- Apply the knowledge to appropriate IC as per the design specifications.
- Design simple digital systems using VHDL.
- Develop simple embedded system for simple real world application.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210243: Data Structures and Algorithms**

**Course Outcomes:**

On completion of the course, student will be able to—

- To discriminate the usage of various structures in approaching the problem solution.
- To design the algorithms to solve the programming problems.
- To use effective and efficient data structures in solving various Computer Engineering domain problems.
- To analyze the problems to apply suitable algorithm and data structure.
- To use appropriate algorithmic strategy for better efficiency

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210243: Data Structures and Algorithms**

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**Second Year of Computer Engineering (2015 Course)**  
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**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210244: Computer Organization and Architecture**

**Course Outcomes:**

On completion of the course, student will be able to–

- Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
- Analyze the principles of computer architecture using examples drawn from commercially available computers.
- Evaluate various design alternatives in processor organization.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210245: Object Oriented Programming**

<b>Teaching Scheme:</b> TH: 04 Hours/Week	<b>Credit</b> 04	<b>Examination Scheme:</b> In-Sem (online): 50 Marks End-Sem (paper): 50 Marks
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**Prerequisites:** Fundamentals of Programming Languages-I and II

**Course Outcomes:**

On completion of the course, student will be able to—

- Analyze the strengths of object oriented programming
- Design and apply OOP principles for effective programming
- Develop programming application using object oriented programming language C++
- Percept the utility and applicability of OOP

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
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**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210249: Soft Skills**

<b>Teaching Scheme:</b> PR: 02 Hours /Week	<b>Credit</b> 01	<b>Examination Scheme:</b> TW: 25 Marks
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**Course Outcomes:**

On completion of the course, student will be able to—

- Effectively communicate through verbal/oral communication and improve the listening skills
- Write precise briefs or reports and technical documents.
- Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- Become more effective individual through goal/target setting, self motivation and practicing creative thinking.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210250: Audit Course 1**  
**AC1-II: Humanities and Social Sciences**

**Course Outcomes:**

On completion of the course, student will be able to—

- Making engineering and technology students aware of the various issues concerning man and society.
- These issues will help to sensitize students to be broader towards the social, cultural, economic and human issues, involved in social changes
- Able to understand the nature of the individual and the relationship between the self and the community
- Understanding major ideas, values, beliefs, and experiences that have shaped human history and cultures

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210250: Audit Course 1**  
**AC1-III: Environmental Studies**

Environmental studies are the field that examines this relationship between people and the environment. An environmental study is an interdisciplinary subject examining the interplay between the social, legal, management, and scientific aspects of environmental issues.

**Course Outcomes:**

On completion of the course, student will be able to—

- Comprehend the importance of ecosystem and biodiversity
- To correlate the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and prevention
- Identify different types of environmental pollution and control measures
- To correlate the exploitation and utilization of conventional and non-conventional resources

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210250: Audit Course 1**  
**AC1-IV: Smart Cities**

**Course Outcomes:**

On completion of the course, learner will be able to—

- Better understanding of the dynamic behavior of the urban system by going beyond the physical appearance and by focusing on representations, properties and impact factors
- Exploration of the city as the most complex human-made organism with a metabolism that can be modeled in terms of stocks and flows
- Knowledge about data-informed approaches for the development of the future city, based on crowd sourcing and sensing
- Knowledge about the latest research results in for the development and management of future cities
- Understanding how citizens can benefit from data-informed design to develop smart and responsive cities

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210250: Audit Course 1**  
**AC1-V: Foreign Language- Japanese (Module 1)**

**Course Outcomes:**

On completion of the course student

- will have ability of basic communication.
- will have the knowledge of Japanese script.
- will get introduced to reading , writing and listening skills
- will develop interest to pursue professional Japanese Language course.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering/IT (2015 Course)**  
**207003: Engineering Mathematics III**

<b>Teaching Scheme:</b> TH: 04 Hours/Week TUT: 01 Hour/Week	<b>Credit</b> 05	<b>Examination Scheme:</b> In-Sem(online): 50 Marks End-Sem(paper): 50 Marks TW: 25 Marks
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**Prerequisites:**

Differential and Integral Calculus, Taylor series and Infinite series, Differential equations of first order and first degree, Fourier series, Measures of Central tendency and dispersion, Vector algebra, Algebra of complex numbers.

**Course Objectives:**

After completing this course, student will have adequate mathematical background, conceptual clarity, computational skills and algorithm design for problem solving related to:

- Linear differential equations of higher order applicable to Control systems, Computer vision and Robotics.
- Transform techniques such as Fourier transform, Z-transform and applications to Image processing.
- Statistical methods such as correlation, regression analysis and probability theory to analyze data and to make predictions applicable to machine intelligence.
- Vector calculus necessary to analyze and design complex electrical and electronic devices as appropriate to Computer engineering.
- Complex functions, conformal mappings and contour integration applicable to Image processing, Digital filters and Computer graphics.

**Course Outcomes:**

On completion of the course, student will be able to—

- Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
- Solve problems related to Fourier transform, Z-Transform and applications to Signal and Image processing.
- Apply statistical methods like correlation, regression analysis and probability theory for analysis and prediction of a given data as applied to machine intelligence.
- Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals.
- Analyze conformal mappings, transformations and perform contour integration of complex functions required in Image processing, Digital filters and Computer graphics.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210251: Computer Graphics**

Teaching Scheme: TH: 04 Hours/Week	Credit 04	Examination Scheme: In-Sem(online): 50 Marks End-Sem(paper): 50 Marks
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**Prerequisite:**

- Data Structures and algorithms
- Basic Mathematics, Geometry, linear algebra, vectors and matrices.

**Course Objectives:**

- To acquaint the learner with the basic concepts of Computer Graphics
- To learn the various algorithms for generating and rendering graphical figures
- To get familiar with mathematics behind the graphical transformations
- To understand and apply various methods and techniques regarding projections, animation, shading, illumination and lighting

**Course Outcomes:**

On completion of the course, student will be able to—

- Apply mathematics and logic to develop Computer programs for elementary graphic operations
- Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics
- Develop the competency to understand the concepts related to Computer Vision and Virtual reality
- Apply the logic to develop animation and gaming programs

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210252: Advanced Data Structures**

<b>Teaching Scheme:</b> TH: 04 Hours/Week	<b>Credit</b> 04	<b>Examination Scheme:</b> In-Sem(online): 50 Marks End-Sem(paper): 50 Marks
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**Prerequisite:**

- Data Structures and algorithms
- Basic Mathematics, Geometry, linear algebra, vectors and matrices.

**Course Objectives:**

- To develop a logic for graphical modelling of the real life problems.
- To suggest appropriate data structure and algorithm for graphical solutions of the problems.
- To understand advanced data structures to solve complex problems in various domains.
- To operate on the various structured data
- To build the logic to use appropriate data structure in logical and computational solutions.
- To understand various algorithmic strategies to approach the problem solution.

**Course Outcomes:**

On completion of the course, student will be able to—

- To apply appropriate advanced data structure and efficient algorithms to approach the problems of various domain.
- To design the algorithms to solve the programming problems.
- To use effective and efficient data structures in solving various Computer Engineering domain problems.
- To analyze the algorithmic solutions for resource requirements and optimization
- To use appropriate modern tools to understand and analyze the functionalities confined to the data structure usage.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210253: Microprocessor**

<b>Teaching Scheme:</b> TH: 04 Hours/Week	<b>Credit</b> 04	<b>Examination Scheme:</b> In-Sem(online): 50 Marks End-Sem(paper): 50 Marks
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**Prerequisite:** Digital Electronics and Logic Design

**Course Objectives:**

- To learn the architecture and programmer's model of advanced processor
- To understand the system level features and processes of advanced processor
- To acquaint the learner with application instruction set and logic to build assembly language programs.
- To understand debugging and testing techniques confined to 80386 DX

**Course Outcomes:**

On completion of the course, student will be able to—

- To apply the assembly language programming to develop small real life embedded application.
- To understand the architecture of the advanced processor thoroughly to use the resources for programming
- To understand the higher processor architectures descended from 80386 architecture

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210254: Principles of Programming Languages**

<b>Teaching Scheme:</b> <b>TH: 03 Hours/Week</b>	<b>Credit</b> <b>TH: 03</b>	<b>Examination Scheme:</b> <b>In-Sem(online): 50 Marks</b> <b>End-Sem(paper): 50 Marks</b>
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**Prerequisite:** Data Structures & Algorithms and Object Oriented Programming

**Course Objectives:**

- To learn principles of programming language
- To understand structural, computational and logical implications regarding programming languages
- To explore main programming paradigms
- To understand and apply Object Oriented Programming (OOP) principles using C++ and Java

**Course Outcomes:**

On completion of the course, student will be able to-

- To analyze the strengths and weaknesses of programming languages for effective and efficient program development.
- To inculcate the principles underlying the programming languages enabling to learn new programming languages.
- To grasp different programming paradigms
- To use the programming paradigms effectively in application development.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210258: Audit Course 2**  
**AC2-I: Water Management**

Water is a vital resource for all life on the planet. Only three percent of the water resources on Earth are fresh and two-thirds of the freshwater is locked up in ice caps and glaciers. One fifth of the remaining one percent is in remote, inaccessible areas. As time advances, water is becoming scarcer and having access to clean, safe, drinking water is limited among countries. Pure water supply and disinfected water treatment are prerequisites for the well-being of communities all over the world. One of the biggest concerns for our water-based resources in the future is the sustainability of the current and even future water resource allocation. This course will provide students a unique opportunity to study water management activities like planning, developing, distributing and optimum use of water resources. This course covers the topics that management of water treatment of drinking water, industrial water, sewage or wastewater, management of water resources, management of flood protection.

**Course Objectives:**

- To develop understanding of water resources.
- To study global water cycle and factors that affect this cycle.
- To analyze the process for water resources and management.
- To study the research and development areas necessary for efficient utilization and management of water resources.

**Course Outcomes:**

On completion of the course, learner will be able to—

- Understanding of the global water cycle and its various processes
- Understanding of climate change and their effects on water systems
- Understanding of Drinking treatment and quality of groundwater and surface water
- Understanding of the Physical, chemical, and biological processes involved in water treatment and distribution.

**Savitribai Phule Pune University**  
**Second Year of Computer Engineering (2015 Course)**  
**210258: Audit Course 2**  
**AC2-III : The Science of Happiness**

Everybody wants to be happy. One can explore innumerable ideas about what happiness is and how we can get some. But not many of those ideas are based on science. That's where this course comes in. The "Science of Happiness" aims to teach the pioneering science of positive psychology, which explores the ancestry of a happy and meaningful life. Clinical psychologists have been dealing with miserable feelings since their discipline was established. In the last 30 years, neuroscientists have made major headway in the understanding of the sources of anger, depression, and fear.

Today, whole industries profit from this knowledge—producing pills for every sort of pathological mood disturbance. But until recently, few neuroscientists focused on the subject of happiness. This course focuses on discovering how cutting-edge research can be applied to their lives. Students will learn about the Intra-disciplinary research supporting this view, spanning the fields of psychology, neuroscience, evolutionary biology, and beyond. The course offers students practical strategies for tapping into and nurturing their own happiness, including trying several research-backed activities that foster social and emotional well-being, and exploring how their own happiness changes along the way.

**Course Objectives:**

- To understand the feeling of happiness
- To study the sources of positive feelings
- To analyze the anatomy of the happiness system
- To study the effect of thoughts and emotions on the happiness system

**Course Outcomes:**

On completion of the course, learner will be able to—

- Ability to understand what happiness is and why it matters to you
- Ability to learn how to increase your own happiness
- Understanding of the power of social connections and the science of empathy
- Ability to understand what is mindfulness and its real world applications



**Bharati Vidyapeeth's  
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Department of Computer Engineering**

**Course Outcomes (BE Computer 2015 Pattern)**

**Semester VII**

**410241 High Performance Computing**

<b>CO1</b>	Describe different parallel architectures, inter-connect networks, programming models
<b>CO2</b>	Develop an efficient parallel algorithm to solve given problem
<b>CO3</b>	Analyze and measure performance of modern parallel computing systems
<b>CO4</b>	Build the logic to parallelize the programming task

**410242 Artificial Intelligence and Robotics**

<b>CO1</b>	Identify and apply suitable Intelligent agents for various AI applications
<b>CO2</b>	Design smart system using different informed search / uninformed search or heuristic approaches.
<b>CO3</b>	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.
<b>CO4</b>	Apply the suitable algorithms to solve AI problems

**410243 Data Analytics**

<b>CO1</b>	Write case studies in Business Analytic and Intelligence using mathematical models
<b>CO2</b>	Present a survey on applications for Business Analytic and Intelligence
<b>CO3</b>	Provide problem solutions for multi-core or distributed, concurrent/Parallel environments

**410244 Elective I**

**410244(A): Digital Signal Processing**

<b>CO1</b>	Understand the mathematical models and representations of DT Signals and Systems
<b>CO2</b>	Apply different transforms like Fourier and Z-Transform from applications point of view.
<b>CO3</b>	Understand the design and implementation of DT systems as DT filters with filter structures and different transforms.
<b>CO4</b>	Demonstrate the knowledge of signals and systems for design and analysis of systems
<b>CO5</b>	Apply knowledge and use the signal transforms for digital processing applications

**410244(B): Software Architecture and Design**

<b>CO1</b>	Express the analysis and design of an application
<b>CO2</b>	Specify functional semantics of an application
<b>CO3</b>	Evaluate software architectures
<b>CO4</b>	Select and use appropriate architectural styles and software design patterns

**410244(C): Pervasive and Ubiquitous Computing**

<b>CO1</b>	Design and implement primitive pervasive applications
<b>CO2</b>	Analyze and estimate the impact of pervasive computing on future computing applications and society
<b>CO3</b>	Develop skill sets to propose solutions for problems related to pervasive computing system
<b>CO4</b>	Design a preliminary system to meet desired needs within the constraints of a particular problem space

**410244(D): Data Mining and Warehousing**

<b>CO1</b>	Apply basic, intermediate and advanced techniques to mine the data
<b>CO2</b>	Analyze the output generated by the process of data mining

<b>CO3</b>	Explore the hidden patterns in the data
<b>CO4</b>	Optimize the mining process by choosing best data mining technique

**410245 Elective II**

**410245(A): Distributed Systems**

<b>CO1</b>	Able to learn and apply the concept of remote method invocation and Remote Procedure Calls
<b>CO2</b>	Able to analyze the mechanism of peer to peer systems and Distributed File Systems
<b>CO3</b>	Demonstrate an understanding of the challenges faced by current and future distributed systems

**410245(B): Software Testing and Quality Assurance**

<b>CO1</b>	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
<b>CO2</b>	Design and develop project test plan, design test cases, test data, and conduct test operations
<b>CO3</b>	Apply recent automation tool for various software testing for testing software
<b>CO4</b>	Apply different approaches of quality management, assurance, and quality standard to software
<b>CO5</b>	Apply and analyze effectiveness Software Quality Tools

**410245(C): Operations Research**

<b>CO1</b>	Identify the characteristics of different types of decision-making environments
<b>CO2</b>	Use appropriate decision making approaches and tools
<b>CO3</b>	Build various dynamic and adaptive models
<b>CO4</b>	Develop critical thinking and objective analysis of decision problems
<b>CO5</b>	Apply the OR techniques for efficacy

**410245(D): Mobile Communication**

<b>CO1</b>	Justify the Mobile Network performance parameters and design decisions.
<b>CO2</b>	Choose the modulation technique for setting up mobile network.
<b>CO3</b>	Formulate GSM/CDMA mobile network layout considering futuristic requirements which conforms to the technology.
<b>CO4</b>	Use the 3G/4G technology based network with bandwidth capacity planning.
<b>CO5</b>	Percept to the requirements of next generation mobile network and mobile applications

**410246 Laboratory Practice I**

The presented course is solely intended to enhance the competency by undertaking the laboratory
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**410247 Laboratory Practice II**

The presented course is solely intended to enhance the competency by undertaking the laboratory
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**410248 Project Work Stage I**

<b>CO1</b>	Solve real life problems by applying knowledge.
<b>CO2</b>	Analyze alternative approaches, apply and use most appropriate one for feasible solution.
<b>CO3</b>	Write precise reports and technical documents in a nutshell.
<b>CO4</b>	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, Interpersonal relationships, conflict management and leadership quality

**410249: Audit Course 5**

**AC5 – I: Entrepreneurship Development**

<b>CO1</b>	Understand the legalities in product development
<b>CO2</b>	Undertake the process of IPR, Trademarks, Copyright and patenting

CO3	Understand and apply functional plans
CO4	Manage Entrepreneurial Finance
CO5	Inculcate managerial skill as an entrepreneur
<b>AC5 – II: Botnet of Things</b>	
CO1	Implement security as a culture and show mistakes that make applications vulnerable to attacks.
CO2	Understand various attacks like DoS, buffer overflow, web specific, database specific, web - spoofing
CO3	Demonstrate skills needed to deal with common programming errors that lead to most security problems and to learn how to develop secure applications
<b>AC5 – III: 3D Printing</b>	
CO1	Apply models for 3D printing
CO2	Plan the resources for 3D printing
CO3	Apply principles in 3D printing in real world
<b>AC5 – IV: Industrial Safety and Environment Consciousness</b>	
CO1	Formulate the plan for Safety performance
CO2	Formulate the action plan for accidents and hazards
CO3	Follow the safety and security norms in the industry
CO4	Consider critically the environmental issues of Industrialization
<b>AC5 – V: Emotional Intelligence</b>	
CO1	Expand your knowledge of emotional patterns in yourself and others
CO2	Discover how you can manage your emotions, and positively influence yourself and others
CO3	Build more effective relationships with people at work and at home
CO4	Positively influence and motivate colleagues, team members, managers
CO5	Increase the leadership effectiveness by creating an atmosphere that engages others
<b>AC5 – VI : MOOC-Learn New Skill</b>	

## **Semester VIII**

<b>410250: Machine Learning</b>
CO1 Distinguish different learning based applications
CO2 Apply different preprocessing methods to prepare training data set for machine learning.
CO3 Design and implement supervised and unsupervised machine learning algorithm.
CO4 Implement different learning models
CO5 Learn Meta classifiers and deep learning concepts
<b>410251: Information and Cyber Security</b>
CO1 Gauge the security protections and limitations provided by today's technology.
CO2 Identify information security and cyber security threats.
CO3 Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
CO4 Build appropriate security solutions against cyber-attacks
<b>410252: Elective III</b>
<b>410252(A): Advanced Digital Signal Processing</b>
CO1 Understand and apply different transforms for the design of DT/Digital systems
CO2 Explore the knowledge of adaptive filtering and Multi-rate DSP
CO3 Design DT systems in the field/area of adaptive filtering, spectral estimation and multi-rate DSP
CO4 Explore use of DCT and WT in speech and image processing
CO5 Develop algorithms in the field of speech , image processing and other DSP applications

**410252(B): Compilers**

- CO1 Design and implement a lexical analyzer and a syntax analyzer
- CO2 Specify appropriate translations to generate intermediate code for the given programming language
- CO3 Compare and contrast different storage management schemes
- CO4 Identify sources for code optimization

**410252(C): Embedded and Real Time Operating Systems**

- CO1 Recognize and classify embedded and real-time systems
- CO2 Explain communication bus protocols used for embedded and real-time systems
- CO3 Classify and exemplify scheduling algorithms
- CO4 Apply software development process to a given RTOS application
- CO5 Design a given RTOS based application

**410252(D): Soft Computing and Optimization Algorithms**

- CO1 Apply soft computing methodologies, including artificial neural networks, fuzzy sets, fuzzy logic, fuzzy inference systems and genetic algorithms
- CO2 Design and development of certain scientific and commercial application using computational neural network models, fuzzy models, fuzzy clustering applications and genetic algorithms in specified

**410253 : Elective IV****410253(A): Software Defined Networks**

- CO1 Interpret the need of Software Defined Networking solutions.
- CO2 Analyze different methodologies for sustainable Software Defined Networking solutions.
- CO3 Select best practices for design, deploy and troubleshoot of next generation networks.
- CO4 Develop programmability of network elements.
- CO5 Demonstrate virtualization and SDN Controllers using OpenFlow protocol

**410253(B): Human Computer Interface**

- CO1 Evaluate the basics of human and computational abilities and limitations.
- CO2 Inculcate basic theory, tools and techniques in HCI.
- CO3 Apply the fundamental aspects of designing and evaluating interfaces.
- CO4 Apply appropriate HCI techniques to design systems that are usable by people

**410253(C): Cloud Computing**

- CO1 To install cloud computing environments.
- CO2 To develop any one type of cloud
- CO3 To explore future trends of cloud computing

**410253(D): Open Elective**

- CO1 To inculcate the out of box thinking and to feed the inquisitive minds of the learners .

**410254:Laboratory Practice III**

The presented course is solely intended to enhance the competency by undertaking the laboratory

**410255:Laboratory Practice IV**

The presented course is solely intended to enhance the competency by undertaking the laboratory

**410256:Project Work Stage II**

- CO1 Show evidence of independent investigation
- CO2 Critically analyze the results and their interpretation.
- CO3 Report and present the original results in an orderly way and placing the open questions in the right

**CO4** Link techniques and results from literature as well as actual research and future research lines with the  
**CO5** Appreciate practical implications and constraints of the specialist subject

**410257: Audit Course 6**

**AC6 – I: Business Intelligence**

**CO1** Apply the concepts of Business Intelligence in real world applications  
**CO2** Explore and use the data warehousing wherever necessary  
**CO3** Design and manage practical BI systems

**AC6 – II: Gamification**

**CO1** To write survey on the gamification paradigms.  
**CO2** To write programs to solve problems using gamification and open source tools.  
**CO3** To solve problems for multi-core or distributed, concurrent/Parallel environments

**AC6 – III: Quantum Computing**

**CO1** Design efficient quantum algorithms  
**CO2** Apply quantum algorithms for several basic promise problems  
**CO3** learn the hidden subgroup problems and their role in quantum computing

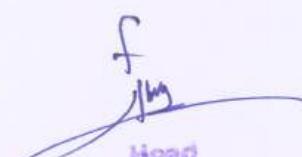
**AC6 – IV: Usability Engineering**

**CO1** Describe the human centered design process and usability engineering process and their roles in system design and development.  
**CO2** Discuss usability design guidelines, their foundations, assumptions, advantages, and weaknesses.  
**CO3** Design a user interface based on analysis of human needs and prepare a prototype system.  
**CO4** Assess user interfaces using different usability engineering techniques.  
**CO5** Present the design decisions

**AC6 – V: Conversational Interfaces**

**CO1** Develop an effective interface for conversation  
**CO2** Explore advanced concepts in user interface

**AC6 – VI MOOC-Learn New Skill**



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**Bharati Vidyapeeth's  
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Department of Computer Engineering**

**Course Outcomes (TE Computer2015 Pattern)**

**Semester V**

**310241: Theory of Computation**

- CO1** To design deterministic Turing machine for all inputs and all outputs.
- CO2** To subdivide problem space based on input subdivision using constraints.
- CO3** To apply linguistic theory.

**310242: Database Management Systems**

- CO1** Design E-R Model for given requirements and convert the same into database tables.
- CO2** Use database techniques such as SQL & PL/SQL.
- CO3** Use modern database techniques such as NOSQL.
- CO4** Explain transaction Management in relational
- CO5** Describe different database architecture and analyses the use of appropriate architecture in real time environment.
- CO6** Students will be able to use advanced database Programming concepts Big Data – HADOOP.

**310243: Software Engineering and Project Management**

- CO1** Decide on a process model for a developing a software project.
- CO2** Classify software applications and Identify unique features of various domains.
- CO3** Design test cases of a software system.
- CO4** Understand basics of IT Project management.
- CO5** Plan, schedule and execute a project considering the risk management.
- CO6** Apply quality attributes in software development life cycle.

**310244: Information Systems and Engineering Economics**

- CO1** Understand the need, usage and importance of an Information System to an organization.
- CO2** Understand the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information system in an organization.
- CO3** Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organizations.
- CO4** Outline the past history, present position and expected performance of a company engaged in engineering practice or in the computer industry.
- CO5** Perform and evaluate present worth, future worth and annual worth analyses on one or more economic alternatives.
- CO6** To carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

**310245: Computer Networks**

- CO1** Analyze the requirements for a given organizational structure to select the most appropriate

- CO2 Demonstrate design issues, flow control and error control.
- CO3 Analyze data flow between TCP/IP model using Application, Transport and Network Layer Protocols.
- CO4 Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
- CO5 Illustrate Client-Server architectures and prototypes by the means of correct standards and technology.
- CO6 Demonstrate different routing and switching algorithms.

#### **310246: Skill Development Lab**

- CO1 Evaluate problems and analyze data using current technologies in a wide variety of business and organizational contexts.
- CO2 Create data-driven web applications
- CO3 Incorporate best practices for building applications
- CO4 Employ Integrated Development Environment(IDE) for implementing and testing of software solution
- CO5 Construct software solutions by evaluating alternate architectural patterns

#### **310247: Database Management System Lab**

- CO1 Develop the ability to handle databases of varying complexities
- CO2 Use advanced database Programming concepts

#### **310248: Computer Networks Lab**

- CO1 Demonstrate LAN and WAN protocol behavior using Modern Tools.
- CO2 Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
- CO3 Demonstrate basic configuration of switches and routers.
- CO4 Develop Client-Server architectures and prototypes by the means of correct standards and technology.

#### **310249: Audit Course 3**

##### **AC3 – I: Cyber Security**

- CO1 Compare the interrelationships among security roles and responsibilities in a modern information-driven enterprise—to include interrelationships across security domains (IT, physical, classification, personnel, and so on)
- CO2 Assess the role of strategy and policy in determining the success of information security;
- CO3 Estimate the possible consequences of misaligning enterprise strategy, security policy, and security plans.

##### **AC3 – II: Professional Ethics and Etiquettes**

- CO1 understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
- CO2 Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
- CO3 Follow Ethics as an engineering professional and adopt good standards & norms of engineering practice.
- CO4 apply ethical principles to resolve situations that arise in their professional lives

**AC3 – III: Emotional Intelligence**

- CO1 Expand your knowledge of emotional patterns in yourself and others
- CO2 Discover how you can manage your emotions, and positively influence yourself and others
- CO3 Build more effective relationships with people at work and at home
- CO4 Positively influence and motivate colleagues, team members, managers
- CO5 Increase your leadership effectiveness by creating an atmosphere that engages others
- CO6 EI behaviors and supports high performance

**AC3 – IV: MOOC-learn New Skill**

- CO1 learner will acquire additional knowledge and skill.

**AC3 – V: Foreign Language(Japanese Module 3)**

- CO1 Have ability of basic communication.
- CO2 Have the knowledge of Japanese script.
- CO3 Get introduced to reading, writing and listening skills for language Japanese.
- CO4 Develop interest to pursue professional Japanese Language course

**Semester VI****310250: Design and Analysis of Algorithms**

- CO1 Formulate the problem.
- CO2 To perform analysis of Algorithms with Time and Space Complexity.
- CO3 Analyze the asymptotic performance of algorithms.
- CO4 Decide and apply algorithmic strategies to solve given problem.
- CO5 Find optimal solution by applying various methods.

**310251: Systems Programming and Operating System**

- CO1 Analyze and synthesize system software
- CO2 Use tools like LEX & YACC.
- CO3 Implement operating system functions.

**310252: Embedded Systems and Internet of Things**

- CO1 Implement an architectural design for IoT for specified requirement.
- CO2 To solve the given societal challenge using IoT.
- CO3 Choose between available technologies and devices for stated IoT challenge.

**310253: Software Modeling and Design**

- CO1 Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application.
- CO2 Design and analyze an application using UML modeling as fundamental tool.
- CO3 Apply design patterns to understand reusability in OO design.
- CO4 Decide and apply appropriate modern tool for designing and modeling.
- CO5 Decide and apply appropriate modern testing tool for testing web-based/desktop application.

**310254: Web Technology**

- CO1 To analyze given assignment to select sustainable web development design methodology.
- CO2 To develop web based application using suitable client side and server side web technologies.

**CO3** To develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management.

**310255: Seminar and Technical Communication**

**CO1** To be familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.

**CO2** To improve skills to read, understand, and interpret material on technology.

**CO3** Improve communication and writing skills.

**310256: Web Technology Lab**

**CO1** develop web based application using suitable client side and server side web technologies

**CO2** develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management

**310257: System Programming & Operating System Lab**

**CO1** Understand the internals of language translators

**CO2** Handle tools like LEX & YACC.

**CO3** Understand the Operating System internals and functionalities with implementation point of view

**310258: Embedded Systems & Internet of Things Lab**

**CO1** Design the minimum system for sensor based application

**CO2** Solve the problems related to the primitive needs using IoT

**CO3** Develop full fledged IoT application for distributed environment

**310259: Audit Course 4**

**AC4-I Digital and Social Media Marketing**

**CO1** Create editorial calendars to manage content distribution.

**CO2** Use Social Listening tools to create timely, relevant content.

**CO3** Create Social Media policies that combine business objectives with appropriate use of social media channels and content.

**AC4-II Green Computing**

**CO1** Understand the concept of green IT and relate it to sustainable development.

**CO2** Apply the green computing practices to save energy.

**CO3** Discuss how the choice of hardware and software can facilitate a more sustainable operation,

**CO4** Use methods and tools to measure energy consumption

**AC4-III Sustainable Energy Systems**

**CO1** To demonstrate an overview of the main sources of renewable energy.

**CO2** To understand benefits of renewable and sustainable energy systems.

**AC4-IV Leadership and Personality Development**

**CO1** Enhanced holistic development of students and improve their employability skills

**AC4 – V: Foreign Language(Japanese Module 4)**

**CO1** Have ability of basic communication.

**CO2** Have the knowledge of Japanese script.

**CO3** Get introduced to reading, writing and listening skills for language Japanese.

#### **CO4 Develop interest to pursue professional Japanese Language course**

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**Mechanical Engineering Department**  
**Course Outcomes Bachelor of Engineering (Mechanical) 2015 Pattern**

Sr. No.	Course Name	Course Outcome NO.	Course Outcomes
1	Engineering Mathematics I	CO1	To understand and solve the system of linear equations arising in all engineering fields using matrix methods and knowledge of Eigen values and Eigen vectors.
		CO2	To understand and solve algebraic and transcendental equations.
		CO3	To understand successive differentiation, sequence and series of the functions.
		CO4	To understand the concept of limits and expansion of functions.
		CO5	To understand and solve ordinary and partial differential equations.
		CO6	To understand the concept of Jacobians, Maxima-Minima and error- approximations.
2	Engineering Physics	CO1	To provide the basic concept to resolve many engineering and technological problems.
		CO2	After completing this course students will be able to appreciate and use the methodologies to analyze and design a wide range of engineering systems. Learn basics of lasers and optical fibers and their use in some applications.
		CO3	To use various technique for measurement ,calculation control and analysis of engineering problems based on the principles of optics, ultrasonic,acoustics,quantum physics ,superconductivity ,laser,physics of nano particles and semiconductor physics
		CO4	To understand the recent trends and advances in technology.this requies precise control over dynamics of macroscopic engineering systems.
		CO5	Basic science like physics also invoke manipulation of processes over micro and even nano scale levels as there is growing demand of solid understandings of principles of basic sciences.
		CO6	TO understands the recent trends and advances in technology.this requies precise control over dynamics of macroscopic engineering systems.
3	Engineering Graphics I	CO1	An ability to Imagine Physical Objects to be represented on paper in 2 and 3 dimensions for engineering communication
		CO2	An ability to draw physical objects manually and interpret engineering drawings
		CO3	An ability to realize the physical dimensions of the objects
		CO4	An ability to design and draw engineering curves
		CO5	An ability to prepare drawings for development of lateral surfaces of solids
		CO6	An ability to design and draw engineering curves
4	Basic Civil and Environmental Engineering	CO1	Able to explain basic areas in civil engineering.
		CO2	Able to explain types of materials used in construction and types of structure.
		CO3	Able to know use of maps and modern survey instruments.
		CO4	Able to explain ecology and ecosystem and Solid waste management.
		CO5	Able to understand the concept of principles of planning and building by-laws.
		CO6	Able to know conventional, non conventional energy sources and types of pollution.
5	Fundamentals of Programming Languages I	CO1	Apply fundamental knowledge to design algorithms and draw flow charts to solve the problems
		CO2	Apply basics of 'C' programming to solve simple applications
6	Engineering Mathematics II	CO1	To understand the concept of modeling of various physical systems such as Newton's law of cooling, Electrical circuits, rectilinear motion etc.
		CO2	To design and analyse the continuous and discrete system, where knowledge of Fourier Series and Harmonic analysis is required.
		CO3	To use advanced techniques to evaluate integrals.
		CO4	To measure the arc length of various curves.

		CO5	To use the concept of Sphere, cone and cylinder that arise in vector calculus, electro-magnetic field theory, cad-cam, computer graphics etc.
		CO6	To workout Area, Volume, RMS values and Center of Gravity using techniques of multiple integrals.
7	Engineering Chemistry	CO1	Technology involved in improving quality of water for its industrial use.
		CO2	Basic concepts of Electro analytical technique that facilitate rapid and reliable measurements.
		CO3	Chemical structure of polymer and its effect on their various properties when used as engineering materials . To lay foundation for the application of polymers for specific applications and as composite materials
		CO4	Study of fossil fuels and derived fuels with its properties and applications.
		CO5	An insight into nanomaterials and composite materials aspects of modern chemistry.
		CO6	The principles of chemical and electrochemical reactions causing corrosion and methods used for minimizing corrosion
8	Basic Mechanical Engineering	CO1	Ability to identify common machine elements with their functions & power transmission devices.
		CO2	Ability to understand steps in design process & mechanism.
		CO3	Ability to understand & knowledge of manufacturing processes of machine elements.
		CO4	Ability to understand the basic elements & working principle of machine tool.
		CO5	Ability to understand the thermodynamics system & properties, laws.
		CO6	Ability to understand & knowledge of energy conversion systems and power plants
9	Engineering Mechanics	CO1	Able to find the position of C.G. & centroid of various geometrical figures.
		CO2	Able to Analyse equation of motion and relative motion and dependant motion of a body
		CO3	Able to analyze rectilinear & curvilinear motions with constant & variable acceleration & its applications.
		CO4	Able to analyse structure by using work energy principle and able to identify the elastic or semiplastic or plastic body.
		CO5	Able to analyze the equilibrium body, draw FBD, classify & analyze the force system
		CO6	Able to analyse truss, frame, cables and friction of the body.
10	Basic Electrical Engineering	CO1	Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
		CO2	Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
		CO3	Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram
		CO4	Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
		CO5	Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply
		CO6	Evaluate work, power, energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.
11	Fundamentals of Programming	CO1	Develop programs using object oriented concepts
		CO2	Design and develop web pages
		CO3	Design and develop mobile application
		CO4	Design and develop simple application using Embedded Programming
12	Engineering Graph	CO1	Create and modify two-dimensional orthographic drawings and three-dimensional solid models using AutoCAD software, complete with construction lines, dimensions, and layers, conforming to industry standards
13	Computer Aided Design	CO1	Understand the importance of CAD in the light of allied technologies such as CAM, CAE, FEA, CFD, PLM
		CO2	Understand the significance of parametric technology and its application in 2D sketching
		CO3	Understand the significance of parametric feature-based modeling and its application in 3D machine components modeling.

	Machine Drawing	CO4	Ability to create 3D assemblies that represent static or dynamic Mechanical Systems
		CO5	Ability to ensure manufacturability and proper assembly of components and assemblies.
		CO6	Ability to communicate between Design and Manufacturing using 2D drawings.
14	Thermodynamics	CO1	Apply various laws of thermodynamics to various processes and real systems
		CO2	Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes
		CO3	Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.
		CO4	Estimate the condition of steam and performance of vapour power cycle and vapour compression cycle
		CO5	Estimate Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.
		CO6	Use Psychrometric charts and estimate various essential properties related to Psychrometry and processes
15	Strength of Materials	CO1	1 Apply knowledge of mathematics, science for engineering applications
		CO2	2 Design and conduct experiments, as well as to analyze and interpret data
		CO3	3 Design a component to meet desired needs within realistic constraints of health and safety
		CO4	4 Identify, formulate, and solve engineering problems
		CO5	5 Practice professional and ethical responsibility
		CO6	6 Use the techniques, skills, and modern engineering tools necessary for engineering practice
16	Fluid Mechanics	CO1	Use of various properties in solving the problems in fluid
		CO2	Use of Bernoulli's equation for solutions in fluids
		CO3	Determination of forces drag and lift on immersed bodies
17	Soft Skills	CO1	Improved communication, interaction and presentation of ideas.
		CO2	Right attitudinal and behavioural change
		CO3	Developed right-attitudinal and behavioral change
18	Theory of Machines – I	CO1	CO1 Identify mechanisms in real life applications.
		CO2	CO2 Perform kinematic analysis of simple mechanisms
		CO3	CO3 Perform static and dynamic force analysis of slider crank mechanism
		CO4	CO4 Determine moment of inertia of rigid bodies experimentally
		CO5	CO 5 Analyze velocity and acceleration of mechanisms by vector and graphical methods

19	Engineering Metallurgy	CO1	Describe how metals and alloys formed and how the properties change due to microstructure
		CO2	Apply core concepts in Engineering Metallurgy to solve engineering problems
		CO3	Conduct experiments, as well as to analyze and interpret data
		CO4	Select materials for design and construction.
		CO5	Possess the skills and techniques necessary for modern materials engineering practice
		CO6	Recognize how metals can be strengthened by alloying, cold-working, and heat treatment
20	Electrical and Electronics Engineering	CO1	APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
		CO2	DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
		CO3	UNDERSTAND the operation of DC motor, its speed control methods and braking
		CO4	DISTINGUISH between types of three phase induction motor and its characteristic features
		CO5	EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems
		CO6	CHOOSE energy storage devices and electrical drives for EVs
21	Machine Shop-I	CO1	Ability to perform manufacture gear on milling machine
		CO2	Ability to do surface grinding operations
		CO3	Perform sheet metal component.
		CO4	Ability to perform plastic moulding component
22	Heat Transfer	CO1	ANALYZE & APPLY the modes of heat transfer equations for one dimensional thermal system.
		CO2	DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction.
		CO3	EVALUATE the heat transfer rate in natural and forced convection & validate with experimentation results.
		CO4	INTERPRET heat transfer by radiation between objects with simple geometries, for black and grey surfaces.
		CO5	ABILITY to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.
		CO6	DESIGN & ANALYSIS of heat transfer equipments and investigation of its performance.
23	Turbo Machines	CO1	Apply thermodynamics and kinematics principles to turbo machines.
		CO2	Analyze the performance of turbo machines
		CO3	Ability to select turbo machine for given application.
		CO4	Predict performance of turbo machine using model analysis.
24	TOM-II	CO1	Student will be able to understand fundamentals of gear theory which will be the prerequisite for gear design.
		CO2	Student will be able to perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
		CO3	The student to analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design
		CO4	Student will be able to design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
		CO5	The student will synthesize a four bar mechanism with analytical and graphical methods.
		CO6	The student will analyze the gyroscopic couple or effect for stabilization of Ship
		CO6	

25	Design of Machine Elements - I	CO1	Ability to identify and understand failure modes for mechanical elements and design of machine elements based on strength
		CO2	Ability to design Shafts, Keys and Coupling for industrial applications
		CO3	Ability to design machine elements subjected to fluctuating loads
		CO4	Ability to design Power Screws for various applications
		CO5	Ability to design fasteners and welded joints subjected to different loading conditions
		CO6	Ability to design various Springs for strength and stiffness
26	Metrology and Quality control	CO1	1. Understand the methods of measurement, selection of measuring instruments / standards of measurement, carryout data collection and its analysis
		CO2	2. Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design
		CO3	3. Understand and use/apply Quality Control Techniques/ Statistical Tools appropriately.
		CO4	4. Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement.
27	Skill Development	CO1	Ability to develop the skill for required in shop floor.
		CO2	Ability to have knowledge of the different tools.
		CO3	Ability to tackles used in machine assembly shop.
		CO4	Ability to use of theoretical knowledge in practice.
		CO5	Ability to knowledge of gears types use in gear box.
		CO6	Compare different types of gears use in gear box.
28	Numerical Methods and Optimization*	CO1	1. Use appropriate Numerical Methods to solve complex mechanical engineering problems.
		CO2	2. Formulate algorithms and programming.
		CO3	Use Mathematical Solver.
		CO4	4. Generate Solutions for real life problem using optimization techniques.
29	Design of Machine Elements-II	CO1	To understand and apply principles of gear design to spur gears and industrial spur gear boxes.
		CO2	To become proficient in Design of Helical and Bevel Gear
		CO3	To develop capability to analyse Rolling contact bearing and its selection from manufacturer's Catalogue
		CO4	To learn a skill to design worm gear box for various industrial applications
		CO5	To inculcate an ability to design belt drives and selection of belt, rope and chain drives.
		CO6	To achieve an expertise in design of Sliding contact bearing in industrial applications.
30	Refrigeration and Air Conditioning	CO1	. Illustrate the fundamental principles and applications of refrigeration and air conditioning system
		CO2	Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems
		CO3	Present the properties, applications and environmental issues of different refrigerants.
		CO4	Calculate cooling load for air conditioning systems used for various applications
		CO5	Operate and analyse the refrigeration and air conditioning systems.
31	Mechatronics	CO1	1. Identification of key elements of mechatronics system and its representation in terms of block diagram
		CO2	2. Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O
		CO3	3. Interfacing of Sensors, Actuators using appropriate DAQ micro-controller

		CO4	4. Time and Frequency domain analysis of system model (for control application)
		CO5	5. PID control implementation on real time systems
		CO6	6. Development of PLC ladder programming and implementation of real life system.
32	Manufacturing - Process-II\$	CO1	Student should be able to apply the knowledge of various manufacturing processes.
		CO2	Student should be able to identify various process parameters and their effect on processes.
		CO3	Student should be able to figure out application of modern machining.
		CO4	Students should get the knowledge of Jigs and Fixtures for variety of operations.
33	Machine Shop-II	CO1	Ability to develop knowledge about the working and programming techniques for various machines and tools
34	Hydraulics and Pneumatics	CO1	Understand working principle of components used in hydraulic & pneumatic systems
		CO2	Identify various applications of hydraulic & pneumatic systems
		CO3	Selection of appropriate components required for hydraulic and pneumatic systems
		CO4	Analyse hydraulic and pneumatic systems for industrial/mobile applications
		CO5	Design a system according to the requirements
		CO6	Develop and apply knowledge to various applications
35	CAD CAM Automation	CO1	1.To apply homogeneous transformation matrix for geometrical transformations of 2D/3D CAD entities
		CO2	2.To model mathematically analytical and synthetic curves, surfaces
		CO3	3.To predict performance of simple mechanical components viz. beam, shafts, plates, trusses using FEA (Mathematical and Software treatment)
		CO4	4. To generate CNC program for appropriate manufacturing techniques viz. turning and milling
		CO5	5. To select and apply suitable Rapid Prototyping techniques for engineering applications
		CO6	6. To study role and components of different Automation strategies.
36	Dynamics of Machinery	CO1	Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
		CO2	Estimate natural frequency for single DOF undamped & damped free vibratory systems
		CO3	Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces..
		CO4	Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
		CO5	Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
		CO6	Explain noise, its measurement & noise reduction techniques for industry and day today life problems.
37	Elective-I (HVAC)	CO1	Determine the performance parameters of trans-critical & ejector refrigeration systems
		CO2	Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
		CO3	Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
		CO4	Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
		CO5	Estimate heat transmission through building walls using CLTD and decrement factor & time lag methods with energy-efficient and cost-effective measures for building envelope.
		CO6	Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.
		CO1	1.Understand the different techniques used to solve mechanical engineering problems.
		CO2	2. Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.

38	Elective-I FEA	CO3	3. Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
		CO4	4. Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
		CO5	5. Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.
		CO6	6. Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence), errors, and numerical (round-off) errors.
39	Elective-II(Automobile Engineering)	CO1	To compare and select the proper automotive system for the vehicle.
		CO2	To analyse the performance of the vehicle.
		CO3	To diagnose the faults of automobile vehicles.
		CO4	To apply the knowledge of EVs, HEVs and solar vehicles
40	Mechanical System Design	CO1	Understand the difference between component level design and system level design.
		CO2	Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
		CO3	Learn optimum design principles and apply it to mechanical components.
		CO4	Handle system level projects from concept to product.
41	Industrial Engineering	CO1	Apply the Industrial Engineering concept
		CO2	Understand, analyze and implement different concepts involved in method study.
		CO3	Design and Develop different aspects of work system and facilities.
		CO4	Understand and Apply Industrial safety standards, financial management practices.
		CO5	Undertake project work based on modeling & simulation area.

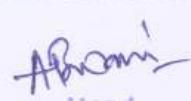


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**BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING LAVALE PUNE**  
**DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING**  
**SE COURSE OUTCOMES 2015 PATTERN**

SEMESTER I		
SUBJECT NAME	COURSE CODE	COURSE OUTCOMES
Signals & Systems	204181	<p>CO1: Understand mathematical description and representation of continuous and discrete time</p> <p>CO2: Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.</p> <p>CO3: Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.</p> <p>CO4: Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.</p> <p>CO5: Understand the basic concept of probability, random variables &amp; random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.</p>
Electronic Devices & Circuits	204182	<p>CO1. Comply and verify parameters after exciting devices by any stated method.</p> <p>CO2. Implement circuit and test the performance.</p> <p>CO3. Analyze small signal model of FET and MOSFET.</p> <p>CO4. Explain behavior of FET at low frequency.</p> <p>CO5. Design an adjustable voltage regulator circuits.</p>
Electrical Circuits and Machines	204183	<p>CO1. Analyze basic AC &amp; DC circuit for voltage, current and power by using KVL, KCL, and network theorems.</p> <p>CO2. Explain the working principle of different electrical machines.</p> <p>CO3. Select proper electrical motor for given application.</p> <p>CO4. Design and analyze transformers.</p>
Data Structure	204184	<p>CO1: Discuss the computational efficiency of the principal algorithms such as sorting &amp; searching.</p> <p>CO2: Write and understand the programs that use arrays &amp; pointers in C</p> <p>CO3: Describe how arrays, records, linked structures are represented in memory and use them in algorithms.</p> <p>CO4: Implement stacks &amp; queues for various applications.</p> <p>CO5: Understand various terminologies and traversals of trees and use them for various applications.</p> <p>CO6: Understand various terminologies and traversals of graphs and use them for various applications.</p>
Digital Electronics	204185	<p>CO1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.</p> <p>CO2. Design combinational and sequential circuits.</p> <p>CO3. Design and implement hardware circuit to test performance and application.</p> <p>CO4. Understand the architecture and use of microcontrollers for basic operations and Simulate using simulation software.</p>
Electronic Measuring Instruments & Tools	204186	<p>CO1. Understand fundamental of various electrical measurements.</p> <p>CO2. Understand and describe specifications, features and capabilities of electronic instruments.</p> <p>CO3. Finalize the specifications of instrument and select an appropriate instrument for given measurement.</p> <p>CO4. Carry out required measurement using various instruments under different setups.</p> <p>CO5. Able to compare measuring instruments for performance parameters</p> <p>CO6. Select appropriate instrument for the measurement of electrical parameter professionally.</p>

SEMESTER II		
Engineering Mathematics III	207005	<p>CO1. Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.</p> <p>CO2. Solve problems related to Fourier transform, Z-transform and applications to Communication systems and Signal processing.</p> <p>CO3. 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.</p> <p>CO4. Perform vector differentiation and integration, analyze the vector fields and apply to Electro-Magnetic fields.</p> <p>CO5. Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.</p>
Integrated Circuits	204187	<p>CO1. Understand the characteristics of IC and Op-Amp and identify the internal structure.</p> <p>CO2. Understand and identify various manufacturing techniques.</p> <p>CO3. Derive and determine various performances based parameters and their significance for Op-Amp.</p> <p>CO4. Comply and verify parameters after exciting IC by any stated method.</p> <p>CO5. Analyze and identify the closed loop stability considerations and I/O limitations.</p> <p>CO6. Analyze and identify linear and nonlinear applications of Op-Amp.</p> <p>CO7. Understand and verify results (levels of V &amp; I) with hardware implementation.</p> <p>CO8. Implement hardwired circuit to test performance and application for what it is being designed.</p> <p>CO9. Understand and apply the functionalities of PLL to Frequency synthesizer, multiplier, FM, and AM demodulators</p>
Control Systems	204188	<p>CO1. Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.</p> <p>CO2. Determine the (absolute) stability of a closed-loop control system.</p> <p>CO3. Perform time domain and frequency domain analysis of control systems required for stability analysis.</p> <p>CO4. Perform time domain and frequency domain correlation analysis.</p> <p>CO5. Apply root-locus, Frequency Plots technique to analyze control systems.</p> <p>CO6. Express and solve system equations in state variable form.</p>
Control System	204188	<p>CO1: To introduce the elements of control system and their modelling using various techniques.</p> <p>CO2: To introduce methods for analyzing the time response, the frequency response and the stability of system.</p> <p>CO3: To introduce the concept of root locus, Bode plots, Nyquist plots.</p> <p>CO4: To introduce the state variable analysis method.</p> <p>CO5: To introduce concept of PID controllers and digital control system</p> <p>CO6: To introduce concepts Programmable logic controller.</p>
Analog Communication	204189	<p>CO1. Understand and identify the fundamental concepts and various components of analog communication systems.</p> <p>CO2. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.</p> <p>CO3. Describe analog pulse modulation techniques and digital modulation technique.</p> <p>CO4. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.</p>
Object Oriented Programming	204190	<p>CO1. Describe the principles of object oriented programming.</p> <p>CO2. Apply the concepts of data encapsulation, inheritance in C++.</p> <p>CO3. Understand basic program constructs in Java</p> <p>CO4. Apply the concepts of classes, methods and inheritance to write programs in Java.</p> <p>CO5. Use arrays, vectors and strings concepts and interfaces to write programs in Java.</p> <p>CO6. Describe and use the concepts in Java to develop user friendly program.</p>
Employability Skill Development	204191	<p>CO1. Have skills and preparedness for aptitude tests.</p> <p>CO2. Be equipped with essential communication skills (writing, verbal and non-verbal)</p> <p>CO3. Master the presentation skill and be ready for facing interviews.</p> <p>CO4. Build team and lead it for problem solving.</p>

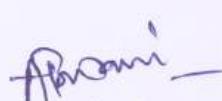
  
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**BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING LAVALE PUNE**  
**DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING**  
**TE COURSE OUTCOMES 2015 PATTERN**

**SEMESTER I**

<b>SUBJECT NAME</b>	<b>COURSE CODE</b>	<b>COURSE OUTCOMES</b>
Digital Communication	304181	<p>CO1.Understand working of waveform coding techniques and analyse their performance.</p> <p>CO2.Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.</p> <p>CO3.Perform the time and frequency domain analysis of the signals in a digital communication system.</p> <p>CO4. Design of digital communication system.</p> <p>CO5.Understand working of spread spectrum communication system and analyze its performance.</p>
Digital Signal Processing	304182	<p>CO1: Analyze the discrete time signals and system using different transform domain techniques.</p> <p>CO2: Design and implement LTI filters for filtering different real world signals.</p> <p>CO3: Develop different signal processing applications using DSP processor.</p>
Electromagnetics	304183	<p>CO1.Understand the basic mathematical concepts related to electromagnetic vector fields.</p> <p>CO2.Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.</p> <p>CO3. Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.</p> <p>CO4.Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.</p> <p>CO5. Apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation</p>
Microcontrollers	304184	<p>CO1: Learn importance of microcontroller in designing embedded application.</p> <p>CO2: Learn use of hardware and software tools.</p> <p>CO3: Develop interfacing to real world devices.</p>
Mechatronics	304185	<p>CO1:Identification of key elements of mechatronics system and its representation in terms of block diagram</p> <p>CO2: Understanding basic principal of Sensors and Transducer.</p> <p>CO3: Able to prepare case study of the system given.</p>
Electronics System Design	304193	<p>CO1. Apply the fundamental concepts and working principles of electronics devices to design electronics systems.</p> <p>CO2. Shall be able to interpret datasheets and thus select appropriate components and devices</p> <p>CO3. Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition system.</p> <p>CO4. Design an electronic system/sub-system and validate its performance by simulating the same.</p> <p>CO5. Shall be able to use an EDA tool for circuit schematic and simulation.</p> <p>CO6. Create, manage the database and query handling using suitable tools.</p>

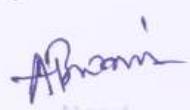
SEMESTER II		
Power Electronics	304186	CO1:Design & implement a triggering / gate drive circuit for a power device CO2:Understand, perform & analyze different controlled converters. CO3:Evaluate battery backup time & design a battery charger. CO4:Design & implement over voltage / over current protection circuit.
Information Theory, Coding and Communication Networks	304187	CO1: Perform information theoretic analysis of communication system. CO2: Design a data compression scheme using suitable source coding technique. CO3: Design a channel coding scheme for a communication system. CO4:Understand and apply fundamental principles of data communication and networking. CO5: Apply flow and error control techniques in communication networks.
Business Management	304188	CO1:Get overview of Management Science aspects useful in Business. CO2:To understand concept of quality management, Financial management and project management CO3:To learn Human Resource Management, Marketing Management are the major tasks in Business CO4: To promote Entrepreneurship CO5:Use marketing platform for various compaigning. CO6:Understand the importance of recent trends
Advanced Processors	304189	CO1. Describe the ARM microprocessor architectures and its feature. CO2. Interface the advanced peripherals to ARM based microcontroller CO3. Design embedded system with available resources. CO4. Use of DSP Processors and resources for signal processing applications.
System Programming and Operating Systems	304190	CO1. Demonstrate the knowledge of Systems Programming and Operating Systems CO2. Formulate the Problem and develop the solution for same. CO3. Compare and analyse the different implementation approach of system programming operating system abstractions. CO4. Interpret various OS functions used in Linux / Ubuntu
Employability Skills and Mini Project	304196	CO1. Understand, plan and execute a Mini Project with team. CO2. Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc. CO3. Prepare a technical report based on the Mini project. CO4. Deliver technical seminar based on the Mini Project work carried out.

  
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<b>SEMESTER I</b>		
<b>SUBJECT NAME</b>	<b>COURSE CODE</b>	<b>COURSE OUTCOMES</b>
VLSI Design & Technology	404181	<p>CO1: Write effective HDL coding for digital design.  CO2: Apply knowledge of real time issues in digital design.  CO3: Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.  CO4: Design CMOS circuits for specified applications.  CO5: Analyze various issues and constraints in design of an ASIC.  CO6: Apply knowledge of testability in design and build self test circuit.</p>
Computer Networks & Security	404182	<p>CO1. Understand fundamental underlying principles of computer networking  CO2. Describe and analyze the hardware, software, components of a network and their interrelations.  CO3. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies  CO4. Have a basic knowledge of installing and configuring networking applications.  CO5. Specify and identify deficiencies in existing protocols, and then go onto select new and better protocols.  CO6. Have a basic knowledge of the use of cryptography and network security.</p>
Radiation & Microwave Techniques	404183	<p>CO1. Differentiate various performance parameters of radiating elements.  CO2. Analyze various radiating elements and arrays.  CO3. Apply the knowledge of waveguide fundamentals in design of transmission lines.  CO4. Design and set up a system consisting of various passive microwave components.  CO5. Analyze tube based and solid state active devices along with their applications.  CO6. Measure various performance parameters of microwave components.</p>
Embedded Systems & RTOS	404184	<p>CO1. Understand design of embedded system  CO2. Use RTOS in embedded application  CO3. Use modern architecture for embedded system  CO4. Use Linux for embedded system development  CO5. Use open platform for embedded system development</p>
Electronics Product Design	404185	<p>CO1. Understand various stages of hardware, software and PCB design.  CO2. Importance of product test &amp; test specifications.  CO3. Special design considerations and importance of documentation.</p>

SEMESTER II		
Mobile Communication	404189	CO1. Apply the concepts of switching technique and traffic engineering to design multistage networks. CO2. Explore the architecture of GSM. CO3. Differentiate thoroughly the generations of mobile technologies.
Broadband Communication Systems	404190	CO1: Perform Link power budget and Rise Time Budget by proper selection of components and check its viability. CO2: Perform Satellite Link design for Up Link and Down Link.
Audio Video Engineering	404191	CO1. Apply the fundamentals of Analog Television and Colour Television standards. CO2. Explain the fundamentals of Digital Television, DTV standards and parameters. CO3. Study and understand various HDTV standards and Digital TV broadcasting systems and acquainted with different types of analog, digital TV and HDTV systems. CO4. Understand acoustic fundamentals and various acoustic systems.
Wireless Sensor Networks	404192	CO1. Explain various concepts and terminologies used in WSN CO2. Describe importance and use of radio communication and link management in WSN CO3. Explain various wireless standards and protocols associated with WSN CO4. Recognize importance of localization and routing techniques used in WSN CO5. Understand techniques of data aggregation and importance of security in WSN CO6. Examine the issues involved in design and deployment of WSN

  
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**BharatiVidyapeeth's college of Engineering Lavale**  
**Department of civil Engineering**

**Program Outcomes**

PO-1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and engg. Specialization to the solution of complex engineering problems.
PO-2	<b>Problem analysis:</b> Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
PO-3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO-4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	<b>Modern tool usage:</b> 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	<b>The engineer and society:</b> 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	<b>Environment and sustainability:</b> 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	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
PO-10	<b>Communication:</b> Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.
PO-11	<b>Project management and finance:</b> 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. Manage projects in multidisciplinary environments
PO-12	<b>Life-long learning:</b> 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.

## **Building Technology and Architectural Planning Lab**

### **Course Objectives:**

1. To enumerate different types of structure and their requirement
2. To describe all basic activities of construction.
3. To study different types of materials, byelaws and Architectural aspects used in construction for civil engineering projects.
4. To plan different building units, Town planning parameters and safety of buildings.

### **Course Outcomes:** On completion of the course, learner will be able to:

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

## **Engineering Mathematics III**

**Course Objectives:** To make the students familiarize with concepts and techniques in Ordinary & Partial differential equations, Numerical methods, Statistical methods, Probability theory and Vector calculus. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

**Course Outcomes:** At the end of this course, students will be able to

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.
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.
3. Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
4. Perform Vector differentiation & integration, analyze the vector fields and apply to fluid flow problems.
5. Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.

## Surveying

**Course Objectives:** With the successful completion of the course, the student should have the capability to:

1. Describe the function of surveying in civil engineering construction,
2. Identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision as it relates to distance, differential leveling, and angular measurements,
3. Identify and calculate the errors in measurements and to develop corrected values for differential level circuits, horizontal distances and angles for open or closed-loop traverses,
4. Effectively communicate with team members during field activities; identify appropriate safety procedures for personal protection; properly handle and use measurement instruments.
5. Be able to identify hazardous environments and take measures to insure one's personal and team safety
6. Perform traverse calculations; determine latitudes, departures, and coordinates of control points and balancing errors in a traverse. Use appropriate software for calculations and plotting.
7. Operate a total station to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system,
8. Work as a team member on a surveying party to achieve a common goal of accurate and timely project completion,
9. Calculate, design and establish curves, Understand, interpret, and prepare plan, profile, and cross-section drawings, Work with cross-sections and topographic maps to calculate areas, volumes, and earthwork quantities.

**Course Outcomes:** On successful completion of this course, Student will be able to:

1. Define and Explain basics of plane surveying and differentiate the instruments used for it.
2. Express proficiency in handling surveying equipment and analyze the surveying data from these equipment.
3. Describe different methods of surveying and find relative positions of points on the surface of earth.
4. Execute curve setting for civil engineering projects such as roads, railways etc.
5. Articulate advancements in surveying such as space based positioning systems
6. Differentiate map and aerial photographs, also interpret aerial photographs.

## Mechanics of Structures

**Course Objectives:**

1. To study various types of stresses for determinate structural members.
2. To learn concept of Shear Force and Bending Moment Diagram for determinate beams.
3. To learn the concept of slope and deflection for determinate structural members.

**Course Outcomes:** On completion of the course, learner will be able to:

1. Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.
2. Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
3. Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
4. Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.

5. Analyze axially loaded and eccentrically loaded column.
6. Determine the slopes and deflection of determinate beams and trusses.

## Geotechnical Engineering

### **Course Objectives:**

1. To describe soil properties, classification and its behavior under stress.
2. To learn methods for measurements and determination of index & engineering properties of soil.
1. To study the interaction between water and soil and the effects of static vs flowing water on soil strength.

### **Course Outcomes:** On completion of the course, learner will be able to,

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

## Fluid Mechanics-I

### **Course Objectives:**

1. To understand conceptually the properties of fluid, fluid statics, fluid kinematics and fluid dynamics, dimensional analysis, boundary layer theory, open channel flow and fluid flow around submerged objects.
2. Apply principles of continuity, mass, momentum and energy as applied to fluid at rest as well as for fluid flow in open channel.
3. To apply fundamental principles of fluid mechanics for the solution of practical Civil Engineering problems.

### **Course Outcomes:** At the end of the course, the learners will be able to

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.
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
3. Understand the concept of Dimensional analysis using Buckingham's  $\pi$  theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
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.
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.
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.

## Structural Analysis I

### **Course Objectives:**

1. This subject will build on the concepts from Engineering Mechanics and Mechanics of Structures.
2. This will create a foundation for analyzing real life structures by imparting knowledge about various methods involved in the analysis of indeterminate structures.

### **Course Outcomes:** On completion of the course, learner will be able to:

1. Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
2. Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
3. Implement application of the slope deflection method to beams and portal frames.
4. Analyze beams and portal frames using moment distribution method.
5. Determine response of beams and portal frames using structure approach of stiffness matrix method.
6. Apply the concepts of plastic analysis in the analysis of steel structures.

## Engineering Geology

### **Course Objectives:**

1. To get the knowledge of the physical properties of mineral and differentiate between the rocks types, their inherent characteristics with Civil Engineering applications.
2. To learn geomorphic features formed by fluvial, marine processes and their role, Indian stratigraphy and historical geology in civil engineering projects.
3. To comprehend Structural geology applied to civil engineering projects and to get idea about plate tectonics.
4. To acquire and apply knowledge of PGE essential for civil engineering projects.
5. To identify and to enable the Students to examine favorable & unfavorable conditions for the proposed construction of dams, reservoir and tunnels. Precautions and treatments required to improve the site conditions of dams, reservoir and tunnels.
6. To learn the role played by the effect of Ground water, Geological hazards and the requirement and utility of good building stone.

### **Course Outcomes:** After successful completion of course, students will be able to :

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.
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.
3. Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
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.
5. Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.

6. Explain geological hazards and importance of ground water and uses of common building stones.

## **Concrete Technology**

### **Course Objectives:**

1. To know properties of various ingredients of concrete and concept of mix design.
2. To learn the behavior and properties of concrete in fresh and hardened state.
3. To understand special concrete and their applications.
4. To understand the durability aspects and preventive measures to enhance the life of concrete.

### **Course Outcomes:**

1. Able to select the various ingredients of concrete and its suitable proportion to achieve desired strength.
2. Able to check the properties of concrete in fresh and hardened state.
3. Get acquainted to concreting equipment, techniques and different types of special concrete.
4. Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques

## **Project Management**

### **Course Objectives:** Students will be able to:

1. Describe the various concepts involved in Project Management.
2. Explain scientific methods of planning and management
3. Segregate the materials as per their annual usage and explain process to find production rate of construction equipment
4. Demonstrate methods of manpower planning and Use various project monitoring methods.
5. Discuss engineering economics and different laws associated with project management.
6. Differentiate the methods of project selection and recommend the best economical project.

### **Course Outcomes:** On completion of the course, student will:

1. Describe project life cycle and the domains of Project Management.
2. Explain networking methods and their applications in planning and management
3. Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
4. Demonstrate resource allocation techniques and apply it for manpower planning.
5. Understand economical terms and different laws associated with project management
6. Apply the methods of project selection and recommend the best economical project.

### **Soft Skill (Credit)**

#### **Course Objectives:**

1. To help the students in building interpersonal skills.
2. To develop skill to communicate clearly.
3. To enhance team building and time management skills.
4. To learn active listening and responding skills.

#### **Course Outcomes:** On completion of the course, learner will be able to:

1. Make use of techniques for self-awareness and self-development.
2. Apply the conceptual understanding of communication into everyday practice.
3. Understand the importance of teamwork and group discussions skills.
4. Develop time management and stress management.
5. Apply business etiquette skills effectively an engineer requires.

### **Awareness To Civil Engineering Practices (Credit)**

#### **Course Objectives:**

1. To provide basic overview of functioning of different Civil Engineering related industries / firms.
2. To create awareness about application of different drawings, contract documents in Civil Engineering.
3. To provide insight of code of ethics, duties and responsibilities, health and safety as a Civil Engineer.

#### **Course Outcomes:** On completion of the course, learner will be able to...

1. CO1: Describe functioning/working of different types of industries/sectors in Civil Engineering.
2. CO2: Describe drawings and documents required and used in different Civil Engineering works.
3. CO3: 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.
4. CO4: Understand different health and safety practices on the site

### **Road Safety Management (Audit)**

#### **Course Objectives:**

1. To provide basic overview on road safety & traffic management issues in view of the alarming increase in vehicular population of the country.
2. To explain the engineering & legislative measures for road safety.
3. To discuss measures for improving road safety education levels among the public.

#### **Course Outcomes:** On completion of the course, learners will be able to...

1. CO1: Summarize the existing road transport scenario of our country
2. CO2: Explain the method of road accident investigation
3. CO3: Describe the regulatory provisions needed for road safety
4. CO4: Identify the safety issues for a road and make use of IRC's road safety manual for conducting road safety audit.

## Project Based Learning (Audit)

### Course Objectives:

1. To engage students in constructive learning environment and develop self-learning abilities.
2. To develop critical thinking and solving civil engineering problems by exploring and proposing sustainable solutions.
3. To integrate knowledge and skills from civil and other engineering areas.
4. To develop professional skills and project management.

**Course Outcomes:** After completion of course the students will be able to

1. Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service.
2. Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project.
3. Create, work in team and applying the solution in practical way to specific problem.

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**Department of civil Engineering**

**Program outcomes**

PO-1	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and engg. Specialization to the solution of complex engineering problems.
PO-2	<b>Problem analysis:</b> Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
PO-3	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO-4	<b>Conduct investigations of complex problems:</b> Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	<b>Modern tool usage:</b> 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	<b>The engineer and society:</b> 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	<b>Environment and sustainability:</b> 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	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
PO-10	<b>Communication:</b> Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.
PO-11	<b>Project management and finance:</b> 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. Manage projects in multidisciplinary environments
PO-12	<b>Life-long learning:</b> 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.

## **Structural Analysis-II**

### **Objectives**

1. Students able to understand the determinate and indeterminate structure
2. The subject provides the various types of structure
3. The subject provides the various method to analysis of beams and frame
4. The course which provides the analysis of members in design field.
5. To select the type of sections.

### **Course Outcomes**

1. Able to identify types of structure.
2. Able to analyze the structure using different methods.
3. Able to identify the deflection of structure.
4. Able to identify whether structure is safe or not
5. Able to identify structural bearing capacity.

## **Advanced Survey**

### **Objectives**

1. To understand the triangulation adjustment.
2. To understand modern engineering tools such as CAD, FEM and GIS is used in geodetic surveying
3. To understand remote sensing and GIS applicable as per public health and safety also.
4. To know different corrections.

### **Course Outcomes**

1. Able to carry out field geodetic survey and apply triangulation adjustment with modern equipment's.
2. Able to do geodetic trigonometric leveling survey and apply corrections.
3. Able to perform hydrographic survey and get solution for problems related to it.
4. Able to study aerial photography and applications in civil engineering.
5. Learn Remote sensing and GIS and its application in civil engineering fields.

## **Structural Design-II**

### **Course Objectives**

1. Able to perform analysis and design of RCC members and connections.
2. Able to identify and interpret the appropriate relevant industry design codes.
3. To become familiar with professional issues in the design of RCC members.

### **Course Outcomes**

1. Various design philosophies
2. Design One way slab.
3. Design two way slab and staircase.
4. Design of singly and doubly flexural members
5. Shear, Bond, torsion.
6. Design of column.

## **Structural Design-I**

### **Course Objectives-**

1. Able to perform analysis and design of structural steel members and connections.
2. To gain an educational and comprehensive experience in the design of simple steel structures.
3. To become familiar with professional issues in the design of structural steel members.

### **Course Outcomes**

1. Different failure modes of steel in tension members.
2. Design of Axially loaded steel members.
3. Design of eccentrically loaded columns and column bases.
4. Design of laterally supported and unsupported beams.
5. Secondary and main beam design and welded plate girder.
6. Design of gantry girder and roof truss.

## **Environment Engineering-I**

### **Course Objectives:**

1. Student should be able to make technology choice to deal with water quality issues.
2. Students must be able to operate and maintain working treatment systems and do troubleshooting of the problems in these systems.
3. The student will be able to apply the knowledge gained from the subject in EIA studies for water component and water pollution control strategies.
4. To provide a sound understanding of design principles in water supply systems and treatment processes.
5. Students will be able to acquire sufficient knowledge on basic design of conventional and advanced water treatment processes.

### **Course Outcomes:**

1. Understand water quality concepts and their effect on treatment process selection.
2. Appreciate the importance and methods of operation and maintenance of water supply systems.
3. Communicate effectively in oral and written presentations to technical and non-technical audiences.
4. After successful completion of the course, the students should be capable of understanding the modern water treatment principles and philosophy.
5. Students should be able to cope with the basic design and operation of unit processes for conventional and advanced water treatment.
6. Graduate exhibit the knowledge to calculate the demand needs for water supply to households, industry and public services.

## **Fluid Mechanics II**

### **Course Objective:**

1. To find the solution of complex problems in Civil Engineering
2. To design system components or processes
3. To apply appropriate techniques, resources, and modern engineering tools such as CAD, FEM and GIS including prediction and modeling.
4. To manage Civil Engineering projects and in multidisciplinary environments.
5. To engage in independent and life-long learning in the broadest context of technological change.

### **Course Outcomes:**

Student will be able to understand:

1. Fluid Flow around Submerged Objects.
2. Depth-Energy Relationships in Open Channel Flow
3. Find energy dissipated in a hydraulic jump
4. Uniform flow in open channel.
5. Understand and apply knowledge of pumps.
6. Understand and apply knowledge of turbines.

## **Infrastructure Engineering and Construction Techniques**

### **Course Objectives:**

- 1) To study the various things comes under railway infrastructure.
- 2) To describe all methods of Dewatering.
- 3) To study different types Tunnel construction methods.
- 4) To enumerate different types of Earth moving equipment's.

### **Course Outcomes:**

On completion of the course, learner will be able to

1. Explain rail components, Cant, curves, crossing and Turnout.
2. Elucidate different dewatering Techniques.
3. Explain different types of tunnel construction methods and their suitability.
4. To understand the different types of Earth moving equipment's and their capacities as well as suitability.

## **Hydrology and Water Resources Engineering**

### **Objective**

1. Studying this course student will be able to identify and categories rainfall data and understand the concept of precipitation and mechanism of precipitation.
2. Student should have an understanding measurement of catchment area and measurement of rainfall data
3. Students should have an understanding irrigation engineering and design of irrigation structures
4. This course provides the detailed presentation and analysis of rainfall data and the concepts of ground water hydrology.

### **Outcomes**

1. Able to describe the hydrologic cycle and analyze the precipitation data
2. Able understand methods and concept of the stream gauging.
3. Able to interpret the methods of irrigation and assess the canal revenue
4. Outline the ground water hydrology.
5. Able to analyze the flood frequency and runoff hydrograph

## Foundation Engineering

### Objectives

1. To understand different type of soil properties.
2. To understand different types of tests.
3. To analyses the soil stability.
4. To analyze type of foundation suitable.
5. To identify different zone of strata

### Outcomes

1. Ability to understand the importance of soil investigation and determine various soilProperties.
2. Ability to calculate the allowable bearing capacity of Shallow foundations and soil conditions.
3. Ability to Understand the settlement behavior of different type of soil
4. Able to understand sheet piles and characterization of BC soil, remedial measures to be cultivated for foundations
5. Able to explain application of geo-synthetics and different earthquake aspects

## Project Management and Engineering Economics

### Course

#### Objective:

- 1) To study the project life cycle.
- 2) To study concept of economic tools needed for project management.

### Course

#### Outcomes:

The student will be able to understand;

1. Objective, functions and principles of Management.
2. Project planning and objectives.
3. Project monitoring and control, Resource allocations.
4. Introduction to project economics.
5. Objective of material management.
6. Project appraisal ,

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**Civil Engineering Course Outcomes for Academic Year 2021-22**

- Second Year Engineering (2019p)

Course structure Semester-I

S.no	Course Code	Course Name
1	201001	Building Technology and Architectural Planning
2	201002	Mechanics of structure
3	201003	Fluid Mechanics
4	207001	Engineering Mathematics III
5	207003	Engineering Geology
6	201007	Audit Course 1

Course structure Semester-II

S.no	Course Code	Course Name
1	201008	Geotechnical Engineering
2	201009	Survey
3	201010	Concrete Technology
4	201011	Structural Analysis
5	201012	Project management
6	201017	Project Based Learning

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**Civil Engineering Course Outcomes for Academic Year 2021-22**

- Third Year Engineering (2019p)

Course structure Semester-I

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	301001	Hydrology and Water Resources Engineering
2	301002	Water Supply Engineering
3	301003	Design of Steel Structures
4	301004	Engineering Economics and Financial Management
5	301005	Elective I- Construction Management
6	301006	Seminar
7	301011	Audit Course I

Course structure Semester-II

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	301012	Waste Water Engineering
2	301013	Design of RC Structures
3	301014	Remote Sensing and GIS
4	301015	Elective II- Architecture and Town Planning
5	301016	Internship
6	301021	Audit Course II

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**Civil Engineering Course Outcomes for Academic Year 2021-22**

- Final Year Engineering (2015p)

Course structure Semester-I

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	401 001	Environmental Engineering II
2	401002	Transportation Engineering
3	401 003	Structural Design and Drawing III
4	401 004	Elective I- Architecture and Town Planning
5	401 005	Elective II- TQM & MIS in Civil Engineering
6	401 006	Project (Phase-I)

Course structure Semester-II

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	401 007	Dams and Hydraulic Structures
2	401008	Quantity Surveying, Contracts and tenders
3	401 009	Elective III- Air Pollution and control
4	401 010	Elective IV- Construction Management
5	401 006	Project

## SE Semester-I

### 201001- Building Technology and Architectural Planning

#### Course Outcomes

On completion of the course, learner will be able to:

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

### 201002 -Mechanics of Structures

#### Course Outcomes

On completion of the course, learner will be able to:

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

### 201003 : Fluid Mechanics

#### Course Outcomes

At the end of the course, the learners will be able to

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.
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
3. Understand the concept of Dimensional analysis using Buckingham's  $\pi$  theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
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.
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.

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.

### 207001 Engineering Mathematics III

#### Course Outcomes

At the end of this course, students will be able to

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.
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.
3. Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
4. Perform Vector differentiation & integration, analyze the vector fields and apply to fluid flow problems.
5. Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.

### 207003 Engineering Geology

#### Course Outcomes

After successful completion of course, students will be able to :

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.
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.
3. Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
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.
5. Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
6. Explain geological hazards and importance of ground water and uses of common building stones.

### Audit Course I

#### **Course Outcomes**

On completion of the course, learners will be able to...

CO1:Summarize the existing road transport scenario of our country

CO2:Explain the method of road accident investigation

CO3:Describe the regulatory provisions needed for road safety

CO4:Identify the safety issues for a road and make use of IRC's road safety manual for conducting road safety audit.

## SE Semester-II

### 201008 Geotechnical Engineering

#### **Course Outcomes**

On completion of the course, learner will be able to,

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

### 201009 Surveying

#### **Course Outcomes**

On successful completion of this course, Student will be able to:

1. Define and Explain basics of plane surveying and differentiate the instruments used for it.
2. Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.
3. Describe different methods of surveying and find relative positions of points on the surface of earth.
4. Execute curve setting for civil engineering projects such as roads, railways etc.
5. Articulate advancements in surveying such as space based positioning systems
6. Differentiate map and aerial photographs, also interpret aerial photographs.

## 201010 Concrete Technology

### Course Outcomes

1. Able to select the various ingredients of concrete and its suitable proportion to achieve desired strength.
2. Able to check the properties of concrete in fresh and hardened state.
3. Get acquainted to concreting equipments, techniques and different types of special concrete.
4. Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.

## 201011: Structural Analysis

### Course Outcomes

On completion of the course, learner will be able to:

1. Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
2. Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
3. Implement application of the slope deflection method to beams and portal frames.
4. Analyze beams and portal frames using moment distribution method.
5. Determine response of beams and portal frames using structure approach of stiffness matrix method.
6. Apply the concepts of plastic analysis in the analysis of steel structures.

## 201012 Project Management

### Course Outcomes

On completion of the course, student will:

1. Describe project life cycle and the domains of Project Management.
2. Explain networking methods and their applications in planning and management
3. Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
4. Demonstrates resource allocation techniques and apply it for manpower planning.
5. Understand economical terms and different laws associated with project management
6. Apply the methods of project selection and recommend the best economical project.

## 201017 Project Based Learning

### Course Outcomes

After completion of course the students will be able to

1. Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service.
2. Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project.
3. Create, work in team and applying the solution in practical way to specific problem.

## TE- Semester-I

### 301001: Hydrology and Water Resource Engineering

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Understand government organizations, apply & analyze precipitation & its abstractions.
- 02 Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.
- 03 Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
- 04 Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics.
- 05 Understand water logging & water management, apply & analyze ground water hydrology
- 06 Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement

### 301002: Water Supply Engineering

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Define identify, describe reliability of water sources, estimate water requirement for various sectors
- 02 Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
- 03 Design various components of water treatment plant and distribution system.
- 04 Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants.
- 05 Design elevated service reservoir capacity and understand the rainwater harvesting.
- 06 Understand the requirement of water treatment plant for infrastructure and Government scheme

### 301003: Design of Steel Structures

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.
- 02 Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.
- 03 Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
- 04 Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.
- 05 Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.
- 06 Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections

### 301004: Engineering Economics and Financial Management

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Understand basics of construction economics.
- 02 Develop an understanding of financial management in civil engineering projects.
- 03 Prepare and analyze the contract account.
- 04 Decide on right source of fund for construction projects.
- 05 Understand working capital and its estimation for civil engineering projects.
- 06 Illustrate the importance of tax planning & understand role of financial regulatory bodies

### 301005 c: Elective I: Construction Management

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Understand the overview of construction sector.
- 02 Illustrate construction scheduling, work study and work measurement.
- 03 Acquaint various labor laws and financial aspects of construction projects.
- 04 Explain elements of risk management and value engineering.
- 05 State material and human resource management techniques in construction.
- 06 Understand basics of artificial intelligence techniques in civil engineering.

### 301006: Seminar

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Appraise the current civil engineering research / techniques / developments / interdisciplinary areas.
- 02 Review and organize literature survey utilizing technical resources, journals etc.
- 03 Evaluate and draw conclusions related to technical content studied.
- 04 Demonstrate the ability to perform critical writing by preparing a technical report.
- 05 Develop technical writing and presentation skills

### 301011 a: Audit Course I: Professional Ethics and Etiquettes

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Understand the basic perception of profession, professional ethics, various moral issues and uses of ethical theories
- 02 Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
- 03 Follow ethics as an engineering professional and adopt good standards and norms of engineering practice.
- 04 Apply ethical principles to resolve situations that arise in their professional lives

## TE Semester-II

### 301012: Waste Water Engineering

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
- 02 Design preliminary and primary unit operations in waste water treatment plant
- 03 Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
- 04 Understand and design suspended and attached growth wastewater treatment systems
- 05 Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
- 06 Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment.

### 301013: Design of Reinforced Concrete Structure

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete.
- 02 Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections.
- 03 Design & detailing of rectangular one way and two-way slab with different boundary conditions
- 04 Design & detailing of dog legged and open well staircase
- 05 Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
- 06 Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.

### 301014: Remote Sensing and Geographic Information System

#### Course Outcomes:

On successful completion of this course, the learner will be able to:

- 01 Articulate fundamentals and principles of RS techniques.
- 02 Demonstrate the knowledge of remote sensing and sensor characteristics.
- 03 Distinguish working of various space-based positioning systems.
- 04 Analyze the RS data and image processing to utilize in civil engineering
- 05 Explain fundamentals and applications of RS and GIS 06 Acquire skills of data processing and its applications using GIS

301015 e: Elective II: Architecture and Town Planning

**Course Outcomes:**

On successful completion of this course, the learner will be able to:

- 01 Apply the principles of architectural planning and landscaping for improving quality of life
- 02 Understand the confronting issues of the area and apply the acts.
- 03 Evaluate and defend the proposals.
- 04 Appraise the existing condition and to develop the area for betterment.

301016: Internship

**Course Outcomes:**

On successful completion of this course, the learner will be able to:

- 01 To develop professional competence through industry internship
- 02 To apply academic knowledge in a personal and professional environment
- 03 To build the professional network and expose students to future employees
- 04 Apply professional and societal ethics in their day to day life
- 05 To become a responsible professional having social, economic and administrative considerations
- 06 To make own career goals and personal aspirations

301021 a: Audit Course II: Leadership and Personality Development

**Course Outcomes:**

On successful completion of this course, the learner will be able to: 01 Enhanced holistic development of students and improve their employability skills

## BE Semester-I

### Environmental Engineering II

#### **CourseOutcomes:**

1. Select and design appropriate wastewater treatment unit processes.
2. Calculate design specifications for unit processes to treat wastewater of a particular quality to a particular standard.
3. Demonstrate proficiency in a range of standard wastewater laboratory analytical methods.
4. Interpret the relevance of these in relation to environmental regulations.
5. Learn how to characterize wastewater for physical, chemical and microbiological treatment of wastewater

### Transportation Engineering

#### **CourseOutcomes:**

1. Understand the role of road transportation and Classification, traffic flow models
2. Apply basic science Highway alignment ,Geometric design and traffic engineering
3. Understand basic properties of sub-grade and performance characteristics and design
4. Understand the characteristics and scientific planning of airports
5. Understand the classification of bridge and types of bridge
6. Design and study of component part of bridges

### Elective I- Architecture and Town Planning

#### **CourseOutcomes:**

1. Principles and elements of Architectural Composition
2. Urban renewal for quality of life and livability
3. Goals and Objectives of planning
4. Different types of planning in town.
5. Legislative mechanism for town planning.
6. Application of special tools in planning.

### Elective II- TQM & MIS in Civil Engineering

#### **CourseOutcomes:**

1. Understand what is Quality and interpretation. Quality as challenges.
2. Introduction of Management Information systems (MIS) Overview
3. Use of Mathematical tools in TQM prevent and rectify defects.
4. To Understand Difference between, quality control, quality assurance, total quality control and total quality management (TQM).
5. To Understand MIS structure based on management activity whether for Operational control, management control or strategic planning.
6. To Development of an MIS for a construction organization associated with building works, study and use of various modules of ERP software for construction.

Dams and Hydraulic Structures

1. History of dam, different terms of dam and classification of dam, Dam safety and instrumentation of dam.
2. Components and design of gravity dam, Concept and types of arch dam.
3. Spillway ,types of spillway & Importance of Hydropower structures
4. Introduction of earth dam and diversion head works.
5. Canal and canal structures.

Quantity Surveying, Contracts and tenders

### **CourseOutcomes:**

1. Students will be able to identify the meaning of important terms in estimating and importance of approximate estimate.
2. Students will be able to take out quantities of various items of works from drawings, make abstract of the same.
3. Students will be able to draft suitable specifications to meet expectations of client and prepare a rate analysis of various items of works.
4. Students will be able to choose suitable method of valuation of property and assess the value of a property.
5. Students will be able to execute works in PWD & prepare documents required for a tender
6. Students will be able to identify various facts of contract including its meaning, validity, the conditions of contract, measures to solve disputes law of contract etc.

### **Elective III- Air Pollution and control**

### CourseOutcomes:

1. Ability to distinguish between various methods of air pollution analysis.
2. To understand air pollution sampling and measurement.
3. Give recent statistics and control strategy of indoor air pollution
4. Theory and development of pollution control devices such as Cyclone, electrostatic particle precipitator, packed towers, gravitational separator, bag house, etc.
5. After attending the course the students shall have acquired knowledge and understanding to evaluate air quality management and analyze the causes and effects of air pollution.
6. Students would be able to understand the type and nature of air pollutants, the behavior of plumes and relevant meteorological determinants influencing the dispersion of air pollutants.

#### **Elective IV- Construction Management**

### **CourseOutcomes:**

1. Understand the roles and responsibilities of a project manager
2. Prepare schedule of activities in a construction project
3. Prepare tender and contract document for a construction project
4. Understand safety practices in construction industry
5. Identify the equipment used in construction
6. Understand use of software in construction industry

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## **Computer Engineering Course Outcomes for Academic Year 2021-22**

- Second Year Engineering (2019p)

Course structure Semester-I

<b>Sr. no</b>	<b>Course Code</b>	<b>Course Name</b>
1	210241	Discrete Mathematics
2	210242	Fundamentals of Data Structures
3	210243	Object Oriented Programming (OOP)
4	210244	Computer Graphics
5	210245	Digital Electronics and Logic Design
6	210246	Data Structures Laboratory
7	210247	OOP and Computer Graphics Laboratory
8	210248	Digital Electronics Laboratory
9	210249	Business Communication Skills
10	210250	Humanity and Social Science
11	210251	Audit Course 3

Course structure Semester-II

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	207003	Engineering Mathematics III
2	210252	Data Structures and Algorithms
3	210253	Software Engineering
4	210254	Microprocessor
5	210255	Principles of Programming Languages
6	210256	Data Structures and Algorithms Laboratory
7	210257	Microprocessor Laboratory
8	210258	Project Based Learning II
9	210259	Code of Conduct
10	210260	Audit Course 4

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**Computer Engineering Course Outcomes for Academic Year 2021-22**

- Third Year Engineering (2019p)

Course structure Semester-I

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	310241	Database Management Systems
2	310242	Theory of Computation
3	310243	Systems Programming and Operating System
4	310244	Computer Networks and Security
5	310245	Elective I
6	310246	Database Management Systems Laboratory
7	310247	Computer Networks and Security Laboratory
8	310248	Laboratory Practice I
9	310249	Seminar and Technical Communication
10	310250	Audit Course 5

Course structure Semester-II

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	310251	Data Science and Big Data Analytics
2	310252	Web Technology
3	310253	Artificial Intelligence
4	310254	Elective II
5	310255	Internship**
6	310256	Data Science and Big Data Analytics Laboratory
7	310257	Web Technology Laboratory
8	310258	Laboratory Practice II
9	310259	Audit Course 6

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**Computer Engineering Course Outcomes for Academic Year 2021-22**

- Final Year Engineering (2015p)

Course structure Semester-I

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	410241	High Performance Computing
2	410242	Artificial Intelligence and Robotics
3	410243	Data Analytics
4	410244	Elective I
5	410245	Elective II
6	410246	Laboratory Practice I
7	410247	Laboratory Practice II
8	410248	Project Work Stage I
9	410249	Audit Course 5

Course structure Semester-II

<b>S.no</b>	<b>Course Code</b>	<b>Course Name</b>
1	410250	Machine Learning
2	410251	Information and Cyber Security
3	410252	Elective III
4	410253	Elective IV
5	410254	Laboratory Practice III
6	410255	Laboratory Practice IV
7	410256	Project Work Stage II
8	410257	Audit Course 6



**Bharati Vidyapeeth's  
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Department of Computer Engineering**

**Course Outcomes SE Computer 2019 Pattern)**

**Semester III**

**210241: Discrete Mathematics**

**CO1:** **Formulate** problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.

**CO2:** **Apply** appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.

**CO3:** **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.

**210242: Fundamentals of Data Structures**

**CO1:** **Design** the algorithms to solve the programming problems, **identify** appropriate algorithmic strategy for specific application, and **analyze** the time and space complexity.

**CO2:** **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.

**CO3:** **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).

**CO6:** **Understand, Implement and apply** principles of data structures-stack and queue to solve computational problems.

**210243: Object Oriented Programming (OOP)**

**CO1:** Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.

**CO2:** Design object-oriented solutions for small systems involving multiple objects.

**CO3:** 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++).

**210244: Computer Graphics**

**CO1:** Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.

**CO2:** Apply mathematics to develop Computer programs for elementary graphic operations.

**CO3:** 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.

**210245: Digital Electronics and Logic Design**

**CO1:** Simplify Boolean Expressions using K

Map. **CO2:** Design and implement

combinational circuits. **CO3:** Design and

implement sequential circuits.

**CO4:** Develop simple real-world application using ASM and PLD.

**CO5:** Differentiate and Choose appropriate logic families IC packages as per the given design specifications.

**CO6:** Explain organization and architecture of computer system

**210246: Data Structures Laboratory**

**CO1:** Use algorithms on various linear data structure using sequential organization to solve real life problems.

**CO2:** Analyze problems to apply suitable searching and sorting algorithm to various applications.

**CO3:** 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.

**210247: OOP and Computer Graphics Laboratory**

**CO1:** Understand and apply the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.

**CO2:** Analyze the concept of file and apply it while storing and retrieving the data from secondary storages.

**CO3:** Analyze and apply computer graphics algorithms for line-circle drawing, scan conversion and filling with the help of object oriented programming concepts.

**CO4:** Understand the concept of windowing and clipping and apply various algorithms to fill and clip polygons.

**CO5:** Apply logic to implement, curves, fractals, animation and gaming programs.

**210248: Digital Electronics Laboratory**

**CO1:** Understand the working of digital electronic circuits.

**CO2:** Apply the knowledge to appropriate IC as per the design specifications.

**CO3:** Design and implement Sequential and Combinational digital circuits as per the specifications.

**210249: Business Communication Skills**

**CO1:** Express effectively through verbal/oral communication and improve listening skills

**CO2:** Write precise briefs or reports and technical documents.

**CO3:** Prepare for group discussion / meetings / interviews and presentations.

**CO4:** Explore goal/target setting, self-motivation and practicing creative thinking.

**CO5:** Operate effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership qualities.

**210250: Humanity and Social Science**

**CO1:** Aware of the various issues concerning humans and society.

**CO2:** Aware about their responsibilities towards society.

**CO3:** 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.

**CO5:** Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.

**210251: Audit Course 3****AC3-I: Green Construction and Design**

**CO1:** Understand the importance of environment friendly society.

**CO2:** Apply primary measures to reduce carbon emissions from their surroundings.

**CO3:** Learn role of IT solutions in design of green buildings.

**CO4:** Understand the use of software systems to complete statutory compliances involved in the design of a new home or office building through green construction.

**AC3-II: Social Awareness and Governance Program**

**CO1:** Understand social issues and responsibilities as member of society.

**CO2:** Apply social values and ethics in decision making at social or organizational level

**CO3:** Promote obstacles in national integration and role of youth for National Integration

**CO4:** Demonstrate basic features of Indian Constitution.

**AC3-III: Environmental Studies**

**CO1:** **Comprehend** the importance of ecosystem and biodiversity

**CO2:** **Correlate** the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and prevention

**CO3:** **Identify** different types of environmental pollution and control measures

**CO4:** **Correlate** the exploitation and utilization of conventional and non-conventional resources

**AC3-IV: Smart Cities**

**CO1:** **Understand** the dynamic behavior of the urban system by going beyond the physical appearance and by focusing on representations, properties and impact factors

**CO2:** **Explore** the city as the most complex human-made organism with a metabolism that can be modeled in terms of stocks and flows

**CO3:** **Knowledge** about data-informed approaches for the development of the future city, based on crowd sourcing and sensing

**CO4:** **Knowledge** about the latest research results in for the development and management of future cities

**CO5:** **Understand** how citizens can benefit from data-informed design to develop smart and responsive cities

**AC3-V: Foreign Language- Japanese (Module 1)**

**CO1:** Will have ability of basic communication.

**CO2:** Will have the knowledge of Japanese script.

**CO3:** Will get introduced to reading, writing and listening skills

**CO4:** Will develop interest to pursue professional Japanese Language course

## Semester IV

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### 207003: Engineering Mathematics III

**CO1:** Solve Linear differential equations, essential in modelling and design of computer-based systems.

**CO2:** Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.

**CO3:** Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.

**CO4:** Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.

**CO5:** Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.

### 210252: Data Structures and Algorithms

**CO1:** Identify and articulate the complexity goals and benefits of a good hashing scheme for real-world applications.

**CO2:** Apply non-linear data structures for solving problems of various domain.

**CO3:** Design and specify the operations of a nonlinear-based abstract data type and implement.

**CO4:** Analyze the algorithmic solutions for resource requirements and optimization

**CO5:** Use efficient indexing methods and multiway search techniques to store and maintain data.

**CO6:** Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage.

### 210253: Software Engineering

**CO1:** Analyze software requirements and formulate design solution for a software.

**CO2:** Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.

**CO3:** 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.

**CO5:** Identify and handle risk management and software configuration management.

**CO6:** Utilize knowledge of software testing approaches, approaches to verification and validation.

**210254: Microprocessor**

**CO1:** Exhibit skill of assembly language programming for the application. **CO2:** Classify Processor architectures.

**CO3:** Illustrate advanced features of 80386 Microprocessor.

**CO4:** Compare and contrast different processor modes.

**CO5:** Use interrupts mechanism in applications

**CO6:** Differentiate between Microprocessors and Microcontrollers.

**CO7:** Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based systems.

**210255: Principles of Programming Languages**

**CO1:** Make use of basic principles of programming languages.

**CO2:** Develop a program with Data representation and Computations.

**CO3:** Develop programs using Object Oriented Programming language : Java. for robust application development.

**CO4:** Develop application using inheritance, encapsulation, and polymorphism.

**CO5:** Demonstrate Multithreading

**CO6:** Develop a simple program using basic concepts of Functional and Logical programming paradigm.

**210256: Data Structures and Algorithms Laboratory**

**CO1:** Understand the ADT/libraries, hash tables and dictionary to design algorithms for a specific problem.

**CO2:** Choose most appropriate data structures and apply algorithms for graphical solutions of the problems.

**CO3:** Apply and analyze non linear 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.

**CO5:** Analyze the efficiency of most appropriate data structure for creating efficient solutions for engineering design situations.

**210257: Microprocessor Laboratory**

**CO1:** Understand and apply various addressing modes and instruction set to implement assembly language programs

**CO2:** Apply logic to implement code conversion

**CO3:** Analyze and apply logic to demonstrate processor mode of operation

**210258: Project Based Learning II**

- CO1:** Identify the real life problem from societal need point of view
- CO2:** Choose and compare alternative approaches to select most feasible one
- CO3:** Analyze and synthesize the identified problem from technological perspective
- CO4:** Design the reliable and scalable solution to meet challenges
- CO5:** Evaluate the solution based on the criteria specified
- CO6:** Inculcate long life learning attitude towards the societal problems

**210259: Code of Conduct**

- CO1:** **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.
- CO2:** **Aware** of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
- CO3:** **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.

**210260: Audit Course 4****AC4-I Water Management**

- CO1:** **Understand** the global water cycle and its various processes
- CO2:** **Understand** climate change and their effects on water systems
- CO3:** **Understand** Drinking treatment and quality of groundwater and surface water
- CO4:** **Understand** the Physical, chemical, and biological processes involved in water treatment and distribution.

**AC4-II Intellectual Property Rights and Patents**

- CO1:** **Understand** the fundamental legal principles related to confidential information, copyright, patents, designs, trademarks and unfair competition
- CO2:** **Identify, apply and assess** principles of law relating to each of these areas of intellectual property
- CO3:** **Apply** the appropriate ownership rules to intellectual property you have been involved

**AC4-III The Science of Happiness**

- CO1:** **Understand** what happiness is and why it matters to you
- CO2:** **Learn** how to increase your own happiness
- CO3:** **Understand** of the power of social connections and the science of empathy
- CO4:** **Understand** what is mindfulness and its real world applications

**AC4-IV Stress Relief: Yoga and Meditation**

- CO1:** **Understand** philosophy and religion as well as daily life issues will be challenged and enhanced.
- CO2:** **Enhances** the immune system.

**CO3:** Intellectual and philosophical understanding of the theory of yoga and basic related Hindu scriptures will be developed.

**CO4:** Powers of concentration, focus, and awareness will be heightened.

**AC4-V: Foreign Language ( Japanese) Module 2**

**CO1:** Have ability of basic communication.

**CO2:** Have the knowledge of Japanese script.

**CO3:** Get introduced to reading , writing and listening skills

**CO4:** Develop interest to pursue professional Japanese Language course



**Bharati Vidyapeeth's  
College of Engineering Lavale, Pune-  
412115**  
**Department of Computer  
Engineering**

**Course Outcomes (TE 2019 Pattern)**

**Semester V**

**310241: Database Management Systems**

- CO1: Analyze and design Database Management System using ER model.
- CO2: Implement database queries using database languages.
- CO3: Normalize the database design using normal forms.
- CO4: Apply Transaction Management concepts in real-time situations.
- CO5: Use NoSQL databases for processing unstructured data.
- CO6: Differentiate between Complex Data Types and analyze the use of appropriate data types.

**310242: Theory of Computation**

- CO1: Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants.
- CO2: Construct regular expression to present regular language and understand pumping lemma for RE.
- CO3: Design Context Free Grammars and learn to simplify the grammar.
- CO4: Construct Pushdown Automaton model for the Context Free Language.
- CO5: Devise Turing Machine for the different requirements outlined by theoretical computer science.
- CO6: Analyze different classes of problems, and study concepts of NP completeness.

**310243: Systems Programming and Operating System**

- CO1: Analyze and synthesize basic System Software and its functionality.
- CO2: Identify suitable data structures and Design & Implement various System Software .
- CO3: Compare different loading schemes and analyze the performance of linker and loader .
- CO4: Implement and Analyze the performance of process scheduling algorithms.
- CO5: Identify the mechanism to deal with deadlock and concurrency issues.
- CO6: Demonstrate memory organization and memory management policies.

**310244: Computer Networks and Security**

- CO1: Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies.
- CO2: Illustrate the working and functions of data link layer.
- CO3: Analyze the working of different routing protocols and mechanisms.
- CO4: Implement client-server applications using sockets.
- CO5: Illustrate role of application layer with its protocols, client-server architectures.
- CO6: Comprehend the basics of Network Security.

**310245A: Elective I- Internet of Things and Embedded Systems**

- CO1: Understand the fundamentals and need of Embedded Systems for the Internet of Things.
- CO2: Apply IoT enabling technologies for developing IoT systems.
- CO3: Apply design methodology for designing and implementing IoT applications.
- CO4: Analyze IoT protocols for making IoT devices communication.
- CO5: Design cloud based IoT systems.

CO6: Design and Develop secured IoT applications.

#### **310245B: Elective I- Human Computer Interface**

CO1: Design effective Human-Computer-Interfaces for all kinds of users.

CO2: Apply and analyze the user-interface with respect to golden rules of interface.

CO3: Analyze and evaluate the effectiveness of a user-interface design.

CO4: Implement the interactive designs for feasible data search and retrieval.

CO5: Analyze the scope of HCI in various paradigms like ubiquitous computing, virtual reality ,multi-media, Worldwide web related environments.

CO6: Analyze and identify user models, user support, and stakeholder requirements of HCI systems.

#### **310245C: Elective I- Distributed Systems**

CO1: Analyze Distributed Systems types and architectural styles. CO2: Implement communication mechanism in Distributed Systems.

CO3: Implement the synchronization algorithms in Distributed System applications.CO4: Develop the components of Distributed File System.

CO5: Apply replication techniques and consistency model in Distributed Systems.

CO6: Build fault tolerant Distributed Systems.

#### **310245D: Elective I- Software Project Management**

CO1: Comprehend Project Management Concepts.

CO2: Use various tools of Software Project

Management .CO3: Schedule various activities in software projects .

CO4: Track a project and manage changes.CO5: Apply Agile Project

Management.

CO6: Analyse staffing process for team building and decision making in Software Projects and Management.

#### **310246: Database Management Systems Laboratory**

CO1: Design E-R Model for given requirements and convert the same into database tables.CO2: Design schema in appropriate normal form considering actual requirements

CO3: Implement SQL queries for given requirements, using different SQL concepts .CO4: Implement PL/SQL Code block for given requirements.

CO5: Implement NoSQL queries using MongoDB.

CO6: Design and develop application considering actual requirements and using database concepts.

#### **310247: Computer Networks and Security Laboratory**

CO1: Analyze the requirements of network types, topology and transmission media.

CO2: Demonstrate error control, flow control techniques and protocols and analyze them.

CO3: Demonstrate the subnet formation with IP allocation mechanism and apply various routing algorithms.

CO4: Develop Client-Server architectures and prototypes.

CO5: Implement web applications and services using application layer protocols.

CO6: Use network security services and mechanisms.

#### **310248: Laboratory Practice I**

CO1: Implement language translators .

CO2: Use tools like LEX and YACC.

CO3: Implement internals and functionalities of Operating System.  
CO4: Design IoT and Embedded Systems based application.  
CO5: Develop smart applications using IoT.  
CO6: Develop IoT applications based on cloud environment.

OR

CO4: Implement the interactive designs for feasible data search and retrieval .  
CO5: Analyze the scope of HCI in various paradigms like ubiquitous computing, virtual Reality and ,multi-media,World wide web related environments.  
CO6: Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.

OR

CO4: Demonstrate knowledge of the core concepts and techniques in Distributed Systems.CO5: Apply the principles of state-of-the-Art Distributed Systems in real time applications. CO6: Design, build and test application programs on Distributed Systems.

OR

CO4: Apply Software Project Management tools .  
CO5: Implement software project planning and scheduling .  
CO6: Analyse staffing in software project.

### **310249: Seminar and Technical Communication**

CO1: Analyze a latest topic of professional interest  
.CO2: Enhance technical writing skills.  
CO3: Identify an engineering problem, analyze it and propose a work plan to solve it.  
CO4: Communicate with professional technical presentation skills.

### **310250: Audit Course 5**

#### **310250(A):Cyber Security**

CO 1: Understand and classify various cybercrimes.  
CO 2: Understand how criminals plan for the cybercrimes.CO 3: Apply tools and methods used in cybercrime.  
CO 4: Analyze the examples of few case studies of cybercrimes.

#### **310250(B):Professional Ethics and Etiquette**

CO1: Summarize the principles of proper courtesy as they are practiced in the workplace.CO2: Apply proper courtesy in different professional situations.  
CO3: Practice and apply appropriate etiquettes in the working environment and day to day life.  
CO4: Build proper practices personal and business communications of Ethics and Etiquettes.

#### **310250(C):Learn New Skills -Full Stack Developer**

CO1: Design and develop web application using frontend and backend technologies.CO2: Design and develop dynamic and scalable web applications.  
CO3: Develop server side scripts.  
CO4: Design and develop projects applying various database techniques.

#### **310250(D):Engineering Economics**

CO1: Understand economics, the cost money and management in engineering.CO2: Analyze business economics and engineering assets evaluation.  
CO3: Evaluate project cost and its elements for business.  
CO4: Develop financial statements and make business decisions.

**310250(E):Foreign Language (one of Japanese/ Spanish/ French/ German)**

CO1: Apply language to communicate confidently and clearly in the Japanese language.  
CO2: Understand and use Japanese script to read and write.  
CO3: Apply knowledge for next advance level reading, writing and listening skills.  
CO4: Develop interest to pursue further study, work and leisure.

**Semester VI****310251: Data Science and Big Data Analytics**

CO1: Analyze needs and challenges for Data Science Big Data Analytics.  
CO2: Apply statistics for Big Data Analytics.  
CO3: Apply the lifecycle of Big Data analytics to real world problems.  
CO4: Implement Big Data Analytics using Python programming.  
CO5: Implement data visualization using visualization tools in Python programming.  
CO6: Design and implement Big Databases using the Hadoop ecosystem.

**310252: Web Technology**

CO1: Implement and analyze behavior of web pages using HTML and CSS.  
CO2: Apply the client side technologies for web development.  
CO3: Analyze the concepts of Servlet and JSP.  
CO4: Analyze the Web services and frameworks.  
CO5: Apply the server side technologies for web development.  
CO6: Create the effective web applications for business functionalities using latest web development platforms

**310253: Artificial Intelligence**

CO1: Identify and apply suitable Intelligent agents for various AI applications.  
CO2: Build smart system using different informed search / uninformed search or heuristic approaches.  
CO3: Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.  
CO4: Apply the suitable algorithms to solve AI problems.  
CO5: Implement ideas underlying modern logical inference systems.  
CO6: Represent complex problems with expressive yet carefully constrained language of representation.

**310254A: Elective II- Information Security**

CO1: Model the cyber security threats and apply formal procedures to defend the attacks.  
CO2: Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography.  
CO3: Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms.  
CO4: Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios.  
CO5: Demonstrate the use of standards and cyber laws to enhance Information Security in the development process and infrastructure protection.

**310254B: Elective II- Augmented and Virtual Reality**

CO1: Understand the basics of Augmented and Virtual reality systems and list their applications.  
CO2: Describe interface to the Virtual World with the help of input and output devices .  
CO3: Explain representation and rendering system in the context of Virtual Reality .

CO4: Analyze manipulation, navigation and interaction of elements in the virtual world  
CO5: Summarize the basic concepts and hardware of Augmented Reality system.  
CO6: Create Mobile Augmented Reality using Augmented Reality techniques and software.

### **310254C: Elective II- Cloud Computing**

CO1: Understand the different Cloud Computing environment.  
CO2: Use appropriate data storage technique on Cloud, based on Cloud application.  
CO3: Analyze virtualization technology and install virtualization software.  
CO4: Develop and deploy applications on Cloud.  
CO5: Apply security in cloud applications.  
CO6: Use advance techniques in Cloud Computing.

### **310254D: Elective II- Software Modeling and Architectures**

CO1: Analyze the problem statement (SRS) and choose proper design technique for designing web-based/desktop application.  
CO2: Design and analyze an application using UML modeling as fundamental tool.  
CO3: Evaluate software architectures.  
CO4: Use appropriate architectural styles and software design patterns.  
CO5: Apply appropriate modern tool for designing and modeling.

### **310255: Internship**

CO1: To demonstrate professional competence through industry internship.  
CO2: To apply knowledge gained through internships to complete academic activities in a professional manner.  
CO3: To choose appropriate technology and tools to solve given problem.  
CO4: To demonstrate abilities of a responsible professional and use ethical practices in day to day life.  
CO5: Creating network and social circle, and developing relationships with industry people.  
CO6: To analyze various career opportunities and decide carrier goals.

### **310256: Data Science and Big Data Analytics Laboratory**

CO1: Apply principles of Data Science for the analysis of real time problems.  
CO2: Implement data representation using statistical methods.  
CO3: Implement and evaluate data analytics algorithms.  
CO4: Perform text preprocessing.  
CO5: Implement data visualization techniques.  
CO6: Use cutting edge tools and technologies to analyze Big Data.

### **310257: Web Technology Laboratory**

CO1: Understand the importance of website planning and website design issues.  
CO2: Apply the client side and server side technologies for web application development.  
CO3: Analyze the web technology languages, frameworks and services.  
CO4: Create three tier web based applications.

### **310258: Laboratory Practice II**

CO1: Design a system using different informed search / uninformed search or heuristic approaches.  
CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: Design and develop an interactive AI application.  
CO4: Use tools and techniques in the area of Information Security  
CO5: Use the cryptographic techniques for problem solving.  
CO6: Design and develop security solution.

OR

CO4: Use tools and techniques in the area of Augmented and Virtual Reality.  
CO5: Use the representing and rendering system for problem solving.  
CO6: Design and develop ARVR applications.

OR

CO4: Use tools and techniques in the area of Cloud Computing.  
CO5: Use cloud computing services for problem solving.  
CO6: Design and develop applications on cloud.

OR

CO4: Use tools and techniques in the area Software Modeling and Architectures.  
CO5: Use the knowledge of Software Modeling and Architectures for problem solving.  
CO6: Design and develop applications using UML as fundamental tool.

### **310259: Audit Course 6**

#### **310259(A):Digital and Social Media Marketing**

CO1: Understand the fundamentals and importance of digital marketing.  
CO2: Use the power of social media for business marketing.  
CO3: Analyze the effectiveness of digital marketing and social media over traditional process.

#### **310259(B):Sustainable Energy Systems**

CO1: Comprehend the importance of Sustainable Energy Systems.  
CO2: Correlate the human population growth and its trend to the natural resource degradation and develop the awareness about his/her role towards Sustainable Energy Systems protection.  
CO3: Identify different types of natural resource pollution and control measures.  
CO4: Correlate the exploitation and utilization of conventional and non-conventional resources.

#### **310259(C):Leadership and Personality Development**

CO1: Express effectively through communication and improve listening skills.  
CO2: Develop effective team leadership abilities.  
CO3: Explore self-motivation and practicing creative/new age thinking.  
CO4: Operate effectively in heterogeneous teams through the knowledge of team work, people skills and leadership qualities.

#### **310259(D):Foreign Language (one of Japanese/Spanish/French/German).**

CO1: Have the ability to communicate confidently and clearly in the Japanese language.  
CO2: Understand the nature of Japanese script.  
CO3: Get introduced to reading, writing and listening skills.  
CO4: Develop interest to pursue further study, work and leisure.

#### **310259(E):Learn New Skills - Software Development Using Agility Approach**

**Savitribai Phule Pune University**  
**Board of Studies - Automobile and Mechanical Engineering**  
**Undergraduate Program - Automobile Engineering & Mechanical Engineering (2019 pattern)**

**Savitribai Phule Pune University**  
**Board of Studies - Automobile and Mechanical Engineering**  
**Undergraduate Program - Mechanical Engineering (2019 pattern)**

Course Code	Course Name	Teaching Scheme (Hrs./week)			Examination Scheme and Marks					Credit															
		TH	PR	TUT	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT												
<b>Semester-V</b>																									
302041	Numerical & Statistical Methods	3	-	1	30	70	25	-	-	125	3	-	1	4											
302042	Heat & Mass Transfer	3	2	-	30	70	-	50	-	150	3	1	-	4											
302043	Design of Machine Elements	3	2	-	30	70	-	-	25	125	3	1	-	4											
302044	Mechatronics	3	2	-	30	70	-	-	25	125	3	1	-	4											
302045	Elective I	3	-	-	30	70	-	-	-	100	3	-	-	3											
302046	Digital Manufacturing Laboratory	-	2	-	-	-	50	-	-	50	-	1	-	1											
302047	Skill Development	-	2	-	-	-	25	-	-	25	-	1	-	1											
302048	Audit course - V <sup>\$</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-											
	<b>Total</b>	<b>15</b>	<b>10</b>	<b>1</b>	<b>150</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>700</b>	<b>15</b>	<b>5</b>	<b>1</b>	<b>21</b>											
<b>Semester-VI</b>																									
302049	Artificial Intelligence & Machine Learning	3	2	-	30	70	-	-	25	125	3	1	-	4											
302050	Computer Aided Engineering	3	2	-	30	70	-	50	-	150	3	1	-	4											
302051	Design of Transmission Systems	3	2	-	30	70	-	-	25	125	3	1	-	4											
302052	Elective II	3	-	-	30	70	-	-	-	100	3	-	-	3											
302053	Measurement Laboratory	-	2	-	-	-	50	-	-	50	-	1	-	1											
302054	Fluid Power & Control Laboratory	-	2	-	-	-	50	-	-	50	-	1	-	1											
302055	Internship/Mini project *	-	4	-	-	-	100	-	-	100	-	4	-	4											
302056	Audit course - VI <sup>\$</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-											
	<b>Total</b>	<b>12</b>	<b>14</b>	<b>-</b>	<b>120</b>	<b>280</b>	<b>200</b>	<b>50</b>	<b>50</b>	<b>700</b>	<b>12</b>	<b>9</b>	<b>-</b>	<b>21</b>											
<b>Elective-I</b>							<b>Elective-II</b>																		
302045-A	Advanced Forming & Joining Processes	<u>302052-A</u>			Composite Materials																				
302045-B	Machining Science & Technology	<u>302052-B</u>			Surface Engineering																				
<b>Abbreviations:</b> <b>TH:</b> Theory, <b>PR:</b> Practical, <b>TUT:</b> Tutorial, <b>ISE:</b> In-Semester Exam, <b>ESE:</b> End-Semester Exam, <b>TW:</b> Term Work, <b>OR:</b> Oral <b>Note:</b> Interested students of TE (Automobile Engineering and Mechanical Engineering) can opt for any one of the audit course from the list of audit courses prescribed by BOS (Automobile and Mechanical Engineering)																									
<b>Instructions:</b> <ul style="list-style-type: none"> <li>Practical/Tutorial must be conducted in FOUR batches per division only.</li> <li>Minimum number of Experiments/Assignments in PR/Tutorial shall be carried out as mentioned in the syllabi of respective courses.</li> <li>Assessment of tutorial work has to be carried out similar to term-work. The Grade cum marks for Tutorial and Term-work shall be awarded on the basis of continuous evaluation.</li> <li><sup>\$</sup>Audit course is mandatory but non-credit course. Examination has to be conducted at the end of Semesters for award of grade at institute level. Grade awarded for audit course shall not be calculated for grade point &amp; CGPA.</li> </ul>																									

# Savitribai Phule Pune University

## B. E. (Mechanical) (2015 Course) Semester – I

Code	Subject	Teaching Scheme Hrs / week			Examination Scheme					Total Marks	Credits	
		Lecture	Tut	Pract	In Sem	End Sem	TW	PR	OR		Theory	TW/ Pr/OR
402041	Hydraulics and Pneumatics	3	-	2	30	70	25	-	25	150	3	1
402042	CAD CAM Automation	3	-	2	30	70	25	50	-	175	3	1
402043	Dynamics of Machinery	4	-	2	30	70	25	-	25	150	4	1
402044	Elective-I	3	-	2	30	70	25	-	-	125	3	1
402045	Elective-II	3	-	-	30	70	-	-	-	100	3	-
402046	Project-I	-	-	4	-	-	25	-	25	50	-	2
Total		16	-	12	150	350	125	50	75	750	16	6
												22

## B. E. (Mechanical) (2015 Course) Semester – II

Code	Subject	Teaching Scheme Hrs / week			Examination Scheme					Total Marks	Credits	
		Lecture	Tut	Pract	In Sem	End Sem	TW	PR	OR		Theory	TW/ Pr/OR
402047	Energy Engineering	3	-	2	30	70	25	-	25	150	3	1
402048	Mechanical System Design	4	-	2	30 (1.5 Hrs)	70 (3 Hrs)	25	-	50	175	4	1
402049	Elective-III	3	-	2	30	70	25	-	-	125	3	1
402050	Elective-IV	3	-	-	30	70	-	-	-	100	3	-
402051	Project-II	-	-	12	-	-	100	-	100	200	-	6
Total		13	-	18	120	280	175	-	175	750	13	9
										22		

Elective – I			Elective – II				
Code	Subject	Code	Subject				
402044 A	Finite Element Analysis	402045 A	Automobile Engineering				
402044 B	Computational Fluid Dynamics	402045 B	Operation Research				
402044 C	Heating Ventilation and Air Conditioning	402045 C	Energy Audit and Management				
		402045 D	Open Elective**				

Elective – III			Elective – IV				
Code	Subject	Code	Subject				
402049 A	Tribology	402050 A	Advanced Manufacturing Processes				
402049 B	Industrial Engineering	402050 B	Solar & Wind Energy				
402049 C	Robotics	402050 C	Product Design and Development				
		402050 D	Open Elective**				

CourseOutcomes:

CO1.DEMONSTRATE fundamentals of artificial intelligence and machine learning.CO2.APPLY feature extraction and selection techniques.

CO3.APPLY machine learning algorithms for classification and regression problems.CO4.DEVISE AND DEVELOP a machine learning model using various steps.

CO5.EXPLAIN concepts of reinforced and deep learning.

CO6.SIMULATE machine learning model in mechanical engineering problems.

302050:ComputerAidedEngineering

CourseOutcomes:

CO1:DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations.

CO2:APPLY the various meshing techniques for better evaluation of approximate results.

CO3:APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.

CO4:ANALYZE and APPLY various numerical methods for different types of analysis.

CO5:EVALUATE and SOLVE non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method.

CO6:GENERATE the results in the form of contour plot by the USE of CAE tools.

302051:DesignofTransmissionSystems

CourseOutcomes:

CO1.APPLY the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T.

CO2.EXPLAIN and DESIGN Bevel & Worm gear considering design parameters as per design standards.

CO3.SELECT & DESIGN Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters.

CO4.DEFINE and DESIGN various types of Clutches, Brakes, used in automobile.CO5.APPLY various concept to DESIGN Machine Tool Gear box, for different applications

CO6.ELABORATE various modes of operation, degree of hybridization and allied terms as

sociated with hybrid electric vehicles.

## BE- Semester-I

### 402041: Hydraulics and Pneumatics

#### Course Outcomes:

- Understand working principle of components used in hydraulic & pneumatic systems
- Identify various applications of hydraulic & pneumatic systems
- Selection of appropriate components required for hydraulic and pneumatic systems
- Analyse hydraulic and pneumatic systems for industrial/mobile applications
- Design a system according to the requirements
- Develop and apply knowledge to various applications

#### 402042:CAD CAM and Automation

##### Course Outcomes:

- Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
- Use analytical and synthetic curves and surfaces in part modeling.
- Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
- Generate CNC program for Turning / Milling and generate tool path using CAM software.
- Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology.
- Understand the robot systems and their applications in manufacturing industries.

#### 402043:Dynamics of Machinery

##### Course Outcomes:

On completion of the course, students will be able to -

- Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
- Estimate natural frequency for single DOF undamped& damped free vibratory systems.
- Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
- Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
- Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
- Explain noise, its measurement & noise reduction techniques for industry and day today life problems.

#### 402044 A:Elective – I Finite Element Analysis

##### Course Outcomes:

On completion of the course, students will be able to -

- Understand the different techniques used to solve mechanical engineering problems.
- Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
- Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
- Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
- Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.

- Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.

**402044 C: Elective – I**  
**Heating, Ventilation, Air Conditioning and Refrigeration Engineering**

**Course Outcomes:**

- Determine the performance parameters of trans-critical & ejector refrigeration systems
- Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
- Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
- Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
- Estimate heat transmission through building walls using CLTD and decrement factor & time lag methods with energy-efficient and cost-effective measures for building envelope.
- Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.

**402045 A:Elective – II Automobile Engineering**

**Course Outcomes:**

- To compare and select the proper automotive system for the vehicle.
- To analyse the performance of the vehicle.
- To diagnose the faults of automobile vehicles.
- To apply the knowledge of EVs, HEVs and solar vehicles

**402046: Project – I**

**Course Outcomes:**

On completion of the course, students will be able to -

- Find out the gap between existing mechanical systems and develop new creative new mechanical system.
- Learn about the literature review
- Get the experience to handle various tools, tackles and machines.

## Semester-II

### 402047:Energy Engineering

#### Course Outcomes:

- Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle
- Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same
- Recognize the layout, component details of hydroelectric power plant and nuclear power plant
- Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle
- Emphasize the fundaments of non-conventional power plants
- Describe the different power plant electrical instruments and basic principles of economics of power generation.

### 402048:Mechanical System Design

#### Course Outcomes:

- Understand the difference between component level design and system level design.
- Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
- Learn optimum design principles and apply it to mechanical components.
- Handle system level projects from concept to product.

### 402049 B:Elective – III Industrial Engineering

#### Course Outcomes:

- Apply the Industrial Engineering concept
- Understand, analyze and implement different concepts involved in method study.
- Design and Develop different aspects of work system and facilities.
- Understand and Apply Industrial safety standards, financial management practices.
- Undertake project work based on modeling & simulation area.

### 402050 A:Elective – IV Advanced Manufacturing Processes

#### Course Outcomes:

- Classify and analyze special forming processes
- Analyze and identify applicability of advanced joining processes
- Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques
- Select appropriate micro and nano fabrication techniques for engineering applications
- Understand and apply various additive manufacturing technology for product development
- Understand material characterization techniques to analyze effects of chemical composition,

composition variation, crystal structure, etc.

402051 : Project – II

  
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**Mechanical Engineering Course Outcomes for Academic Year 2021-22**

- Second Year Engineering

Course structure Semester-I

S.no	Course Code	Course Name
1	202041	Solid Mechanics
2	202042	Solid Modeling and Drafting
3	202043	Engineering Thermodynamics
4	202044	Engineering Materials and Metallurgy
5	203156	Electrical and Electronics Engineering
6	202045	Geometric Dimensioning and Tolerancing Lab
7	202046	AuditCourse- III

Course structure Semester-II

S.no	Course Code	Course Name
1	207002	Engineering Mathematics-III
2	202047	Kinematics of Machinery
3	202048	Applied Thermodynamics
4	202049	Fluid Mechanics
5	202050	Manufacturing Processes
6	202051	Machine Shop
7	202052	Project Based Learning- II
8	202053	Audit Course-IV

  
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**Mechanical Engineering Course Outcomes for Academic Year 2021-22**

- Third Year Engineering

Course structure Semester-I

S.no	Course Code	Course Name
1	302041	Numerical & Statistical Methods
2	302042	Heat & Mass Transfer
3	302043	Design of Machine Elements
4	302044	Mechatronics
5	302045	Elective I
6	302046	Digital Manufacturing Laboratory
7	302047	Skill Development
8	302048	Audit course

Course structure Semester-II

S.no	Course Code	Course Name
1	302049	Artificial Intelligence & Machine Learning
2	302050	Computer Aided Engineering
3	302051	Design of Transmission Systems
4	302052	Elective II
5	302053	Measurement Laboratory
6	302054	Fluid Power & Control Laboratory
7	302055	Internship
8	302056	Audit course

  
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**Mechanical Engineering Course Outcomes for Academic Year 2021-22**

- Final Year Engineering

**Course structure Semester-I**

S.no	Course Code	Course Name	
1	402041	Hydraulics and Pneumatics	
2	402042	CADCAM Automation	
3	402043	Dynamics of Machinery	
4	402044 (A&B)	Elective-I	(A) Finite Element Analysis
			(B) Heating Ventilation and Air Conditioning
5	402045 (A&B)	Elective-II	(A) Automobile Engineering
			(B) Energy Audit and Management
6	402046	Project-I	

**Course structure Semester-II**

S.no	Course Code	Course Name	
1	402047	Energy Engineering	
2	402048	Mechanical System Design	
3	402049 (B)	Elective-III	Industrial Engineering
			Advanced Manufacturing Processes
			Product Design and Development
4	402050	Elective-IV	
5	402051	Project-II	

  
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**Mechanical Engineering Course Outcomes for Academic Year 2021-22**

**SE- Semester-I**

**202041-Solid Mechanics**

**CourseOutcomes**

- CO1. DEFINE various types of stresses and strain developed on determinate and indeterminate members.
- CO2. DRAW Shear force and bending moment diagram for various types of transverse loading and support.
- CO3. COMPUTE the slope & deflection, bending stresses and shear stresses on a beam.
- CO4. CALCULATE tensional shear stress in shaft and buckling on the column.
- CO5. APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
- CO6. UTILIZE the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.

**202042-Solid Modeling and Drafting**

**CourseOutcomes**

- CO1. UNDERSTAND basic concepts of CAD system, need and scope in Product Life cycle Management
- CO2. UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry
- CO3. CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system
- CO4. APPLY geometric transformations to simple 2D geometries
- CO5. USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.
- CO6. USE PMI & MBD approach for communication.

## 202043-Engineering Thermodynamics

### CourseOutcomes

- CO1. DESCRIBE the basics of thermodynamics with heat and work interactions.
- CO2. APPLY laws of thermodynamics to steady flow and non-flow processes.
- CO3. APPLY entropy, available and non-available energy for an Open and Closed System,
- CO4. DETERMINE the properties of steam and their effect on performance of vapour power cycle.
- CO5. ANALYSE the fuel combustion process and products of combustion.
- CO6. SELECT various instrumentations required for safe and efficient operation of steam generator.

## 202044-Engineering Materials and Metallurgy

### CourseOutcomes

- CO1. COMPARE crystal structures and ASSESS different lattice parameters.
- CO2. CORRELATE crystal structures and imperfections in crystals with mechanical behavior of materials.
- CO3. DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials.
- CO4. IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
- CO5. ANALYSE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy.
- CO6. SELECT appropriate materials for various applications.

## 203156-Electrical and Electronics Engineering

### CourseOutcomes

- CO1. APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
- CO2. DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
- CO3. UNDERSTAND the operation of DC motor, its speed control methods and braking
- CO4. DISTINGUISH between types of three phase induction motor and its characteristic features
- CO5. EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems
- CO6. CHOOSE energy storage devices and electrical drives for EVs

## 202045-Geometric Dimensioning and Tolerancing Lab

### Course Outcomes

- CO1. SELECT appropriate IS and ASME standards for drawing
- CO2. READ & ANALYSE variety of industrial drawings
- CO3. APPLY geometric and dimensional tolerance, surface finish symbols in drawing
- CO4. EVALUATE dimensional tolerance based on type of fit, etc.
- CO5. SELECT an appropriate manufacturing process using DFM, DFA, etc.



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**Mechanical Engineering Course Outcomes for Academic Year 2021-22**

**SE- Semester-II**

**207002-EngineeringMathematics-III**

**CourseOutcomes**

- CO1. SOLVE higher order linear differential equations and its applications to model and analyze mass spring systems.
- CO2. APPLY Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.
- CO3. APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control.
- CO4. PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems.
- CO5. SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations.

**202047-Kinematics of Machinery**

**CourseOutcomes**

- CO1. APPLY kinematic analysis to simple mechanisms
- CO2. ANALYZE Velocity and acceleration in mechanisms by vector and graphical method
- CO3. SYNTHESIZE a four bar mechanism with analytical and graphical methods
- CO4. APPLY fundamentals of gear theory as a prerequisite for gear design
- CO5. CONSTRUCT cam profile for given follower motion

## 202048-Applied Thermodynamics

### CourseOutcomes

- CO1. DETERMINE COP of refrigeration systems and ANALYZE psychometric processes. CO2. DISCUSS basic of engine terminology, air standard, fuel air and actual cycles.
- CO3. IDENTIFY factors affecting the combustion performance of SI and CI engines. CO4. DETERMINE performance parameters of ICE engines and emission control.
- CO5. EXPLAIN working of various ICE engines systems and use of alternative fuels.
- CO6. CALCULATE performance of single and multi stage reciprocating compressors and DISCUSS rotary positive displacement compressors

## 202049-Fluid Mechanics

### CourseOutcomes

- CO1. DETERMINE various properties of fluid
- CO2. APPLY the laws of fluid statics and concepts of buoyancy
- CO3. IDENTIFY types of fluid flow and terms associated in fluid kinematics
- CO4. APPLY principles of fluid dynamics to laminar flow
- CO5. ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface
- CO6. CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws

## 202050-Manufacturing Processes

### CourseOutcomes

- CO1. SELECT appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process
- CO2. UNDERSTAND mechanisms of metal forming techniques and CALCULATE load required for flat rolling
- CO3. DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations
- CO4. CLASSIFY and EXPLAIN different welding processes and EVALUATE welding characteristics
- CO5. DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques
- CO6. UNDERSTAND the principle of manufacturing of fibre-reinforced composites and metal matrix composites

## 202051-MachineShop

### CourseOutcomes

- CO1. PERFORM welding using TIG/MIG/Resistance/Gas welding technique
- CO2. MAKE Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
- CO3. PERFORM cylindrical/surface grinding operation and CALCULATE its machining time
- CO4. DETERMINE number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine
- CO5. PREPARE industry visit report
- CO6. UNDERSTAND procedure of plastic processing

## 202052-ProjectBasedLearning-II

### CourseOutcomes

- CO1. IDENTIFY the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
- CO2. ANALYZE the results and arrive at valid conclusions.
- CO3. PROPOSE a suitable solution based on the fundamentals of mechanical engineering by possibly integrating previously acquired knowledge.
- CO4. CONTRIBUTE to society through proposed solutions by strictly following professional ethics and safety measures.
- CO5. USE of technology in proposed work and demonstrate learning in oral and written form.
- CO6. DEVELOP ability to work as an individual and as a team member.

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**Mechanical Engineering Course Outcomes for Academic Year 2021-22**

**TE - Semester-I**

302041: Numerical and Statistical Methods

**CourseOutcomes:**

- CO1: SOLVE system of equations using direct and iterative numerical methods.
- CO2: ESTIMATE solutions for differential equations using numerical techniques.
- CO3: DEVELOP solution for engineering applications with numerical integration
- CO4: DESIGN and CREATE a model using a curve fitting and regression analysis.
- CO5: APPLY statistical Technique for quantitative data analysis.
- CO6: DEMONSTRATE the data, using the concepts of probability and linear algebra.

302042: Heat and Mass Transfer

CourseOutcomes:

- CO1.ANALYZE&APPLY the modes of heat transfer equations for one dimensional thermal system.
- CO2.DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction.
- CO3.EVALUATE the heat transfer rate in natural and forced convection & validate with experimentation results.
- CO4.INTERPRET the heat transfer by radiation between objects with simple geometries, for black and grey surfaces.
- CO5ABILITY to analyze the rate of mass transfer using Fick's Law of Diffusion and understand mass diffusion in different coordinate systems.
- CO6.DESIGN&ANALYSIS of heat transfer equipments and investigation of its performance.

302043:Design of Machine Elements

CourseOutcomes:

- CO1.DESIGN AND ANALYZE the cotter and knuckle joints, levers and components subjected to eccentric loading.
- CO2.DESIGN shafts, keys and couplings under static loading conditions.
- CO3.ANALYZE different stresses in power screws and APPLY those in the procedure to design screw jack.
- CO4.EVALUATE dimensions of machine components under fluctuating loads.
- CO5.EVALUATE & INTERPRET the stress developed on the different type of welded and threaded joints.
- CO6.APPLY the design and development procedure for different types of springs.

302044: Mechatronics

**CourseOutcomes:**

On completion of the course, learner will be able to

CO1.DEFINE key elements of mechatronics, principle of sensor and its characteristics.

CO2UTILIZE

concept of signal processing and MAKE use of interfacing systems such as ADC, DA  
C, Digital I/O.

CO3.DETERMINE the transfer function by using block diagram reduction technique.

CO4.EVALUATE Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.

CO5.APPLY the concept of different controller modes to an industrial application.

CO6.DEVELOP the ladder programming for industrial application.

302045-A: Advanced Forming & Joining Processes

**CourseOutcomes:**

On completion of the course, learner will be able to

CO1.ANALYSE the effect of friction in metal forming deep drawing and IDENTIFICATION of surface effects and their remedies in deep drawing operations

CO2.ASSESS the parameters for special forming operation and SELECT appropriate special forming operation for particular applications

CO3. ANALYSE the effect of HAZ on microstructure and mechanical properties of materials

CO4.CLASSIFY various solid state welding processes and SELECT suitable welding processes for particular applications

CO5.CLASSIFY various advanced welding processes and SELECT suitable welding processes for particular applications.

CO6.INTERPRET the principles of sustainable manufacturing and its role in manufacturing industry.

302045-B: Machining Science & Technology

**CourseOutcomes:**

CO1.DEFINE metal cutting principles and mechanics of metal cutting and tool life.

CO2.DESCRIBE features of gear and thread manufacturing processes.

CO3.SELECT appropriate grinding wheel and demonstrate the various surface finishing processes.

CO4.SELECT appropriate jigs/fixtures and to draw the process plan for a given component

CO5.SELECT & EVALUATE various parameters of process planning.

CO6.GENERATE CNC program for Turning/Milling processes and generate tool path using CAM software.

302046: Digital Manufacturing Laboratory

**Course Outcomes:**

CO1.DEVELOP a component using conventional machines, CNC machines and Additive

Manufacturing Techniques.

CO2.ANALYZE cutting tool parameters for machining given job.

CO3.DEMONSTRATE simulation of manufacturing process using Digital Manufacturing Tools.

CO4.SELECT and DESIGN jigs and Fixtures for a given component.

CO5.DEMONESTRATE different parameters for CNC retrofitting and reconditioning.

### 302047:SkillDevelopment

#### Course Objectives:

1. INTRODUCE the skills required in an industry such as design, development, assembly & disassembly.
2. DEVELOP the skills required for fault diagnosis of engine and transmission of different automotive and various home appliances.
3. ESTABLISH the skills required for maintenance of any machine tool.
4. CREATE awareness about industrial environment.



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College Of Engineering, Lavale Pune

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### **Mechanical Engineering Course Outcomes for Academic Year 2021-22**

#### **TE - Semester-II**

### 302049:Artificial Intelligence & Machine Learning

**S.E (Electronics / Electronics & Telecommunication Engineering)  
 (Course 2019)**

**Semester-III**

**207005**

**Engineering Mathematics III**

**Course Outcomes: On completion of the course, learner will be able to –**

- CO1: Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of electrical circuits and control systems.
- CO2: Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems, signal & image processing and communication systems.
- CO3: 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.
- CO4: Perform vector differentiation & integration, analyze the vector fields and apply to electro-magnetic fields & wave theory.
- CO5: Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital filters, signal and image processing.

**204181**

**Electronic Circuits**

**Course Outcomes: On completion of the course, learner will be able to –**

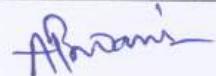
- CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.
- CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.
- CO3: Analyze and assess the performance of linear and switching regulators, with their variants, towards applications in regulated power supplies.
- CO4: Explain internal schematic of Op-Amp and define its performance parameters.
- CO5: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.
- CO6: Understand and compare the principles of various data conversion techniques and PLL with their applications.

**204182**

**Digital Circuits**

**Course Outcomes: On completion of the course, learner will be able to –**

- CO1: Identify and prevent various hazards and timing problems in a digital design.
- CO2: Use the basic logic gates and various reduction techniques of digital logic circuit.



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CO3: Analyze, design and implement combinational logic circuits.  
CO4: Analyze, design and implement sequential circuits.  
CO5: Differentiate between Mealy and Moore machines.  
CO6: Analyze digital system design using PLD.

**204183**

**Electrical Circuits**

**Course Outcomes: On completion of the course, learner will be able to -**

CO1: Analyze the simple DC and AC circuit with circuit simplification techniques.  
CO2: Formulate and analyze driven and source free RL and RC circuits.  
CO3: Formulate & determine network parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.  
CO4: Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.  
CO5: Explain construction, working and applications of special purpose motors & understand motors used in electrical vehicles.  
CO6: Analyze and select a suitable motor for different applications.

**204184**

**Data Structures**

**Course Outcomes: On completion of the course, learner will be able to -**

CO1: Solve mathematical problems using C programming language.  
CO2: Implement sorting and searching algorithms and calculate their complexity.  
CO3: Develop applications of stack and queue using array.  
CO4: Demonstrate applicability of Linked List.  
CO5: Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.  
CO6: Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.

**Semester-IV**

**204191**

**Signals & Systems**

**Course Outcomes: On completion of the course, learner will be able to -**

CO1: Identify, classify basic signals and perform operations on signals.  
CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between two signals.  
CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.

CO4: Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.  
CO5: Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.  
CO6: Compute the mean, mean square, variance and standard deviation for given random variables using PDF.

## 204192

## Control Systems

**Course Outcomes: On completion of the course, learner will be able to -**

CO1: Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.  
CO2: Determine the (absolute) stability of a closed-loop control system.  
CO3: Perform time domain analysis of control systems required for stability analysis.  
CO4: Perform frequency domain analysis of control systems required for stability analysis.  
CO5: Apply root-locus, Frequency Plots technique to analyze control systems.  
CO6: Express and solve system equations in state variable form.  
CO7: Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.

## 204193

## Principles of Communication Systems

**Course Outcomes: On completion of the course, learner will be able to -**

CO1: To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study.  
CO2: Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.  
CO3: Explain generation and detection of FM systems and compare with AM systems.  
CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM).  
CO5: Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).  
CO6: Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

## 204194

## Object Oriented Programming

**Course Outcomes: On completion of the course, learner will be able to -**

CO1: Describe the principles of object oriented programming.  
CO2: Apply the concepts of data encapsulation, inheritance in C++.  
CO3: Understand Operator overloading and friend functions in C++.

<b>304181</b>	<b>Digital Communication</b>
<b>Course Outcomes: On completion of the course, learner will be able to -</b>	
CO1: Apply the statistical theory for describing various signals in a communication system.	
<b>304182</b>	<b>Electromagnetic Field Theory</b>
<b>Course Outcomes: On completion of the course, learner will be able to -</b>	
CO1: Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.	
CO2: Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.	
CO3: 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.	
CO4: Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.	
CO5: 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, Vmax/ Vmin, length of transmission line using Smith Chart.	
CO6: Carry out a detailed study, interpret the relevance and applications of Electromagnetics.	
<b>304183</b>	<b>Database Management</b>
<b>Course Outcomes: On completion of the course, learner will be able to -</b>	
CO1: Ability to implement the underlying concepts of a database system.	
CO2: Design and implement a database schema for a given problem-domain using data model.	
CO3: Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.	
CO4: Implement transactions, concurrency control, and be able to do Database recovery.	
CO5: Able to understand various Parallel Database Architectures and its applications.	
CO6: Able to understand various Distributed Databases and its applications.	
<b>304184</b>	<b>Microcontroller</b>

<b>Course Outcomes: On completion of the course, learner will be able to -</b>	
CO1: Understand the fundamentals of microcontroller and programming.	
CO2: Interface various electronic components with microcontrollers.	
CO3: Analyze the features of PIC 18F XXXX.	
CO4: Describe the programming details in peripheral support.	
CO5: Develop interfacing models according to applications.	
CO6: Evaluate the serial communication details and interfaces.	
<b>304185 (A)</b>	<b>Digital Signal Processing (Elective -I)</b>
<b>Course Outcomes: On completion of the course, student will be able to -</b>	
CO1: Interpret and process discrete/ digital signals and represent DSP system.	
CO2: Analyze the digital systems using the Z-transform techniques.	
CO3: Implement efficient transform and its application to analyze DT signals.	
CO4: Design and implement IIR filters.	
CO5: Design and implement FIR filters.	
CO6: Apply DSP techniques for speech/ biomedical/ image signal processing.	
<b>304190</b>	<b>Skill Development</b>
<b>Course Outcome: After Successfully completing the course,</b>	
CO1: Student should recognize the need to engage in independent and life-long learning in required skill sets.	
CO2: Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems.	
CO3: Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.	
CO4: Student would be able to communicate effectively at different technical and administrative levels.	
CO5: Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.	
<b>Semester-VI</b>	
<b>304192</b>	<b>Cellular Networks</b>
<b>Course Outcomes: On completion of the course, learner will be able to -</b>	
CO1: Understand fundamentals of wireless communications.	

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CO2: Discuss and study OFDM and MIMO concepts.  
CO3: Elaborate fundamentals mobile communication.  
CO4: Describes aspects of wireless system planning.  
CO5: Understand of modern and futuristic wireless networks architecture.  
CO6: Summarize different issues in performance analysis.

**304193**

**Project Management**

**Course Outcomes: On completion of the course, learner will be able to -**

CO1: Apply the fundamental knowledge of project management for effectively handling the projects.  
CO2: Identify and select the appropriate project based on feasibility study and undertake its effective planning.  
CO3: Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.  
CO4: Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline.  
CO5: Identify and assess the project risks and manage finances in line with Project Financial Management Process.  
CO6: Develop new products assessing their commercial viability and develop skill sets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.

**304194**

**Power Devices & Circuits**

**Course Outcomes: On completion of the course, learner will be able -**

CO1: 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.  
CO2: To design triggering / driver circuits for various power devices.  
CO3: To evaluate and analyze various performance parameters of the different converters and its topologies.  
CO4: To understand significance and design of various protections circuits for power devices.  
CO5: To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery.  
CO6: To understand case studies of power electronics in application like electric vehicles, solar systems etc.

**304195 (D)**

**Embedded Processors(Elective -II)**

**Course Outcomes: On completion of the course, learner will be able to -**

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CO1: Understand basics of Embedded C Programming and usage of Embedded C and study different software tools for programming microcontrollers.

CO2: Get acquainted with various Embedded Processor architectures related to industrial application.

CO3: Know about the programming of ARM 7 based microcontroller with on chip peripherals and external peripherals.

CO4: Understand the architectures of ARM Cortex M4 Microcontrollers and its advantages over ARM 7 Microcontrollers.

CO5: Implement the real world programming of ARM 7 based microcontroller with on chip peripherals and external peripherals.

CO6: Recognize the interfacing of real world sensors and standard buses. Will also able to design different case studies.

**304199**

**Internship**

**Course Outcomes: On completion of the internship, learner will be able to –**

CO1: To develop professional competence through internship.

CO2: To apply academic knowledge in a personal and professional environment.

CO3: To build the professional network and expose students to future employees.

CO4: Apply professional and societal ethics in their day to day life.

CO5: To become a responsible professional having social, economic and administrative considerations.

CO6: To make own career goals and personal aspirations.

**304200**

**Mini Project**

**Course Outcome: On completion of the course, student will be able to -**

CO1: Understand, plan and execute a Mini Project with team.

CO2: Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.

CO3: Prepare a technical report based on the Mini project.

CO 4: Deliver technical seminar based on the Mini Project work carried out.

**B.E. (Electronics & Telecommunication)  
(2015 Pattern)**

**Semester VII**

**404181**

**VLSI Design & Technology**

**Course Outcomes: On completion of the course, student will be able to**

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

**404182**

**Computer Networks & Security**

**Course Outcomes: On completion of the course, student will be able to**

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

**404183**

**Radiation and Microwave Techniques**

**Course Outcomes: On completion of the course, student will be able to**

1. Differentiate various performance parameters of radiating elements.
2. Analyze various radiating elements and arrays.
3. Apply the knowledge of waveguide fundamentals in design of transmission lines.
4. Design and set up a system consisting of various passive microwave components.
5. Analyze tube based and solid state active devices along with their applications.
6. Measure various performance parameters of microwave components.

**404184**

**Embedded Systems and RTOS(Elective-I)**

**Course Outcomes: On completion of the course, student will be able to**

1. Understand design of embedded system
2. Use RTOS in embedded application
3. Use modern architecture for embedded system
4. Use Linux for embedded system development
5. Use open platform for embedded system development

**404188**

**Project Phase-I**

**Course Outcomes:** After the successful completion of this course, the student is expected to have/be able to:

1. List and generally explain the main sources of energy and their primary applications in the India, and the world.
2. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
3. Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.
4. List and describe the primary renewable energy resources and technologies.
5. Describe/illustrate basic electrical concepts and system components.
6. Convert units of energy—to quantify energy demands and make comparisons among energy uses, resources, and technologies.
7. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

**Semester-VIII**

**404189**

**Mobile Communication**

**Course Outcomes:** On completion of the course, student will be able to -

1. Apply the concepts of switching technique and traffic engineering to design multistage networks.
2. Explore the architecture of GSM.
3. Differentiate thoroughly the generations of mobile technologies.

**404190**

**Broadband Communication Systems**

**Course Outcomes:** After successfully completing the course students will be able to:

1. Perform Link power budget and Rise Time Budget by proper selection of components and check its viability.
2. Perform Satellite Link design for Up Link and Down Link.

**404191**

**Audio Video Engineering (Elective III)**

**Course Outcomes:** On successful completion of the course, students able to:

1. Apply the fundamentals of Analog Television and Colour Television standards.

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Deaprtment of Electronics & Telecommunication

2. Explain the fundamentals of Digital Television, DTV standards and parameters. 3. Study and understand various HDTV standards and Digital TV broadcasting systems and acquainted with different types of analog, digital TV and HDTV systems. 4. Understand acoustic fundamentals and various acoustic systems.
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<b>404194</b>	<b>Wireless Sensor Networks (Elective-IV)</b>
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**Course Outcomes: On completion of the course, student will be able to**

1. Explain various concepts and terminologies used in WSN. 2. Describe importance and use of radio communication and link management in WSN. 3. Explain various wireless standards and protocols associated with WSN. 4. Recognize importance of localization and routing techniques used in WSN. 5. Understand techniques of data aggregation and importance of security in WSN. 6. Examine the issues involved in design and deployment of WSN.
--

<b>Audit Course 6 (1)</b>	<b>Team Building, Leadership and Fitness</b>
---------------------------	--

**Course Outcomes: On completion of the course, society will observe –**

1. Change in awareness levels, knowledge and understanding of today's youth. 2. Change in attitudes / behavior of students with regards to their improved teamwork, institutional leadership and other life skills 3. Increase in the body's fitness levels and also reduced health problems. 4. Improvement in social health and attitude.
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<b>Audit Course 6 (2)</b>	<b>Environmental Issues And Disaster Management</b>
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**Course Outcomes : On completion of course students will be able:**

1. To learn the different environmental issues and disasters. 2. To deal with problems associated with environment and effectively handle the disasters.
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**Head**

Dept. of Electronics & Telecommunication  
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Lavale, Pune - 412 115.

## **First Year Engineering (2019 Course)**

### **Course Outcomes (COs):**

#### **107001 – Engineering Mathematics – I**

CO1: Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.

CO2: the Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.

CO3: to deal with derivative of functions of several variables that are essential in various branches of Engineering.

CO4: to apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.

CO5: the essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems

#### **107002: Engineering Physics**

CO1: Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.

CO2: Learn basics of lasers and optical fibers and their use in some applications.

CO3: Understand concepts and principles in quantum mechanics. Relate them to some applications.

CO4: Understand theory of semiconductors and their applications in some semiconductor devices.

CO5: Summarize basics of magnetism and superconductivity. Explore few of their technological applications.

CO6: Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nanomaterials and their application.

### 111006 -Workshop Practice

- CO1: Familiar with safety norms to prevent any mishap in workshop.
- CO2: Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
- CO3: Able to understand the construction, working and functions of machine tools and their parts.
- CO4: Able to know simple operations (Turning and Facing) on a centre lathe.

### 101007: Environmental Studies-I

- CO1: Demonstrate an integrative approach to environmental issues with a focus on sustainability.
- CO2: Explain and identify the role of the organism in energy transfers in different ecosystems.
- CO3: Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.
- CO4: Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.

### 107009: Engineering Chemistry

- CO1: Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.
- CO2: Select appropriate electro-technique and method of material analysis.
- CO3: Demonstrate the knowledge of advanced engineering materials for various engineering applications.
- CO4: Analyze fuel and suggest use of alternative fuels.
- CO5: Identify chemical compounds based on their structure.
- CO6: Explain causes of corrosion and methods for minimizing corrosion.

### 104010:Basic Electronics Engineering

- CO1: Explain the working of P-N junction diode and its circuits.
- CO2: Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.
- CO3: Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.
- CO4: Use different electronics measuring instruments to measure various electrical parameters.
- CO5: Select sensors for specific applications.



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# C E R T I F I C A T E

*This is to certify that,*

*Miss/Mrs. ABHIJEEET SHIVRAJ SWAMI*

*Class BE - CIVIL Roll No. 69 has*

*completed all the Practical Work, Team Work satisfactorily in the*

*Subject of DSC/T in the Department of CIVIL*

*as prescribed by the Savitribai Phule Pune University in the  
academic year 21-22*

*Date*

*Teacher*

*H.O.D. / In-Charge of  
the Department*



Founder:

Dr. Patangrao Kadam *Affiliated to Savitribai Phule Pune University.*  
M.A., L.L.B., Ph.D.

BHARATI VIDYAPEETH'S  
COLLEGE OF ENGINEERING, LAVALE, PUNE 412 115.

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## Department of civil Engineering

### Vision

- To be an excellence Centre in Civil Engineering education through teaching-learning, research, and consultancy.

### Mission

- To provide Civil Engineering graduates for professional career and higher studies through excellent teaching-learning environment.
- To provide a community to civil Engineering graduates through knowledge and expertise.

### Goals

- To bridging the gap between academia and industry by arranging industrial visits. To help the students to inculcate the leadership qualities, team building.

Enable them to interpret and analyze data and to make them learn the software's like Autocad, Stadd Pro and Primavera.



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**JOURNAL**

SUBJECT Data Structure & Algorithms

DEPARTMENT Computer Engineering

NAME Abhivrat Tijal Dattatreya

CLASS : Second year ROLL NO. 68

EXAM NO. \_\_\_\_\_ SEMESTER / YEAR IV



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**College of Engineering, Lavale**

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**C E R T I F I C A T E**

*This is to certify that,*

*Miss/Mrs....Abhineet....Lyal....Dattatray.....*

*Class Second year..... Roll No. ....68..... has*

*completed all the Practical Work, Team Work satisfactorily in the*

*Subject of Data Structure the Department of Computer Engineering  
and algorithms*

*as prescribed by the Savitribai Phule Pune University in the*

*academic year 2021-22*

*Date 17/5/22*

*17/5/22*  
Teacher

*H.O.D. / In-Charge of  
the Department*

*17/5/2022*

**Head**  
Dept. of Computer Engineering,  
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## POs, PEOs and PSOs - Computer Engineering

POs, PEOs and PSOs

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## PO's, PEO's and PSO's

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1 / 3 | - 100% +

**Bharati Vidyapeeth's  
College of Engineering, Lavale, Pune  
Department of Computer Engineering**

**Program Outcomes (POs)**  
(for Bachelor of Computer Engineering at Savitribai Phule Pune University)  
Learners are expected to know and be able to-

**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 analyse complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and Engineering sciences.



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**JOURNAL**

SUBJECT Industrial Engineering.

DEPARTMENT Mechanical

NAME Bangar Vishal Prabhakar

CLASS : 3.C ROLL NO. 63

EXAM NO. \_\_\_\_\_ SEMESTER / YEAR 2021-22



## Bharati Vidyapeeth's College of Engineering

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**Staff Web mail Login**



# POs, PEOs and PSOs - Mechanical Engineering

## Programme Outcomes (POs):

1. To train student to apply knowledge of engineering, science and mathematics to problem solving.
2. To analyze engineering problems.
3. To design solution to problems.
4. To train student to be able to carry out methodical investigation.
5. To be able to use modern IT tools.
6. To be able to assess societal, cultural, health, safety and legal issues.
7. To be able to understand effect of solution on environment.
8. To be able to take ethical decisions.
9. To be able to work in multidisciplinary teams as team member or team leader.
10. To train students to communicate orally as well as write effective reports on engineering documentation and make effective presentations.
11. To be able to manage a project.
12. To be able to update knowledge continuously and be lifelong learner.

## Our Visitors

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**JOURNAL**

SUBJECT AVE

DEPARTMENT E ETC

NAME AKASH SATYANARAYAN WATGURE

CLASS: B.ECE<sup>3</sup>TC ROLL NO. 2151113002

EXAM NO. 2151113002 SEMESTER / YEAR 2021-22



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**College of Engineering, Lavale**

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## C E R T I F I C A T E

*This is to certify that,*

*Miss / Mrs. Akash... Satyanarayan... Latguse.....*

*Class B.E..... Roll No. 2..... has  
completed all the Practical Work, Team Work satisfactorily in the  
Subject of A.V.E..... in the Department of E.N.T.C.....  
as prescribed by the Savitribai Phule Pune University in the  
academic year 2021-2022*

*6-5-2022  
Date*

*6/5/22  
Teacher*

*H.O.D. / In-Charge of  
the Department*



BHARATI VIDYAPEETH'S  
COLLEGE OF ENGINEERING LAVALE  
PUNE - 412115

Department of electronics and telecommunication

PO12	An ability to design, implement and manage the electronic projects for real world applications with optimum financial resources
Program Specific Outcomes	
PSO1	Professional Skills: The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.
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 a zest for higher studies.

COs POs Mapping  
**AUDIO VIDEO ENGINEERING**  
**LAB MANUAL**

Sr. No	Title	Co	Po
1.	Voltage and waveform analysis for color TV.	Co <sub>1</sub>	PO2,PO3,PO4
2.	Study of direct to home TV and set top box.	Co <sub>2</sub>	PO3,PO4,PO5
3.	Study of Digital TV pattern generator.	Co <sub>3</sub>	PSO1,PO3
4.	Study of HDTV	Co <sub>3</sub>	PO5,PSO1

# WELCOME TO MOBILE COMMUNICATION & BROADBAND COMMUNICATION LABORATORY

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING  
LAVALE, PUNE-412115

## PROGRAM OUTCOMES (POs)

- Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 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.
- Design development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate guidelines for the public health and safety, and the cultural, societal, and environmental considerations.
- 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.
- Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities.
- The engineer and society:** Apply relevant informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 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.
- Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- Individual and team work:** Work effectively as an individual and as a member or leader in a team, and in multidisciplinary settings.
- 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.
- 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.
- Life-long learning:** Recognize the need for, and have the preparation and ability to engage in, self-directed and life-long learning in the broadest context of technological change.

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING  
LAVALE, PUNE-412115

DEPARTMENT OF  
ELECTRONICS & TELECOMMUNICATION ENGINEERING

## Vision

"To be a prominent and globally recognized department in academics and research activities with the goal of training highly competent professionals to serve the society and technology evolution in industries."

## Mission

- To be a preferred destination for learners by providing State-of-the-Art resources through a learning framework in Learning-Centered Process.
- To develop students to reach higher performance levels through team effort.
- To reduce the development of rigid, stiff set norms and core competence of students and the faculty by allowing them opportunity to bring out their inherent talents.
- To continuously improve and update the system, Infrastructure, Processes and Services through Total Quality Management to achieve Customer Delight.
- To evolve partnership with the community and industry to contribute the process of nation building.

## Goals

- To provide advanced facilities of teaching and practical training to the students.
- To inculcate entrepreneurial talents and technology application programs.
- To educate students by applying quality education in the areas of Electronics and Telecommunication Engineering.
- To reach global standards in production and value added living through an honest and scientific approach.
- To guide our young students to become professionally and morally sound engineers.
- To impart updated technical, educational, and knowledge.

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING  
LAVALE, PUNE-412115

## PROGRAM SPECIFIC OUTCOMES (PSOs)

Electronics and Telecommunication Engineering Graduates will be able to:

- PSO1:** Apply the fundamentals of mathematics, science and engineering knowledge to formulate, design and investigate complex engineering problems of electric circuits, analog and digital electronic circuits, electrical machines and power systems.
- PSO2:** Apply appropriate techniques and modern Engineering hardware and software to power systems to engage in life-long learning and to successfully adapt in multi-disciplinary environments.

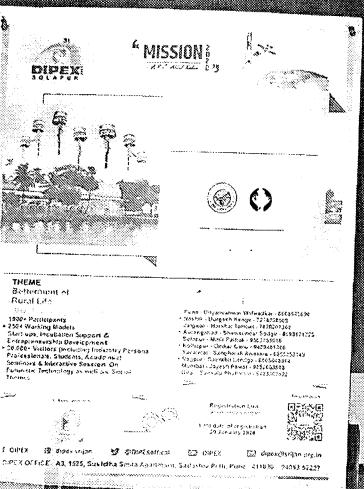
- PSO3:** Understand the impact of Professional Engineering solutions in societal and environmental context, commit to professional ethics and communicate effectively.



# NOTICE BOARD

## DEPARTMENT OF E&TC ENGINEERING

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8V/COE1/3021/2018-19



## POs PEOs PSOs - Electronics & Telecommunication Engineering

### Program Outcomes:

PO1	<b>Engineering knowledge &amp; Updated Technology:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. 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.
PO2	<b>Problem analysis Conduct investigations of complex problems:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. 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.
PO3	<b>Design/development of solutions:</b> 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	<b>Modern tool usage:</b> 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
PO5	<b>The Engineer and Society:</b> 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.
PO6	<b>Individual and team work Ethics:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO7	<b>Communication:</b> 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.

**PO8**

**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.

## Program Specific Outcomes

<b>PSO1</b>	To impart knowledge to students on basic science, mathematics, computer and information technology to understand the design and development concepts of Electronics and Telecommunication engineering.
<b>PSO2</b>	To identify and solve complex electronics and communication problems by choosing modern methods and tools for appropriate analysis.
<b>PSO3</b>	To be able to design variety of electronic based components and system for Specific applications including signal processing, communication networks, process automation, embedded and VLSI design
<b>PSO4</b>	Identify indigenous materials and methods for producing innovative, energy efficient and eco-friendly solutions.

 Last Updated: 17 June 2019

## Our Visitors

NEW Admission Enquiry 2022-23

Free MHTCET Online Practice Test

Instructions to use MHTCET Online Practice Test Portal



BHARATI VIDYAPEETH'S  
**College of Engineering, Lavale**

Tal.- Mulshi, Dist.- Pune 412115.

**C E R T I F I C A T E**

*This is to certify that,*

Miss/Mrs. ABHIJEET SHINRAJ SWAMI

Class BE - CIVIL Roll No. 69 has

*completed all the Practical Work, Team Work satisfactorily in the*

*Subject of Q S C T in the Department of CIVIL*

*as prescribed by the Savitribai Phule Pune University in the  
academic year 21-22*

Date

Teacher

H.O.D. / In-Charge of  
the Department

## Program Outcomes

**Students are expected to know and be able -**

1. To apply knowledge of mathematics, science, engineering fundamentals, problem solving skills, algorithmic analysis to solve complex engineering problems.
2. To analyze the problem by finding its domain and applying domain specific skills
3. To understand the design issues of the product/software and develop effective solutions with appropriate consideration of public health and safety, cultural, societal, and environmental issues.
4. To find solutions of complex problems by conducting investigations applying suitable techniques.
5. To adapt the usage of modern tools and recent software.
6. To contribute towards the society by understanding the impact of Engineering on global aspect.
7. To understand environment issues and design a sustainable system.
8. To understand and follow professional ethics.
9. To function effectively as an individual and as member or leader in diverse teams and interdisciplinary settings.
10. To demonstrate effective communication at various levels.
11. To apply the knowledge of Computer Engineering for development of projects, and its finance and management.
12. To keep in touch with current technologies and inculcate the practices of lifelong learning.

# **Savitribai Phule Pune University**

## **Computer Engineering**

### **Program Educational Objectives**

1. To prepare globally competent graduates having strong fundamentals and domain knowledge to provide effective solutions for engineering problems.
2. To prepare the graduates to work as a committed professionals with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
3. To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
4. To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.

## Savitribai Phule Pune University, Pune

### Bachelor of Computer Engineering

#### Program Educational Objectives

1. To prepare globally competent graduates having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.
2. To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.
3. To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.
4. To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.

#### Program Outcomes

**Students are expected to know and be able –**

1. To apply knowledge of mathematics, science, engineering fundamentals, problem solving skills, algorithmic analysis and mathematical modeling to the solution of complex engineering problems.
2. To analyze the problem by finding its domain and applying domain specific skills
3. To understand the design issues of the product/software and develop effective solutions with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
4. To find solutions of complex problems by conducting investigations applying suitable techniques.
5. To adapt the usage of modern tools and recent software.
6. To contribute towards the society by understanding the impact of Engineering on global aspect.
7. To understand environment issues and design a sustainable system.
8. To understand and follow professional ethics.
9. To function effectively as an individual and as member or leader in diverse teams and interdisciplinary settings.
10. To demonstrate effective communication at various levels.
11. To apply the knowledge of Computer Engineering for development of projects, and its finance and management.
12. To keep in touch with current technologies and inculcate the practice of lifelong learning.

#### Program Specific Outcomes (PSO)

**A graduate of the Computer Engineering Program will demonstrate-**

**PSO1:** 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.

**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 a zest for higher studies.