



COLLEGE OF ENGINEERING AND TECHNOLOGY, AKOLA

**Accredited By NAAC With 'A' Grade
(CGPA 3.27)**

CRITERION- 2

“TEACHING LEARNING & EVALUATION”

2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all programmes offered by institute are stated and displayed on website.



Shri Shivaji Education Society, Amravati's

COLLEGE OF ENGINEERING AND TECHNOLOGY, AKOLA



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Date: 04/05/2023

Declaration

This is to declare that the information, reports, true copies and numerical data etc

Furnished in this file as supporting documents is verified by IQAC and found correct.

Dr. S. K. Patil

IQAC Coordinator

Dr. S. K. Patil

IQAC Coordinator

College of Engineering and Technology
Akola



Dr. S. K. Deshmukh

Principal

Principal
College of Engg.
& Tech., Akola

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Shri Shivaji Education Society, Amravati's
College of Engineering & Technology, Akola
At post: Babhulgaon (Jh) N.H No 6 Tal. Dist. Akola (M.S) 444104

2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website

Being affiliated to Sant Gadge Baba Amravati University, Amravati, the institution follows university syllabi for teaching, learning and evaluation mechanism.

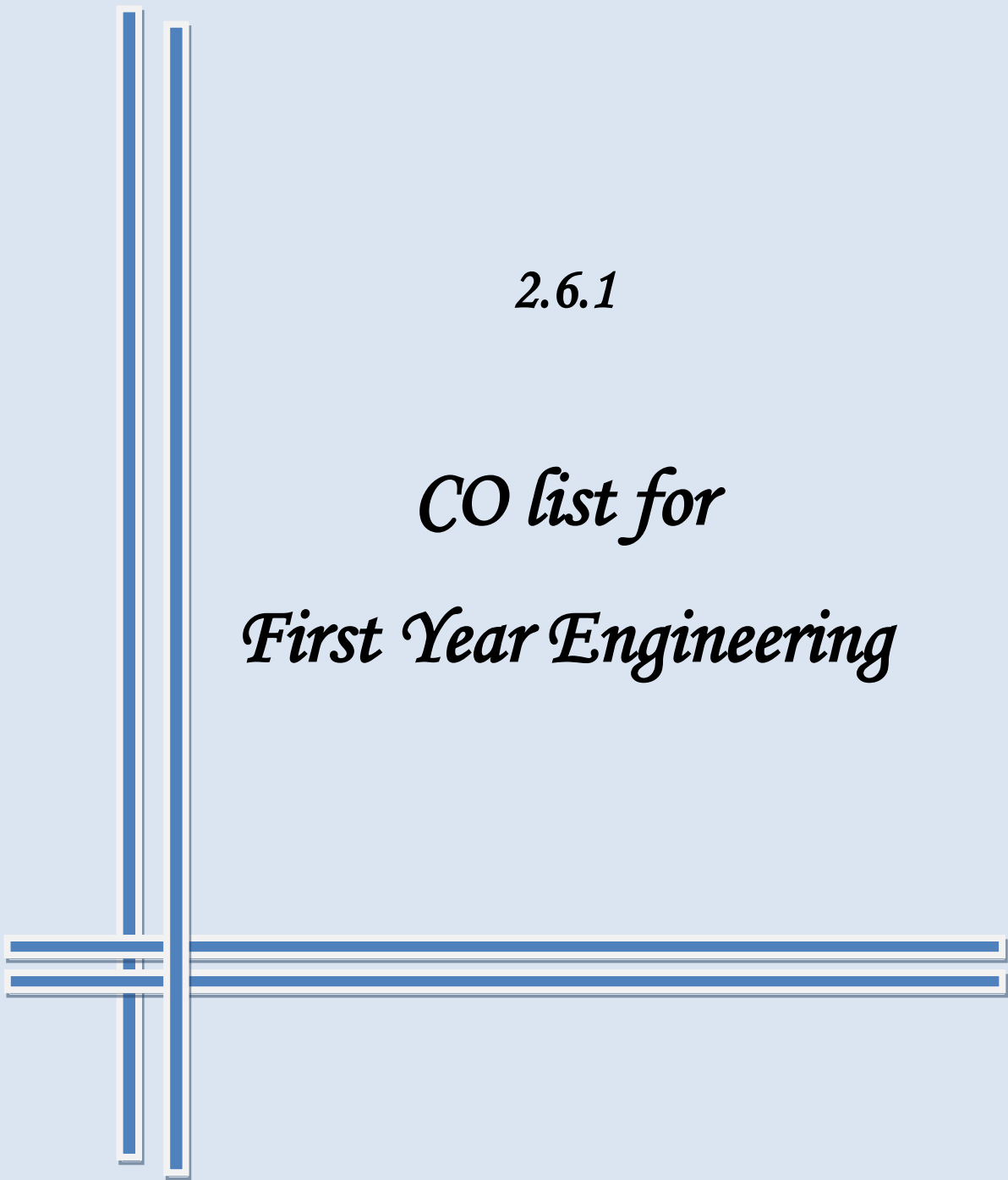
The program outcomes (PO) and program specific outcomes (PSO) for every department are available on college website and course outcomes (CO) are conveyed to students by HOD and subject teachers in the initial classes of every semester.

The steps are conveyed to students regarding attainment of CO. Linkages between various subjects is also highlighted. The course outcomes and steps to achieve them are subject dependent. Hence it is utmost necessary to mention PO and CO in the beginning of each academic session.


Principal
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Program Outcomes (POs)

1. **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
4. **Conduct** investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11. **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.
12. **Life-long Learning:** Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.



2.6.1

*CO list for
First Year Engineering*

Shri Shivaji Education Society Amravati's
COLLEGE OF ENGINEERING AND TECHNOLOGY AKOLA
DEPARTMENT OF FIRST YEAR ENGINEERING (APPLIED SCIENCES & HUMANITIES)
Course outcomes of all subject Semester-I & II (Common to all programs)

Group - A

Subject	Subject Code	Course Outcomes
Mathematics- I	1A1	<ol style="list-style-type: none"> 1. Able to understand Rolle's Theorem and its applications to Engineering Problems. 2. Able to understand maxima minima concept 3. Able to apply Demoiver's theorem in various concepts of complex number. 4. Able to solve differential equations of certain types that they might encounter in the same or higher semester.
Engineering Physics	1A2	<ol style="list-style-type: none"> 1. Understand the concept of Solid State Physics 2. Modern/ Quantum Physics 3. Understand the concept of Electric and Magnetic fields. 4. Optics: Interference and diffraction of light. 5. Fiber optics and its principle and working. 6. Fluid dynamics and Acoustics of Buildings.
Engineering Mechanics	1A3	<ol style="list-style-type: none"> 1. Compose and resolve the forces along with its effect 2. Apply principles of statics to the system of rigid bodies and analyse simple structures. 3. Calculate frictional forces for simple contact, wedges and belt friction. 4. Locate centroid and calculate moment of inertia. 5. Calculate various kinematic quantities. 6. Solve the problems using different kinetic equations related to direct and interconnected particles. 7. Apply principle of conservation of momentum and laws of impact
Computer Programming	1A4	<ol style="list-style-type: none"> 1. To explain fundamental concepts of computer and computing. 2. To test and execute the programs and correct syntax and logical errors. 3. To implement conditional branching, iteration and recursion. 4. To use arrays, pointers and structures to formulate algorithms and programs. 5. To recognize various problem-solving techniques and computer applications. 6. To apply programming concepts to solve real life problems.

Workshop Practice	1A5	<ol style="list-style-type: none"> 1. Upon completion of this course, the students will gain knowledge of different manufacturing processes which are commonly employed in industry. 2. Upon completion of this course, the students will be able to fabricate the components using various manufacturing techniques. 3. The students will be conversant with the concept of dimensional accuracy and tolerances
Engineering Physics Lab	1A6	<ol style="list-style-type: none"> 1. Understand the Characteristics of P-N junction diode 2. Understand the Characteristics of LED diode 3. Understand the Characteristics of Zener diode 4. To study the CRO -different shapes of waves 5. To study the CRO -different types of lissajous patterns 6. To determine the grating element of diffraction grating using LASER beam. 7. To determine the radius of plano convex lence using Newton's ring experiments. 8. To compare the viscosities of given two liquids by using Ostwald's viscometer.
Engineering Mechanics Lab	1A7	<ol style="list-style-type: none"> 1. Prove the concepts related to engineering mechanics. 2. Calculate lifting machine parameters. 3. Perform graphical analysis of force systems and simple structures 4. To analyse Support reactions 5. Remember the concept of coefficient of Friction 6. Understand the concept Forces in Members 7. Able to understand concept of Acceleration due to Gravity 8. Identify mass Moment of Inertia
Computer Programming Lab	1A8	<ol style="list-style-type: none"> 1. To study anatomy of computer system 2. To understand the concepts of operators in c 3. To understand the concepts of basics in c programming 4. To understand the concepts of control instructions in c 5. To understand the concepts of looping in c 6. To understand the concepts of switch case statements 7. To understand the concepts of structure and array 8. To understand the concepts of file handling in c


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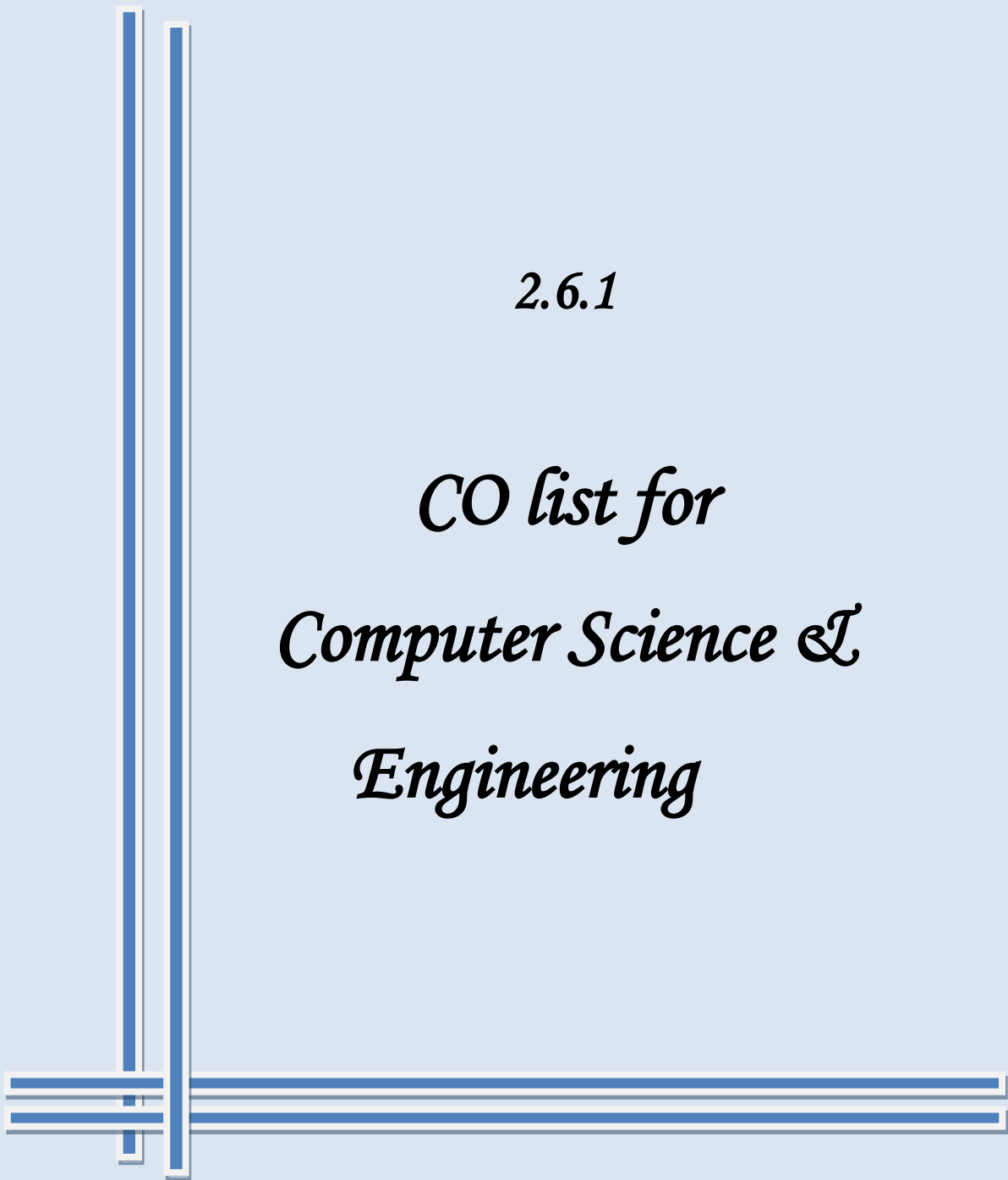
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COLLEGE OF ENGINEERING AND TECHNOLOGY AKOLA
DEPARTMENT OF FIRST YEAR ENGINEERING (APPLIED SCIENCES & HUMANITIES)
Course outcomes of all subject Semester-I & II (Common to all programs)

Group – B

Subject	Subject Code	Course Outcomes
Mathematics-II	1B1	<ol style="list-style-type: none"> 1. The essential tool of matrices and linear Algebra in a comprehensive Manner. 2. Evaluation of Integrals by Reduction Formulae, Gamma and Beta Function. 3. Use the tool of Fourier series for learning advanced engineering mathematics. 4. Use new techniques DUIS to evaluate Integrals and Tracing of Curves 5. The Mathematical tools needed in evaluating Multiple Integrals and their usage.
Engineering Chemistry	1B2	<ol style="list-style-type: none"> 1. Apply the knowledge of chemistry in softening processes involved in water technology. 2. Identify various types of corrosion and methods to protect the metallic structures form corrosive environment 3. Understanding of the energy storage system (battery) . 4. Apply the knowledge of useful engineering materials such as cement, lubricants, ceramics, and nano materials based on their properties. 5. Develop the technique involved in the manufacturing process of cement 6. Apply the knowledge about the properties of chemical fuels for the generation of power. 6. Apply the knowledge of various polymeric material, their synthesis and applications. 7. Identify various phases of material at different thermodynamics variables. 8. Identification and analysis of materials by using advanced analytical techniques
Basic Electrical Engineering	1B3	<ol style="list-style-type: none"> 1. Explain the basic concepts of electric and magnetic circuits. 2. The students will be able to solve problems on AC fundamentals & three phase circuits 3. Explain the operating principles of various electrical machines and describe the working of various measuring instruments and importance of earthing

Engineering Graphics	1B4	<ol style="list-style-type: none"> 1. Students will able to read/prepare/understand the engineering drawings 2. Students will able to create the projections and sectional views of 3D objects 3. Students will able to draw the orthographic and isometric views of 3D objects. 4. Students will able to use graphics software to create Engineering drawings and represent engineering systems.
English Communication skill Lab	1B5	<ol style="list-style-type: none"> 1. The learning outcome of students will be assessed through assignments, tests and final exams and most importantly through practical performances. 2. Through these tests, it would be revealed that students are able to reproduce their understanding of concepts/principles of communication in English language. 3. Students can present themselves well in front of large audience on a variety of topics. Moreover they get the knack for structured conversation to make their point of views clear to the listeners.
Engineering Chemistry Lab	1B6	<ol style="list-style-type: none"> 1. Understand the objective of their experiments. 2. Record and analyze the results 3. Follow the proper and safe procedure to get the accurate results. 4. Interpret the results through proper writing in journal
Basic Electrical Engg. Lab	1B7	<ol style="list-style-type: none"> 1. To introduce students with different technologies in electrical engineering and different theorems 2. To understand magnetic circuits 3. To study A.C. Fundamentals 4. Understand concepts related to study of polyphase circuits 5. To acquire the knowledge about electrical machines and transformer 6. To study different measuring instruments and electrical apparatus and safety (earthling)


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 HOD, Engg. Chemistry
 College of Engineering & Technology
 AKOLA



2.6.1

*CO list for
Computer Science &
Engineering*



PROGRAM OUTCOMES (PO)

POs are statements that describe what students are expected to know and be able to do by the time of graduation. The program outcomes for Bachelor of Technology are as follows:

PO-1:Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO-2. Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO-3. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO-4. Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO-5. Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO-6. The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO-7. Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO-8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO-9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO-10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO-11. Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12. Life-long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1: 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 complexity.

PSO 2: Apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO 3: Work professionally in software industries and develop the modern tools in IT fields.

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III SEM Course Outcomes

Subject Name	Course Outcome
3 KS01 ENGINEERING MATHEMATICS- III	<ol style="list-style-type: none">1. Demonstrate the knowledge of differential equations and linear differential equations2. Apply Laplace transform to solve differential equations.3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.4. Demonstrate the basic concepts of probability and statistics.5. Apply the knowledge of Complex Analysis.6. Apply the knowledge of vector calculus to solve physical problems.
3KS02 DISCRETE STRUCTURE AND GRAPH THEORY	<ol style="list-style-type: none">1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.3. Classify algebraic structure for a given mathematical problem.4. Perform combinatorial analysis to solve counting problems.5. Develop the given problem as graph net works and solve with techniques of graph theory6. To understand the basic discrete structures, and be able to model problems in real life mathematically using these structures.
3KS03 OBJECT ORIENTED PROGRAMMING	<ol style="list-style-type: none">1. Apply Object Oriented approach to design software.2. Implement programs using classes and objects.3. Specify the forms of inheritance and use them in programs.4. Analyze polymorphic behaviour of objects.5. Design and develop GUI programs.6. Develop Applets for web applications
3KS04 DATA STRUCTURES	<ol style="list-style-type: none">1. Apply various linear and nonlinear data structures2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures3. Examine the usage of various structures in approaching the problem solution.4. Choose appropriate data structure for specified problem domain5. Analyze the efficiency of programs based on Path length & Huffman's algorithm6. Prove the correctness of a program using Insertion Sort, Selection Sort, Radix sort, Merge Sort
3KS05 ANALOG& DIGITAL ELECTRONICS	<ol style="list-style-type: none">1. Explain basic concepts of semiconductor devices and its application.2. Compare different Number System and basics of conversion of number systems.3. Realize different minimization technique to obtain minimized expression.4. Design Combinational Circuits.5. Design and Develop Sequential Circuits6. Know about the logic families and realization of logic gates.

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IV SEM Course Outcomes

Subject Name	Course Outcome
4KS01 ARTIFICIAL INTELLIGENCE	<ol style="list-style-type: none">1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.2. Formulate problems as state space search problem & efficiently solve them.3. Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.4. Apply AI techniques in applications which involve perception, reasoning and learning.5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.6. Use classical Artificial Intelligence techniques, such as search algorithms, minimax algorithm, neural networks, tracking, robot localisation.
4KS02 DATA COMMUNICATIO N AND NETWORKING	<ol style="list-style-type: none">1. Describe data communication Components, Networks, Protocols and various topology based network architecture2. Design and Test different encoding and modulating techniques to change digital – to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,3. Explain the various multiplexing methods and evaluate the different error detection & correction techniques.4. Illustrate and realize the data link control and data link protocols.5. Describe and demonstrate the various Local area networks and the IEEE standards.6. Understand the basic aspects of packet-based protocol design and implementation.
4KS03 OPERATING SYSTEM	<ol style="list-style-type: none">1. Explain memory management issues like external fragmentation, internal fragmentation.2. Illustrate multithreading and its significance.3. List various protection and security mechanisms of OS.4. Analyze and solve the scheduling algorithms.5. Analyze the deadlock situation and resolve it.6. Compare various types of operating systems
4KS04 MICROPROCESS OR & ASSEMBLY LANGUAGE PROGRAMMING	<ol style="list-style-type: none">1. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.2. Design and Test assembly language programs using 8086 microprocessor instruction set.3. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language.4. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.5. Explain the basic concepts of Internet of Things6. The program prepares students to successfully compete for employment in Electronics, Manufacturing and Embedded fields.
4KS05 THEORY OF COMPUTATION	<ol style="list-style-type: none">1. To construct finite state machines to solve problems in computing.2. To write regular expressions for the formal languages.3. To construct and apply well defined rules for parsing techniques in compiler4. To construct and analyze Push Down, Turing Machine for formal languages5. To express the understanding of the Chomsky Hierarchy.6. To express the understanding of the decidability and un-decidability problems



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College of Engineering & Technology, Akola
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

V SEM Course Outcomes

Subject Name	Course Outcome
5KS01 Database Management Systems	<ol style="list-style-type: none">1. Model, design and normalize databases for real life applications.2. Discuss data models, conceptualize and depict a database system using ER diagram.3. Query Database applications using Query Languages like SQL.4. Design & develop transaction processing approach for relational databases.5. Understand validation framework like integrity constraints, triggers and assertions6. Demonstrate their understanding of key notions of query evaluation and optimization techniques.
5KS02 COMPILER DESIGN	<ol style="list-style-type: none">1. Describe the fundamentals of compiler and various phases of compilers.2. Design and implement LL and LR parsers3. Solve the various parsing techniques like SLR, CLR, LALR.4. Examine the concept of Syntax-Directed Definition and translation.5. Assess the concept of Intermediate-Code Generation and run-time environment6. Explain the concept code generation and code optimization.
5KS03 COMPUTER ARCHITECTURE & ORGANIZATION	<ol style="list-style-type: none">1. Discuss basic structure of computer.2. Understand the basic operation of CPU.3. Compare and select various Memory and I/O devices as per requirement.4. Solve the concepts of number representation and their operation.5. Explain the concept of parallel processing and pipelining.6. To understand the overall concept of CPU and its essential components mainly ALU, Registers, CU and their sub components.
5KS04 INTERNET OF THINGS	<ol style="list-style-type: none">1. Understand the basics of IoT2. Understand design methodology and platforms involved in IoT3. Apply the knowledge to interface various sensors with IoT development4. Design and Implement IoT system for real time application5. Explain the impact of IoT on governance and society.6. Implement IoT to solve real world problems.
5KS04 INTRODUCTION TO CYBER SECURITY	<ol style="list-style-type: none">1. Know fundamentals of Cybercrimes and Cyber offenses2. Realize the Cyber threats, attacks and Vulnerabilities.3. Explore the industry practices and tools.4. Comprehend the Access Control and Authentication Process.5. Implement Intrusion Detection and Prevention.6. Analyse the risks involved while sharing their information in cyber space and numerous related solutions like sending protected and digitally signed documents.


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VI SEM Course Outcomes


Subject Name	Course Outcome
6KS01 SECURITY POLICY & GOVERNANCE	<ol style="list-style-type: none">1. List and discuss the key characteristics of Information Security, Leadership and Management2. Differentiate between Law and Ethics3. Describe why ethical codes of conduct are important to Information Security4. Discuss the importance, benefits and desired outcomes of Information Security Governance5. Discuss the process of developing, implementing and maintaining various types of Information Security Policies.6. Define Risk Management and its role in the organization.
6KS02 DESIGN AND ANALYSIS OF ALGORITHMS	<ol style="list-style-type: none">1. Decide on a process model for a developing a software project2. Classify software applications and identify unique features of various domains3. Design test cases of a software system.4. Understand basics of Project management.5. Plan, schedule and execute a project considering the risk management.6. Apply quality attributes in software development life cycle.
6KS03 SOFTWARE ENGINEERING	<ol style="list-style-type: none">1. Decide on a process model for a developing a software project2. Classify software applications and identify unique features of various domains3. Design test cases of a software system.4. Understand basics of Project management.5. Plan, schedule and execute a project considering the risk management.6. Apply quality attributes in software development life cycle.
6KS04 SENSORS AND ACTUATORS	<ol style="list-style-type: none">1. Fabricate some of those sensors2. Simulate sensors and characterize before fabricating it3. Design application with sensors and actuators for real world4. Interpret the acquired data and measured results5. Create analytical design and development solutions for sensors and actuators6. Take part in team work and be able to independently present various professional materials.
6KS04 CRYPTOGRAPHY	<ol style="list-style-type: none">1. Classify the symmetric encryption techniques2. Illustrate various public key cryptographic techniques3. Evaluate the authentication and hash algorithms.4. Discuss authentication applications5. Summarize the intrusion detection and its solutions to overcome the attacks.6. Understand basic concepts of system level security

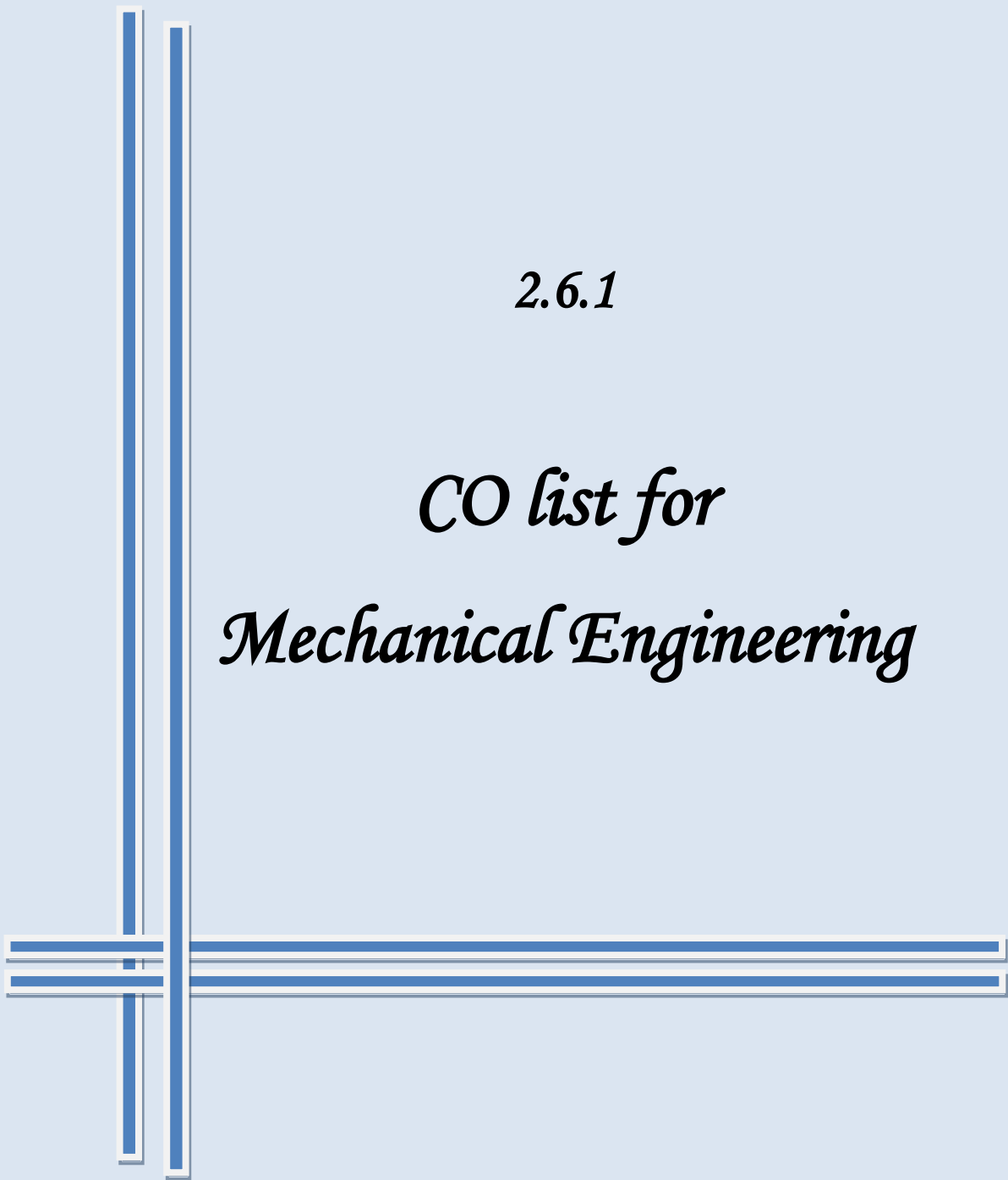
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College of Engineering & Technology, Akola
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
VII SEM Course Outcomes

Subject Name	Course Outcome
7KS01 SOCIAL SCIENCES AND ENGINEERING ECONOMICS	<ol style="list-style-type: none">1. An ability to understand the importance of social science and economics in professional life.2. An ability to utilize high-level interpersonal skills to negotiate with stakeholders and maintain cordial relationships with them reflecting the professional ethics and responsibilities.3. Understanding of professional responsibility with socioeconomic constraints and norms4. An ability to understand the need of society and design the system to fulfil it with deep analysis.5. An ability to understand the social science and engage in a lifelong learning process performing better in the group as well as individually.6. Develop statistical, analytical and communication skills that are highly valued
7KS02 COMPUTER GRAPHICS	<ol style="list-style-type: none">1. Describe the basic concepts of Computer Graphics.2. Demonstrate various algorithms for basic graphics primitives.3. Apply 2-D geometric transformations on graphical objects.4. Use various Clipping algorithms on graphical objects5. Explore 3-D geometric transformations, curve representation techniques and projections methods6. Explain visible surface detection techniques and Animation.
7KS03 CLOUD COMPUTING	<ol style="list-style-type: none">1. Describe the fundamental concept, architecture and applications of Cloud Computing.2. Discuss the problems related to cloud deployment model.3. Examine the concept of virtualization.4. Identify the role of network connectivity in the cloud.5. Assess different Cloud service providers.6. Inspect the security issues in cloud service models.
7KS04 EMBEDDED SYSTEM	<ol style="list-style-type: none">1. Describe the basics of embedded systems and structural core units as well as memory organization for embedded system.2. Explain components of embedded system, characteristics and quality attributes of embedded systems.3. Discuss role of 8051 microcontroller and its architecture in design of embedded systems4. Examine the different Addressing modes and Instruction Set of 8051 microcontrollers.5. Use knowledge of C programming to do embedded programming.6. Assess the Real-Time Operating System concepts with VxWorks RTOS.
7KS04 DIGITAL FORENSICS	<ol style="list-style-type: none">1. Describe Digital Forensics and its related preparation2. Outline Data Acquisition tools3. Use knowledge to improve crime investigations.4. Examine Digital Forensic and its validation5. Assess role of email and social media in investigations6. Discuss Cloud Forensics.
7KS05 BLOCK CHAIN FUNDAMENTALS	<ol style="list-style-type: none">1. Describe Crypto currency as application of block chain technology2. Examine Basic Cryptographic primitives used in Block chain3. Illustrate Consensus in a Blockchain4. Discuss empirical study of bitcoin the mining5. Compare and contrast Ethereum and Bitcoin6. Use concepts of Block chain technology that are commonly used across multiple industries to solve large scale problems.


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2.6.1

***CO list for
Mechanical Engineering***



VIII SEM Course Outcomes

Subject Name	Course Outcome
8KS01 OBJECT ORIENTED ANALYSIS AND DESIGN	<ol style="list-style-type: none">1. Describe Object Oriented principles, for performing object-oriented analysis and design.2. Explain the basic concepts of UML, Software Development Processes and Design pattern.3. Illustrate requirements for developing a software.4. Create initial domain model & system sequence diagram for use case scenario.5. Design static and dynamic objects for modeling.6. Construct UML and Design Patterns for developing object-oriented software.
8KS02 PROFESSIONAL ETHICS AND MANAGEMENT	<ol style="list-style-type: none">1. Relate ethical and non-ethical situations2. Outline ethics in the society & environment3. Examine the moral judgment & correlate the concepts in addressing the ethical dilemmas4. Identify risk and safety measures in various engineering fields5. Justify ethical issues related to engineering responsibilities and rights6. Synthesize cognitive skills in solving social problems
8KS03 WIRELESS SENSOR NETWORKS	<ol style="list-style-type: none">1. Describe Network of Wireless Sensor Nodes2. Explain Node Architecture and Physical Layer.3. Discuss Medium Access Control and its related properties.4. Analyze the protocols and algorithms used at different network protocol layers in sensor systems.5. Compare different power management techniques and clocks and the Synchronization problems.6. Explain time synchronization and its problems.
8KS03 SYSTEM & SOFTWARE SECURITY	<ol style="list-style-type: none">1. Relate malicious and non-malicious attacks.2. Outline web common vulnerabilities, attack mechanisms and methods against computer and information systems.3. Apply relevant methods for security modeling and analysis of Operating System.4. Investigate a secure network by monitoring and analyzing the nature of attacks.5. Explain cryptography, intrusion detection and firewall system6. Implement different security solutions at various levels such as operating systems, databases and clouds.
8KS04 DISTRIBUTED LEDGER TECHNOLOGY	<ol style="list-style-type: none">1. Describe basic knowledge of Distributed Ledger Technologies2. Outline Analytical Framework for Distributed ledger technology3. Use Cryptographic method for ledgers.4. Explain knowledge of Bitcoin5. Inspect Bitcoin cryptocurrency mechanisms6. Synthesize bitcoin mining process.

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SHRI SHIVAJI EDUCATION SOCIETY, AMRAVATI'S
COLLEGE OF ENGINEERING AND TECHNOLOGY, AKOLA
DEPARTMENT OF MECHANICAL ENGINEERING
PROGRAM OUTCOMES(POs)

POS	TITLE OF POS	DISCRIPTION OF POS
PO1	Engineering Knowledge	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis	Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	Design/ Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO4	Conduct	Investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	Modern Tool Usage	Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The Engineer and Society	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	Environment and Sustainability	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate 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 Team Work	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO10	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.
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.


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Department of Mechanical Engineering

Program Specific Outcomes (PSO)

PSO1: Professional Skill:

An ability to identify, formulate and analyze complex engineering solutions for Thermal, Hydraulic, Design, Manufacturing and Automation Systems that meet the specified needs with team work and management skills for Safety , Societal and Environmental aspects through lifelong learning.

PSO2: Problem-solving Skills:

An ability to use Modeling and Analysis tools and technologies necessary for obtaining effective, economical and accurate solution of Mechanical Engineering problem using latest hardware and software tools with industrial management skill, and interdisciplinary technologies.

PSO3: Professional Career and Entrepreneurship:

An ability to design mechanical and automation system in multidisciplinary environments through better communication by an understanding of social awareness & environmental wisdom along with ethical responsibility to have successful career and sustain passion and zeal for real world application using optimal resources as an Entrepreneur.


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DEPARTMENT OF MECHANICAL ENGINEERING
SEMESTER-III


Subject	Course Outcomes
3ME01 MATHS - III	1. Demonstrate the knowledge to solve ordinary Linear Differential equations with constant coefficient and its reducible equation using particular integral and complementary function and apply method of variation of parameter to solve ordinary Linear differential equations 2. Define the Laplace transform and its inverse transform for the basic functions. Locate the Laplace transform of periodic function. Apply the Laplace transform to solve differential equation 3. Apply False Position, Newton Raphson method to solve nonlinear & polynomial equations Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations, Apply Eulers method, Runge-Kutta method, Picards method to solve differential equations 4. Define Gradient, divergent and curl of vector point functions. Finds the directional derivatives of scalar point functions. Discuss the Irrotational and solenoidal vector fields. 5. Define line surface and volume integrals
3ME02 MAN. PROCESS	1. Basic concept of foundry process and related activities 2. Concept of complete sand casting process with advance casting methods 3. Fundamentals of welding processes 4. Various processes like electroplating, anodizing etc and their importance in industries
3ME03 MECHANICS OF MAT.	1. Determine the stress & strain in the member subjected to axial, bending & tensional load 2. To observe different types of material behavior such as elastic, plastic, ductile and brittle 3. Apply SF and BM diagrams to analyse resistance offered by the beam and able to solve practical problems in real world 4. Apply deflection criteria to check the stability of beam
3ME04 ENGG. THERMO DYNAMICS	1. Understand the basic concepts of thermodynamics, thermodynamic systems, work and heat 2. Apply first law of thermodynamics and application of first law to flow and non-flow processes 3. Apply second law of thermodynamics and understand concept of entropy 4. Understand the properties of steam, work done and heat transfer during various thermodynamics processes with steam as working fluid 5. Understand the concept of air standard cycles
3ME05 FLUID MECHANICS	1. Identify importance of various fluid properties at rest and in motion 2. Derive and apply general governing equations for various fluid flows 3. Understand the concept of boundary layer theory and flow separation. 4. Calculate energy losses in pipe flow. 5. Evaluate the performance characteristics of hydraulic jets


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SEMESTER-IV

Subject	Course outcomes
4ME01 MATERIAL SCIENCE	<ol style="list-style-type: none"> 1. Basic concepts of metallurgy and types of materials, 2. Iron-Carbon Equilibrium Diagram, critical temperatures, formation of microstructures and they will get the knowledge of alloys. 3. Uses and practical applications of ferrous & non ferrous materials 4. Various heat treatment processes, powder metallurgy and industrial applications.
4ME02 ENERGY CONVERSION - I	<ol style="list-style-type: none"> 1. Students will study the concept steam and steam power plant, mounting and accessories. 2. Students will demonstrate the calculation of various efficiency & related parameters. 3. Student will show the adequate knowledge of fuel & ash handling systems. 4. Students will demonstrate the knowledge of condenser & application. 5. Students will understand the concepts of steam nozzles & steam turbine.
4ME03 MANUFACTURING TECHNOLOGY	<ol style="list-style-type: none"> 1. Apply the knowledge of theory of metal cutting, tool selection & calculate cutting forces 2. Demonstrate the knowledge of basics of turning operations 3. Understand the drilling and boring operations and working of drilling & boring machines 4. Understand the milling and gear cutting operations and working of respective machines 5. Understand the working of grinding, shaper, planer and slotter machines 6. Understand the knowledge of unconventional machining processes
4ME04 BASIC ELECTRICAL DRIVES AND CONTROL	<ol style="list-style-type: none"> 1. Understand the working of electrical drives and their components 2. Understand the basics of DC motors and their characteristics 3. Understand the working of AC motors, induction motors and concept of braking 4. Understand the different speed control methods of A.C. and D.C. motors 5. Understand the design of transducers and their applications 6. Understand the industrial applications of different drives
4ME05 HYDRAULIC AND PNEUMATIC SYSTEMS	<ol style="list-style-type: none"> 1. Demonstrate basic concepts of prime movers and turbines 2. Utilize the knowledge of centrifugal and reciprocating pumps for applications 3. Reveal the importance of other water lifting devices 4. Solve the elementary treatment on compressible fluid flow 5. Understand the concept of hydrostatic and hydrokinetic systems 6. Use the knowledge of hydraulics & pneumatics in developing project work.


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DEPARTMENT OF MECHANICAL ENGINEERING**SEMESTER-V**

Subject	Course outcomes
5ME01 HEAT TRANSFER	<ol style="list-style-type: none">1. Apply the concept of heat transfer, laws of heat transfer and various mathematical equations.2. Demonstrate the knowledge of determining the thermal conductivity of various materials.3. Understanding and verifying various laws of radiation. Capable to explain the concept of heat exchanger and demonstrate the calculations of efficiency.
5ME02 METROLOGY & QUALITY CONTROL	<ol style="list-style-type: none">1. Create & apply the concept of inspection, quality control and its importance to industry.2. Demonstrate the skills of controlling various out of control processes using statistical quality control tools.3. Understand the importance of improving production and productivity using work study approach.4. Apply the knowledge of various measurement standards and techniques in the industry to measure various parameters related to metrology.
5ME03 KINEMATICS OF MACHINES	<ol style="list-style-type: none">1. Understand & apply the concept and its applications of link, mechanisms and machines.2. Demonstrate the ability to analyze the mechanisms and machines on the basis of velocity and acceleration and they will show the ability to solve analytical methods.3. Show the ability to use graphical and analytical methods for synthesis of mechanisms to develop mini projects in the course duration.4. Understand the practical for study of brake, clutch, dynamometer, gear train etc.
5ME04 MEASUREMENT SYSTEMS	<ol style="list-style-type: none">1. Understand & apply the concept of measurement system and will know its importance related to the industry.2. Demonstrate the ability to measure various parameters like pressure, flow, speed, vibration etc.3. Understand to use various measuring instruments.4. Understand the practical approach of engineering and will be confident in industry.
5ME05-PRODUCTION MANAGEMENT	<ol style="list-style-type: none">1. Apply the knowledge of operations management and its applications in industrial environment.2. Demonstrate the knowledge of advanced manufacturing technologies and philosophies.3. Students will demonstrate the importance of inventory control, JIT in manufacturing.
5ME05 MANUFACTURING TECHNIQUES	<ol style="list-style-type: none">1. Apply the knowledge of various manufacturing techniques and its applications in engineering.2. Understand the knowledge of machining operations, sheet metal working and processes.3. Students will show the ability to apply various joining methods in practice.4. Students will exhibit the knowledge of powder metallurgy.



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SEMISTER-VI

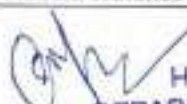
Subject	Course outcomes
6ME01 DOME	<ol style="list-style-type: none"> 1. Understand the concept of various stresses and apply the design procedure to riveted joints and welded joints. 2. Understand design procedure of knuckle joint, springs and power screw. 3. Analyze & select types of shafts, keys, couplings for various machines and industrial applications. 4. Analyze the various types of bearings and understand the design procedure of IC Engine parts.
6ME02 DYOM	<ol style="list-style-type: none"> 1. Apply basic concept of static force analysis and lubrication mechanism. 2. Understand the knowledge of dynamic force analysis analytically and graphically 3. Apply the knowledge of space mechanism and vehicle dynamics. 4. Understand concept of free vibration and force vibration, concept of Tensional vibration. 5. Analyze the concept of balancing of machinery.
6ME03 CONTROL SYSTEM ENGINEERING	<ol style="list-style-type: none"> 1. Understand the basic system concept and study different types of systems. 2. Understand the concept Transient- Response analysis and will apply in numerical methods, the knowledge of basic control action and industrial controllers. 3. Understand the concept of Stability and exhibit the knowledge of root locus concept. 4. Understand the concept of Frequency Response method and use bode diagram in solving analytical problems
6ME04 TOOL ENGINEERING	<ol style="list-style-type: none"> 1. Create the design of single and multi point cutting tools. 2. Apply the knowledge related to machining in order to estimate tool life and selection of cutting fluids. 3. Create the design of multipoint tools like twist drills, reamers, broach and milling cutters & press working dies like punching, blanking and drawing. 4. Analyze the real time problems of work holding by designing jigs and fixtures.
6ME05 NON- CONVENTIONAL ENERGY SYSTEMS	<ol style="list-style-type: none"> 1. Able to study the concept of renewable and non-renewable sources. 2. Apply the basic concept of solar energy utilization and storage. 3. Apply the concept of energy from ocean and wind. 4. Study the concept of bio-mass energy resources.


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SEMESTER-VII

Subject	Course outcomes
7ME01 MECHATRONICS	<ul style="list-style-type: none"> Understand the concept of computer process control. 3. Create the working models for various mechatronics system for industrial applications. 4. Create mini projects on material handling systems like pick and place type robot, machine loading system etc. 5. Create pneumatic and hydraulic circuits for various industrial applications.
7ME02 PRODUCTIVITY TECHNIQUES	<ul style="list-style-type: none"> 1. Understand Productivity. 2. Differentiate Method Study & Work Measurement. 3. Apply Ergonomics Principles. 4. Analyze Wage payment & Incentive Plans. 5. Implement reengineering. 6. Understand different Maintenance methods.
7ME03 INDUSTRIAL MANAGEMENT & COSTING	<ul style="list-style-type: none"> Understand the working of business environment. 2. Understand the management thoughts, its evolution and functions. 3. Apply standard and scientific techniques in materials management. 4. Evaluate time, costs, cost sheet and depreciation of industry.
7ME04 ENERGY CONVERSION – II	<ul style="list-style-type: none"> Understand the working of different types of compressors. 2. Analyze, handle and resolve the problems related to working of air compressor. 3. Understand the principle of working of refrigeration systems, air conditioning and its applications. 4. Understand various nuclear reactions and issues related to working and maintenance of nuclear power generation.
7ME05 COMPUTER INTEGRATED MANUFACTURING	<ul style="list-style-type: none"> Able to Specify a quality control method for analyzing a finished product. 2. To develop a strategy for implementing computer integrated manufacturing. 3. To synthesize and apply the concepts learnt 4. Describe various operation in numerical control system and part programming 5. Describe CNC machining and interfaces of CAM and CNC 6. Undertake, under supervision, laboratory experiments to design in CAD and to program in CAM for machining.
7ME05 AUTOMOBILE ENGINEERING	<ul style="list-style-type: none"> Understand the basics of automobile engineering and its components. 2. Idea creation of cooling system, electrical system and ignition system. 3. Analysis of transmission system and types of gears box. 4. Design and development of suspension and lubrication.
7ME05 DESIGN OF TRANSMISSION SYSTEM	<ul style="list-style-type: none"> 1. Selection of belts, chains and rope drives 2. Failure theories Gears & design of spur gear 3. Interpret the concepts of design of fluid couplings and torque converters 4. Design of gear boxes 5. Design of design of cams, brakes and clutches


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7ME05
COMPUTATIONAL FLUID
DYNAMICS

Numerically solve the governing partial differential equations of fluid flow and heat transfer problems.

- Construct and solve the different mathematical models and computational methods for fluid flows.
- Apply the discretization methods to solve fluid flow and heat transfer problems.
- Choose and justify the CFD schemes for the respective fluid flow/transport phenomena problem.
- Perform verification and validation of numerical model.
- Demonstrate the ability to use modern CFD software tools.



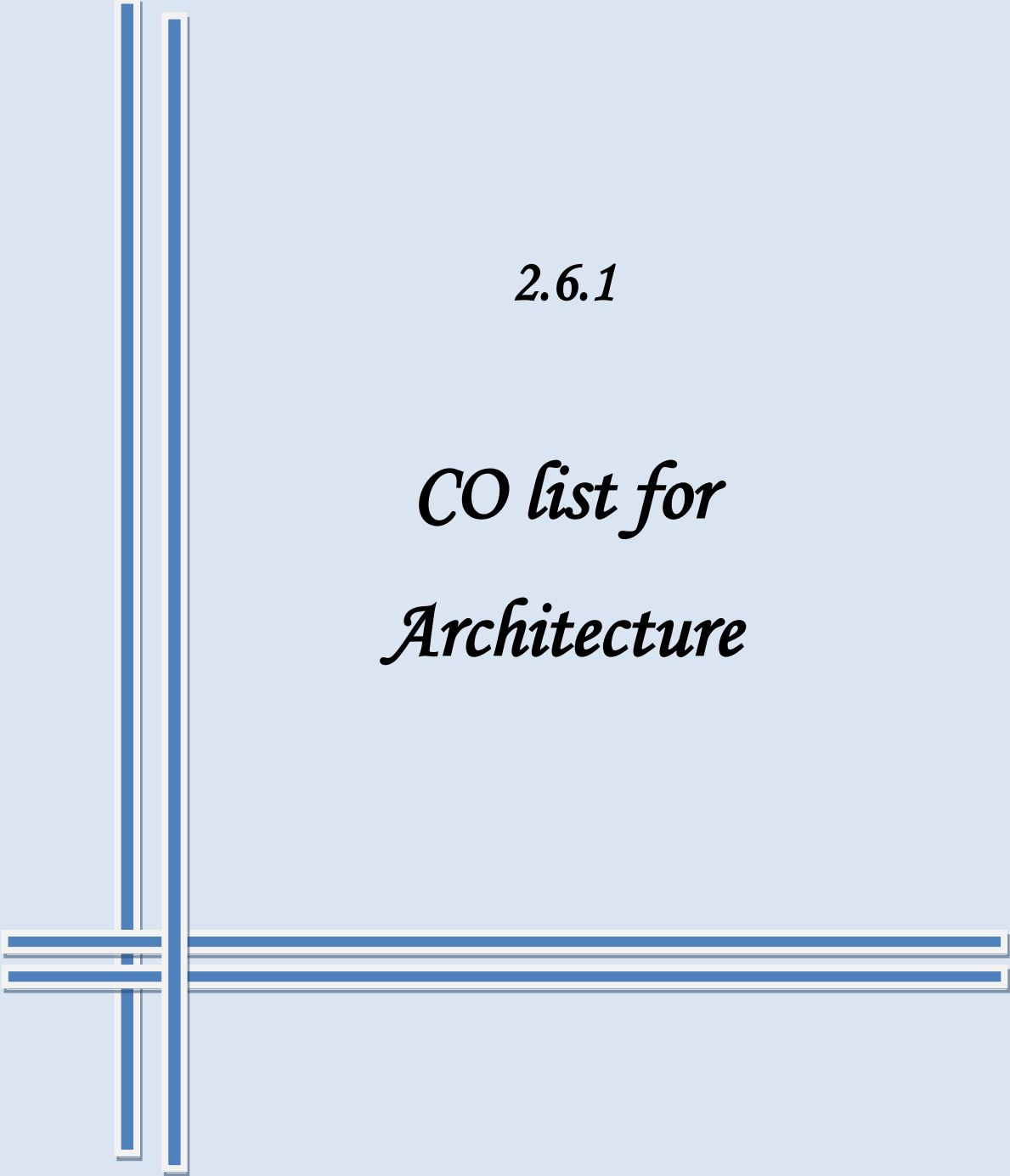
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SEMISTER-VIII

Subject	Course outcomes
8ME02 I. C. ENGINES	Remember fundamentals of I.C. engines, their types and cycle analysis. 2. Remember the knowledge of fuels and alternative fuels, study of fuel injection pump. 3. Remember the concept of combustion of CI engine. 4. Understand the concept of supercharging its objectives, advantages and limitations.
8ME01 OPERATION RESEARCH TECHNIQUES	Course Outcomes (CO): 1. Understand the knowledge of OR and OR models. 2. Analyze the transportation problems and related issues. 3. Understand the concept network models, CPM and PERT analysis. 4. Understand the concept replacement models and solve the problem on simulation techniques.
8ME03 ENERGY CONSERVATION & MANAGEMENT	1. To understand the basic knowledge of different terms & principles of energy conservation, audit and management. 2. To Evaluate the energy saving & conservation in different mechanical utilities 3. To understand efficient heat & electricity utilization, saving and recovery in different thermal and electrical system. 4. To prepare energy audit report for different energy conservation instances.
8ME03 RODUCTION PLANNING AND CONTROL	1. Understand the importance of production planning and control, its functions, advantages. 2. Apply the skills of calculating for sales forecasts using various forecasting methods. 3. Remember concept of machine capacity, loading of machines and man machine activity charts. 4. Understand concept of inventory control & various cases of inventory system and modern techniques/philosophies of management like CIM, JIT, MRP-I and MRP-II.
8ME04 REFRIGERATION & AIR CONDITIONING	1. Understand the fundamental basics of simple vapour compression system, types of refrigerant used in refrigeration system. 2. Understand the multistage pressure system, its types and elementary treatment of refrigeration system. 3. Apply the knowledge of refrigeration system and its controls, defrosting. 4. Apply the concept air conditioning system as winter, summer air conditioning system applications and its related issues.
8ME04 ROBOTICS & INDUSTRIAL APPLICATIONS	1. Understand the concept of robotics, its history. 2. Remember robot anatomy and various configurations for different industrial applications. 3. Understand the concept of kinematic analysis of robots. 4. Remember the concept robot programming, its methods and programming languages.


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2.6.1

***CO list for
Architecture***

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B.Arch.

PROGRAM OUTCOMES (POs)

POs are statements that describe what students are expected to know and be able to do by the time of graduation. The program outcomes for Bachelor of Technology are as follows:

PO1: Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, research literature & analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences & engineering.

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or process that meet specified needs with appropriate considerations for public health and safety, cultural, societal, and environmental considerations.

PO4: Conduct Investigations of Complex Problems: Using research-based knowledge & research methods including design of experiments, analysis & interpretation of data & synthesis of information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select & apply appropriate techniques, resources and modern engineering & IT tools including prediction & modelling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues & the consequent responsibilities relevant to professional engineering practices.

PO7: Environment and Sustainability: Understand the impact of engineering solutions in societal and environmental context & demonstrate knowledge of & 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 a leader in diverse teams and in multidisciplinary settings.

PO10: Communication: Communicate effectively in 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 receive clear instructions.


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PO11: Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as member and a 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 lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Visual & Creativity: Understanding and analyzing the thought process to develop and create desirable and functional designs with respect to every other architectural challenge in a broad spectrum of flexible options.

PSO2: Problem-Solving Skills: Apply standard and strategic logical solutions to architectural, urban, landscape and interior designs to deliver quality and efficient design solutions.

PS O3: Architectural Practice: Work professionally in methods using drafting, 3d software, generic land knowledge and proposed by-laws


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SEMESTER – I

01AR01: BUILDING MATERIALS AND CONSTRUCTION-I THEORY

CO1: Understand properties of wood and its allied products.

CO2: Understand various types of treatments to timber materials construction.

CO3: Understand various types of Timber doors and windows choosing appropriate materials and techniques as per current market trends.

CO4: Understand various construction techniques of Timber windows.

CO5: Understand & Analyze various types of Timber trusses.

CO6: Analyze various Timber structures.

01AR01: 01AR02 - ARCHITECTURAL GRAPHICS-I THEORY

CO1: Understand drafting procedure, lines, lettering, Dimensioning, graphic codes and symbols.

CO2: Understand various construction of Architectural scales construction.

CO3: Understand Construction of basic and complex geometrical shapes and curves. Choosing appropriate materials and techniques as per current market trends.

CO4: Analyze Principles and projection methods of orthographic.

CO5: Understand & Analyze Projection of straight lines, planes, solids, sections of solids and development of surfaces.

CO6: Introduction to Architectural plans, Elevations and Sections.

01AR03: HISTORY OF ARCHITECTURE & CULTURE – 1

CO1: Recognize & Understand Old Stone Age – the agricultural revolution – The New stone age- Development of shelter.

CO2: Understand River valley civilization and cultures.

CO3: Recognize various thematic study of cultural influence different rulers.


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CO4: Recognize Cave painting Architecture.

CO5: Recognize & Understand Miniature painting – Indian and Islamic miniature paintings.

CO6: Understand Impressionism/Expressionism/Cubism/Futurism/ Abstract Art.

01AR04 - COMPUTER GRAPHICS THEORY

CO1: Understand Technology of small computer system, computer terminology operation principles.

CO2: Understand various types of application software, and graphic system construction.

CO3: Understanding the use of drawing tools, object editing, drawing.

CO4: Setting up of drawings of various simple architectural objects with complete text and dimensioning.

CO5: Understand & Analyze Advance computer aided 2D Draft Advance computer aided 2D Drafting.

CO6: Understand Advance command programming.

01AR05_ARCHITECTURAL COMMUNICATION SKILLS

CO1: Understand Comprehension Skills

CO2: Understand Writing Skills

CO3: Understand Architectural Communications I

CO4: Understand Architectural Communications II

CO5: Understand Other forms of written communications.

CO6: Understand Public speaking and presentation skills.



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SEMESTER – II

02AR01: BUILDING MATERIALS AND CONSTRUCTION-II THEORY

- CO1: Understand properties of wood and its allied products.
- CO2: Understand various types of treatments to timber materials construction.
- CO3: Understand various types of Timber doors and windows choosing appropriate materials and techniques as per current market trends.
- CO4: Understand various construction techniques of Timber windows.
- CO5: Understand & Analyze various types of Timber trusses.
- CO6: Analyze various Timber structures.

02AR04: THEORY OF ARCHITECTURE – THEORY

- CO1: Introduction to Architecture definition of architecture, elements of architecture
- CO2: Understanding architectural design, scope of Architecture integration of aesthetic and functional correlation.
- CO3: Understand space and mass, visual and emotional effect of geometrical form like cube, cylinder, pyramid, cylinder cone.
- CO4: Understand aesthetic components of design - proportion, scale, balance rhythm symmetry, pattern and axis with building example.
- CO5: Understand & Application of color in Architecture, color symbolism.
- CO6: Understand & Application of all with examples with different building examples.


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02AR05: ARCHITECTURAL STRUCTURE - I

CO1: Concurrent and non-concurrent coplanar forces, moment, conditions of equilibrium

CO2: Statically determinant plane frames, determination of forces in members of pin-jointed frames by analytical and graphical methods, wind forces on frames.

CO3: Stress, strain, hook's law, lateral strain, Poisson's ratio, young's modulus, modulus of rigidity, bulk modulus and their relationships.

CO4: Shear force and bending moment diagrams for strained beams

subjected to concentrated and distributed loadings.

CO5: Centroid and moment of inertia of plain areas, parallel axis theorem, moment of inertia, principal axis

CO6: Bending stresses and deflection in simply supported beams and cantilever beams.

02 AR02: ARCHITECTURAL GRAPHICS - II

CO1: Understanding Measured drawing of simple objects.

CO2: Introduction to architectural presentations techniques, isometric and oblique three-dimensional views, conical projections, perspectives, one point and two point.

CO3: Introduction to basic terms, principles, types and techniques of perspective drawing: realistic expression of ideas.

CO4: Understanding a two-point perspective of simple objects.

CO5: Understanding basic principles of sciography and its application to the field of architecture.

CO6: Understanding Sciography of three-dimensional objects in plan and elevation and views.



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02AR03: HISTORY OF ARCHITECTURE II

CO1: Recognize & Understand Indus Valley Civilization.

CO2: Understand Hinayana and Mahayana Buddhism – Interaction of Hellenic & Indian Ideas in Northern India.

CO3: Evolution of Hindu Temple – Early shrines of the Gupta and Chalukyan periods.

CO4: Recognize Dravidian Architecture & Dravidian culture.

CO5: Understanding salient features of an Indo Aryan Temple

CO6: Architectural solutions through historical periods to understand the building materials, construction techniques, planning and designing features.


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SEMESTER – III

03 AR01: APPLIED MATERIAL - THEORY

CO1: Different types of finishing & furnishing materials for interior and exterior

CO2: artificial and natural paving & cladding materials

CO3: polymer and polymer-based materials for walls pipes sanitary ware their properties.

CO4: manufacturing timber-based materials. False ceiling

CO5: materials useful for different types of partition like glass aluminum etc. their properties.

CO6: acoustical materials their application, use. Structural glazing, curtain walling.

03 AR02: BUILDING MATERIAL AND CONSTRUCTION III-THEORY

CO1: Introduction to timber floor, specific application to various activities. Study of single double, triple, jack arch, composite floor.

CO2: Application of false ceiling materials such as asbestos sheets, soft boards, acoustic boards, plaster of Paris etc.; on timber, steel, or aluminum framework.

CO3: Cement and its varieties, composition, properties, uses, tests

CO4: Concrete - manufacture & properties, ingredients suitability

CO5: Introduction and purpose of foundation, Brief introduction to types of shallow and deep foundation.

CO6: Formwork and its importance to R.C.C. building elements, comparison & analysis of steel & timber foundation


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03AR04 _APPLIED CLIMATOLOGY-I THEORY

CO1: Understand ideas, issues, and concepts of sustainable Architecture, related to types of climates.

CO2: Understand & Analyze applications for heating and cooling.

CO3: Evaluate various low energy and wind systems.

CO4: Understand & Analyze day light factors.

CO5: Analyze Applications of Climatic Principles.

CO6: Understanding & Analyze the planning and design features to be considered with respect to various Climate.

03AR05: ARCHITECTURAL STRUCTURE-II THEORY

CO1: Recognize & Understand Strain energy in tension, compression and shear; tension member under impact load.

CO2: Understand Theory of simple bending in beams. Distribution of shearing and bending stress on horizontal section.

CO3: Recognize Column and struts, Euler's theory of long column, Ranking theory.

CO4: Recognize & Understand Foundation design soil aspects.

CO5: Recognize& Understand Design methods of compaction and consolidation.

CO6: Understand Direct and bending stresses, eccentric loading on short column, middle third rule, chimneys.



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SEMESTER – IV

04 AR07: BUILDING MATERIALS & CONSTRUCTION STUDIO - IV THEORY

CO1: Recognize & Understand Ferrous metals, brief study of cast iron, wrought iron, pig iron and steel.

CO2: Understand Nonferrous metals and its various uses in building construction. Steel and aluminum sections for door design

CO3: Understand Metal casements useful for windows and ventilators & types of metal casements windows.

CO4: Recognize & Understand Metal casements useful for partitions, fixtures, fitting, and method of fixing.

CO5: Recognize & Understand Composition of Glass, brief study on manufacture, treatment, properties, and uses of glass.

CO6: Understand Thermoplastic and thermosets properties and architectural uses of plastics.

04 AR03: HISTORY OF ARCHITECTURE - II THEORY

CO1: Recognize & Understand Delhi OR Imperial Style. Development of Architectural Style during the Dynasties

CO2: Understand Provincial Style: Development of the Provincial Style of different regions.

CO3: Recognize various Mughal Style: Development of the Mughal Style under the different rulers.

CO4: Recognize & Understand Industrial Revolution and its effect on modern contemporary Architecture.

CO5: Recognize & Understand Western Pioneer Architects, their philosophy and work.

CO6: Understand Indian Contemporary Architects and their work.


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04AR04: APPLIED CLIMATOLOGY- II THEORY

CO1: Recognize & Understanding of planning, designing, materials and techniques considered in traditional structures with respect to climate.

CO2: Understand Impact of Micro and Macro climatic conditions.

CO3: Recognize Thermal properties of traditional and modern building materials and its comparative analysis.

CO4: Recognize & Understand Solar chart and its use.

CO5: Recognize& Understand Day light factor; effect of size.

CO6: "Understand Planning and design of building by considering Passive Cooling and heating.

04AR05: ARCHITECTURAL STRUCTURE-II THEORY

CO1: Recognize & Understand Fixed beams with concentrated load and uniformly distributed Load.

CO2: Understand Continuous beams (without settlement) with uniform sections by three moments.

CO3: Recognize Moment distribution method for symmetrical portal frames with symmetrical load.

CO4: Recognize & Understand Understanding and identification of location of forces.

CO5: Recognize& Understand Design procedures for simple load bearing foundations.

CO6: Understand architectural solutions Improvement of soil properties.


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SEMESTER – V

05AR01: BUILDING MATERIALS AND CONSTRUCTION-V

CO1: Understand structural steel members with connections of girders, stanchions and grillage foundations.

CO2: Understand various types of R.C.C frame structures and detailing of R.C.C. work with reinforcement for one way & two-way slabs, R.C.C. beams, columns, footings, and its types.

CO3: Understand R.C.C. cantilevers and reinforcement details in chajjas, balcony, canopy, lofts, etc. R.C.C. staircases and its reinforcement details

CO4: Understand shallow foundations and its types.

CO5: Understand appropriate cost-effective construction techniques and materials to be useful to conserve energy.

CO6: Understand special concrete and concreting methods, properties and uses. current developments in concrete product.

05AR02: BUILDING SERVICES AND EQUIPEMENTS

CO1: Understand general ideas of types of water impurities. Systems of water supply of low-rise buildings and high-rise buildings

CO2: Understand and analyze computing water demands for various uses - hot water supply system- solar water heater- geysers.

CO3: Understand water supply pipes and fittings, material, size and classifications. Types of taps, toilet and kitchen fittings.

CO4: Understand water storage reservoir, their types and importance in water supply scheme.

CO5: Understand drainage systems, conservancy, and water carriage systems.

CO6: Understand sewage disposal systems from building.


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05AR04: SPECIFICATION

CO1: Understand the art of writing specifications of material along with emphasis on the quality of the materials and proper sequence of construction works.

CO2: Understand Importance of specification in the building activities, method of writing correct order and sequence of use of materials.

CO3: Analyze primary considerations for selections of materials for various operations.

CO4: Understand specifications of basic materials required in residential buildings such as bricks, concrete, r.c.c., plastering, various finishes, timber work, flooring materials, glazing, metals.

CO5: Understand specification of works for residential building- load bearing masonry type and R.C.C. framed type, steel structures, ceiling and partitions.

CO6: Understand and analyze paneling, insulation and waterproofing. Specification for services such as drainage, water supply, electrical installation.

05AR03: ARCHITECTURAL STRUCTURE-IV

CO1: Understanding of Basic Theory of Concrete technology.

CO2: Understanding Mild steel and tor steel reinforcement, bending and fixing, placing of concrete and methods of compacting, expansions and constructions joints.

CO3: Understanding & analyzing Use of I.S. Code for R.C.C. member, I.S.456, I.S.800, I.S.875

CO4: Understanding R.C.C. theory - Introduction to limit state method.

CO5: Understanding & analyzing Column, beam and slab design in limit state method.

CO6: Understanding & analyzing R.C.C. footing and staircases design by limit state method.


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SEMESTER – VI

06AR02: BUILDING MATERIALS AND CONSTRUCTION-VI

CO1: Understand Structural steel framework & trusses for various spans, design consideration, advantages, connection of various members supported on R.C.C. column, brick piers, fixing, wind bracing etc.

CO2: Understand Steel north light roof trusses, connections Gutters, patented glazing.

CO3: Understand Patent glazing for skylights, lanterns, steel Monitor roofs, methods of fixing, fixtures and fastenings.

CO4: Understand precast building elements, comparative study with cast in situ constructions and its construction details.

CO5: Understand Study of Deep foundation and study, Pile foundation and its purpose.

CO6: Understand shoring its purposes and types. Underpinning its purposes and types.

06AR04: ESTIMATE AND COSTING

CO1: Understand types of estimates. Data required for framing estimate method of preparing estimates.

CO2: Understand standard mode of measurement, schedule of rates and its use, administrative approval, technical sanction, competent authority, issue rate, interest, indent of work etc.

CO3: Understand Method and procedure of working out abstract and bill of quantities.

CO4: Understand examples and exercise for working out quantities for items.

CO5: Understand rate analysis, factors affecting the rate of an item, rate analysis of advance equipment's use in buildings.

CO6: Understand and analysis detail estimate of project given.


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06FEAR06: ACOUSTICS AND ILLUMINATION

CO1: Understand and analysis sound waves, frequency, intensity, wavelength, measure of sound, decibel scale, speech and music frequencies.

CO2: "Understand and analysis sound transmission and absorption – outdoor noise levels, acceptable indoor noise level, sound absorbing materials, absorption co-efficient and measurements, resonance reverberation time, sound levels and their calculations.

CO3: Understand acoustical defects and remedies.

CO4: Understand and analysis site selection, shape, volume, treatments for interior surfaces, basic principles in designing open air theatres, cinemas, broadcasting studio, concert hall, theaters, lecture halls.

CO5: Understand principles of Illumination-

CO6: Understand and analysis lighting design & classification of lighting.

06AR03: ARCHITECTURAL STRUCTURE-V

CO1: Understanding of Basic Theory and principles of structural analysis and structural properties of elements.

CO2: Understanding Application of thumb rules for beams, columns, slab for fixing & sectional properties.

CO3: Understanding & analyzing Water tanks resting on ground with flexible and rigid base by I.S. code method.

CO4: Understanding types of joints in steel structures, riveted, welded and bolted joints. Types of steel section and their properties.

CO5: Understanding & analyzing Simple welded and riveted connection (without moments) only axial loads.

CO6: Understanding & analyzing Design of simple tension and compression member of trusses.


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SEMESTER – VII

07AR02: ENVIRONMENTAL SERVICES II

CO1: Introduction To impart knowledge of various aspects of city level water supply systems, drainage and solid waste disposal.

CO2: "Understand To apply water supply systems, drainage and solid waste disposal building planning principles practically while developing projects construction.

CO3: To study climatic conditions and decide corresponding provisions of water supply, sanitary system in planning level.

CO4: To know about garbage disposal recycling method vermicomposting biogas.

CO5: To know about water treatment, water pollution, its prevention, rainwater harvesting.

CO6: Explain different environmentally friendly services, treatments for sustainable architecture.

07AR01: ADVANCE CONSTRUCTION I

CO1: Analysis of different type of foundation as per load bearing capacity of soils, types of soil and building loading conditions.

CO2: Introduction of earthquake, types of earthquakes, origin and causes of earthquake.

CO3: Understanding Remedial measures in terms of planning, designing, materials and techniques for earthquake resistant structure.

CO4: Analyze General study of standardization of building elements its uses for various construction.

CO5: Understanding Concept of curtain wall and structural glazing material and construction techniques, fixing details of various metal casements.

CO6: Understanding Architectural glass system.


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07AR04: URBAN PLANNING

CO1: Understanding Urban planning interrelationship between urban planning, urban design, urban landscape design.

CO2: Understanding & analyzing planning during Medieval and renaissance period in western and Indian context.

CO3: Understanding & analyzing Evolution of modern planning concepts. Impact of industrial revolution on planning process.

CO4: Introduction to TPS, master plans, structure plan, regional plans, land use planning, Neighborhood Planning, zoning.

CO5: Understanding & analyzing Recent trends in urban planning, new towns development, SEZ, JNNURM, Green cities, ISHDP, Urban renewal process.

CO6: National habitat and housing policy. Slum improvement scheme, ISHDP, DCR relevant to housing.

07AR03: PROFESSIONAL PRACTICE

CO1: Role of professional bodies

CO2: Understanding Professional responsibilities of the architect, copyrights, scale of charges, variation of charges, mode of payment, termination of services, specialized building services.

CO3: Understanding techniques of valuation, elements of valuation and factors affecting valuation. Methods, valuation of landed and building property, comparable cost of sale, purchase and

CO4: Analyzing Valuation for compensation on acquisition, compensation under central and state legislation, relevance of the Town Planning Act.

CO5: Analyzing valuation for renewal or lease/extension of lease, standard rent, easement rights, dilapidation, insurance, estate development and advice on investment policy.

CO6: Understanding arbitration, arbitrators, umpire and nature of arbitration.


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SEMESTER – VIII

08AR03: ENVIRONMENTAL SERVICES II

CO1: To understand students specialized services in building.

CO2: Understand & apply these services in building planning principles practically while developing projects construction.

CO3: to study climate conditions and decide corresponding provisions of services in structure.

CO4: To know about safety precautions and regulations in building while applying services.

CO5: To implement various services in building plans manually and computationally.

CO6: Explain different materials especially eco-friendly materials and safety measures to be adopted at any construction site.

08AR04: SUSTAINABLE ARCHITECTURE

CO1: Introduction of Planning Concept EIA, understanding the essential ingredients of Sustainable development.

CO2: Understanding the historical development of early settlement pattern to study the planned layouts, orientation of streets, habitable environment, and planning methods.

CO3: To check the availability of resources and implementation of these at building and campus level.

CO4: Implementation of appropriate construction techniques with sustainable materials and ecofriendly construction practices.

CO5: Understanding the sustainable planning policies like Rio de Jannero agenda, Earth summits at national and international level.


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08AR05: LANDSCAPE DESIGN

CO1: Landscape Architecture. Understanding man and nature land and landscape. Relationship of architecture and Landscape Architecture

CO2: History of the art of garden design of India, China, Persia, Japan, Italy, France and England.

CO3: Study of Garden Design of the modern world.

CO4: Basic Principles of landscape design and element. Types of landscape elements and their various uses.

CO5: To study Plant classification & plant identification. Study of various types of plants and their suitability of landscaping, plant selection criteria, planting design and visual aspects of plant form.

CO6: Methodology and process of site analysis, Preparation, interpretation and evolution of landscape site planning.

08AR02: ADVANCE CONSTRUCTION - II

CO1: Understanding general introduction to large span structures and high rise structures, planning features and its construction aspects

CO2: Understanding R.C.C. and steel space frame structures.

CO3: Understanding constructions aspect consider in temporary structures which are in portable nature for various short terms events.

CO4: Implementation ferro cement techniques and its appropriate various uses for building construction elements

CO5: Introduction to prestressed concrete, principle and method of prestressing, advantages, and disadvantages.

CO6: Understanding types of elevators.



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SEMESTER – IX

09AR01: Practical Training (At Architectural Practicing Firm/ Company)

Each candidate shall have to prepare a detail report along with necessary drawing, sketches, measurement, record, reading, observations, survey analysis, log sheets and modes, if necessary, on the following size aspects which are concerned with the poetical training.

SEMESTER – X

10AR01: CLIMATE RESPONSIVE ARCHITECTURE THEORY

CO1: Understand ideas, issues, and concepts of sustainable Architecture, related to types of climates.


CO2: Understand & Analyze applications for heating and cooling.

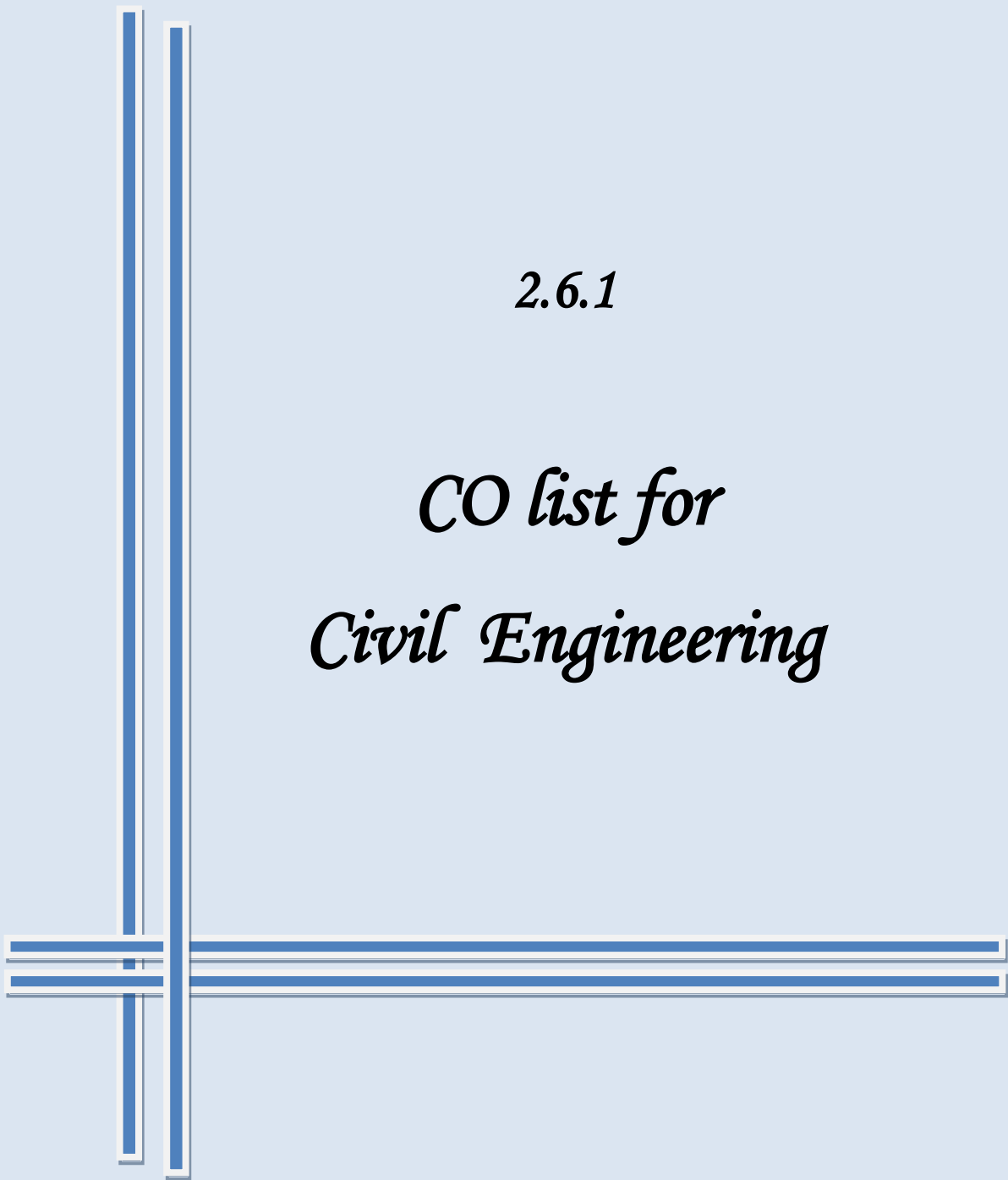
CO3: Evaluate various low energy and wind systems.

CO4: Understand & Analyze day light factors.

CO5: Analyze Applications of Climatic Principles.

CO6: Understanding & Analyze the planning and design features to be considered with respect to various Climate.


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2.6.1

***CO list for
Civil Engineering***

College of Engineering and Technology, Akola

Department of Civil Engineering

Program Outcomes (PO)	Statement
PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and Civil Engineering principles to the solution of complex problems in Civil Engineering.
PO2	Identify, formulate, research literature, and analyze complex Civil Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
PO3	Design solutions for complex Civil 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	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 related to Civil Engineering problems.
PO5	Create, select, and apply appropriate techniques, resources, and modern engineering tools such as CAD, FEM and GIS including prediction and modeling to complex Civil Engineering activities with an understanding of the limitations.
PO6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Civil Engineering practice.
PO7	Understand the impact of the professional Civil Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the Civil Engineering practice.
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communicate effectively on complex Civil 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	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 Civil Engineering projects and in multidisciplinary environments.
PO12	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.

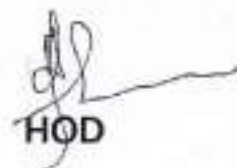

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Department of Civil Engineering

Program Specific Outcomes

PSO1	Plan, analyze, design, prepare cost estimates and execute all kinds of Civil Engineering Projects.
PSO2	Apply modern construction techniques, equipment and management tools so as to complete the project within specified time and funds.
PSO3	Graduates will have requisite understanding on impact of civil engineering projects and processes in a global, economic and societal context.



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THIRD SEMESTER

3CE01 MATHEMATICS III

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations; applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Partial Differential Equations.
4. Compute different Numerical Methods.
5. Apply the knowledge of Complex Analysis.
6. Demonstrate the basic concepts of probability and statistics.

3CE02 – STRENGTH OF MATERIALS

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.
6. To understand the concept of Columns and the various parameters required to analyze the columns

3CE03 – BUILDING CONSTRUCTION & ENGINEERING GEOLOGY

Course outcomes:

At the end of the subject the students will be able -

1. To understand Load bearing and Frame structure.
2. To recognize various types of construction material and its suitability
3. To recognize the various levels in building and its need.
4. To know types of staircase, doors, windows and other related fixtures.
5. To recognize types of rock and minerals and its construction properties.
6. To know reason for earthquake and seismic waves.

3CE04 – TRANSPORTATION ENGINEERING

Course outcomes:

At the end of the subject the students will be able –

1. To identify type of roads and its utility.
2. To understand the application of various road studies at time of survey and actual construction.
3. To design the various types of road pavements.
4. To understand rules regulations, signals, type of gauges and railway sleepers density.
5. To recognize the Airport features and design concept of components for Aero plains movement.
6. To identify types and components of Tunnels and bridges and its design components.

3CE05 – CONCRETE TECHNOLOGY & RCC

Course outcomes:

At the end of the subject the students will be able -

1. To know need and composition of binding material, cement.
2. To recognize concrete and RCC and will be able to perform desired test for suitability.
3. To analyze RCC Components like slab and lintels.
4. To decide and utilize the admixtures as per the need of Concrete.
5. To understand importance of mix design.
6. Able to describe the behavior and repair of concrete structures under adverse conditions


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FOURTH SEMESTER

4CE01 BUILDING PLANNING DESIGNING & CAD

Course outcomes:

At the end of the subject the students will be able -

1. To make engineering drawings by First angle and Third angle method.
2. To apply building planning principles practically while developing projects.
3. To study the climatic conditions and decide the corresponding provision in structure.
4. To know about Bylaws, Town development authority rules and terms.
5. To draw various plans manually and computationally.
6. Able to compile ideas and plan public buildings.

4CE02 - HYDROLOGY & WATER RESOURCE ENGINEERING

Course outcomes:

At the end of the subject the students will be able -

1. Explain the hydrology and hydrological data.
2. To analyse the hydrological methods for runoff.
3. Evaluate the ground water hydrological problems.
4. Explain the need of irrigation systems and its alternatives.
5. Able to characterize the various terms related to reservoir planning.
6. Able to explain the lift irrigation schemes and process of water logging.

4CE03 SURVEYING

Course Outcomes:

At the end of the course the student will be able to:

1. Define principles of Surveying, Remote Sensing and Geomatics.
2. Describe different instruments, tools, applications and techniques to determine the positions on the surface of the earth, change detection.
3. To perform Linear measurement methods of surveying.
4. Differentiate the techniques for setting out alignments, curves, other layouts, modern survey systems etc.
5. To perform survey at elevation and conduct Plane Table survey.
6. Able to set out civil engineering works and use of modern digital equipment.

4CE04 - GEOTECHNICAL ENGINEERING -I

Course Outcomes:

At the end of the subject the students will be able –

1. To determine the Index properties and Atterberg limits for soil classification.
2. To understand the mechanics of compaction and quality control in field.
3. To explain permeability of soil and methods of dewatering.
4. To calculate the seepage discharge and design the graded filter.
5. To understand the concept of consolidation and stress distribution in soil mass.
To calculate the shear strength of different soil.
6. Compute the lateral thrust due to backfill on the retaining walls.

4CE05 - STRUCTURAL ANALYSIS- I

Course outcomes:

At the end of the subject the students will be able -

1. To decide what is required to be analyzed depending upon type of structural element.
2. To know about degree of freedom, Condition of equilibrium and determinacy of element.
3. To understand reason for failure and permissible limits for safety.
4. To apply the knowledge of beam analysis for practical analysis and design purpose.
5. To make application of various analysis methods for actual structural member analysis and design.
6. To know merits for utilization of suspension, 2 hinged and 3 hinged arches.


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V Semester

5CE01 : Design Of Reinforced & Prestressed Concrete Structures

Course outcomes:

At the end of the subject the students will be able -

1. To analyze and design of rectangular section.
2. To analyze and design of slab.
3. To analyze and design of staircase and retaining wall.
4. To analyze and design of column and footing.
5. To understand grid slab and ductile detailing.
6. Explain the general behavior of PC sections under external load.

5CE02: Surveying & Geomatics

Course Outcomes:

At the end of the course students will be able to

1. Understand the use of different types of curves and their field implications.
2. Understand the triangulation adjustment.
3. Understand the hydrographic survey.
4. Acquire skills in handling spatial data base warehousing and mining.
5. Understand the surveying with advance instrument like remote sensing, GPS and GIS.
6. Able to describe types, design and setting of curves

5CE03: Numerical Methods and Computer Programming

Course outcomes:

At the end of subject the students will able -

1. To use spreadsheet software for solving civil engineering problems.
2. To impart knowledge to analyze, solve, design and code numerical method problems using C language.
3. To impart knowledge to analyze, solve, design and code civil engineering problems using C language.


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(Professional Elective I)

5CE04 : (i) Highway Construction and Management

Course outcomes:

At the end of the subject the students will be able –

1. Explain the basic concepts about highway engineering
2. To design geometric elements of the highway.
3. To design the various types of road pavements with construction and maintenance of highway.
4. To carry out traffic studies and implement traffic regulation and control measures and intersection design.
5. To apply the knowledge to prevent the road accidents.

5CE04: (ii) Repairs & Rehabilitation Of Structures

Course outcomes

At the end of the subject the students will be able –

1. Various distress and damages to concrete and masonry structures
2. The importance of maintenance of structures, types and properties of repair materials etc
3. Assessing damage to structures and various repair techniques

5CE04 : (iii) Sustainable Construction Methods

SECTION A

Course outcomes:

At the end of the subject the students will be able -

1. To understand present condition and need for replacement of non renewable resources.
2. To understand concept of sustainability and strategy to achieve it.
3. To understand various criteria's and considerations to achieve sustainable construction according to Green Rating Agencies.
4. To decide application of sustainable methods in construction for Roof, Wall, thermo resistivity etc.
5. To reduce water need and reuse of house hold waste water.



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5CE04 : (iv) Watershed Engineering And Management

Course Outcome: Student shall be able to

1. Explain the hydrology and hydrological data.
2. Analyze the hydrological methods for runoff.
3. Evaluate the ground water hydrological problems.

(Open Elective)

5CE05 : (i) Basics of Building Construction

Course outcomes:

At the end of the subject the students will be able -

1. To understand Load bearing and Frame structure with their foundations.
2. To recognize various types of construction material and its suitability
3. To recognize the various levels in building and its need.
4. To know types of openings, doors, windows and other related fixtures.
5. To recognize types of rock and minerals and its construction properties.
6. To understand the basic concepts of DPC, fireproof, soundproof and expansion joints in structure.

5CE05 : (ii) Disaster Management

Course outcomes:

At the end of the subject the students will be able -

1. To understand concept and terms related to Disaster.
2. To understand various types of Natural and Artificial Disaster .
3. To decide and take actions to mitigate impact of disaster.
4. To know roles and responsibility of organizations – public and private , individual and group to manage disaster.

5CE05 : (iii) Soft Skills and Interpersonal Communication

Course outcomes:

At the end of the subject the students will be able -

1. Interact in developed way so as to handle the situations .
2. To take analyzed decisions over the problem and will effectively carry out wok in time.
3. To handle task with developed leadership skills.
4. To determine the reasons and solutions over conflict and will be able to manage it.
5. To understand need for negotiation and strategy negotiate things.
6. To have strong communication.
7. To carry out formal documentation process and will have proper guideline for writing formal basic documents.

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Sixth Semester

6CE01: Design of Steel Structure

Course outcomes:

At the end of the subject the students will be able -

1. To explain the methods of design of steel structure.
2. To design bolted and welded connection.
3. To identify the different failure modes of bolted and welded connections, and determine their design strengths.
4. To design the Tension and compression member.
5. To identify and compute the design loads on a typical steel roof trusses.
6. To design basic elements of steel structure like beams, column and bases.

6CE02: Environmental Engineering – I

Course Outcomes: -

At the end of the subject the students will be able -

1. Define and explain the significance of terms and parameters frequently used in water supply engineering.
2. Evaluate the influence of the different parameter in design and treatment of water treatment plant (water quality parameters).
3. Basic methodology for water treatment (viz., sedimentation, coagulation, flocculation, filtration, disinfection and water softening.)
4. An understanding of water quality criteria and standards, and their relation to public health.

6CE03: Fluid Mechanics

Course Outcome:

At the end of the subject the students will be able -

1. Describe basic properties of fluid flow.
2. Apply the knowledge to fluid flow problems.
3. Analyze the type of flow by using basic of mathematical principle.
4. Solve and modeling the pipe flow problems.


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Professional Elective - II
6CE04: (i) Advanced Construction Materials

Course outcomes:

At the end of the subject the students will be able -

1. To understand special type of concrete and supplementary cementitious materials.
2. To recognize various types of metals and new alloy steels.
3. To understand Thermal and Sound insulating materials.
4. To know types of construction chemicals and wastes.
5. To recognize types of shoring and formwork materials.
6. To understand the elementary concept of smart materials.

6CE04 : (ii) Geographic Information System & Science

Course Outcomes:

At the end of the course students will be able to

1. Explain and communicate quantitative remote-sensing principles and integrate different tools for remote sensing data analysis
2. Perform image corrections, enhancements and generate high-level remote sensing products.
3. Apply basic graphic and data visualization concepts such as colour theory, symbolization, and use of white space.
4. Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.
5. Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.
6. Review the fundamental concepts of a digital image processing system.

6CE04 : (iii) Masonry Structure

Course Outcomes:

At the end of the subject the students will be able -

1. Explain engineering properties and use of masonry units defect and cracks in masonry and its remedial measures
2. Summaries various formulas for finding compressive strength of masonry units.
3. Explain permissible stress and design criteria as per IS: 1905 and SP-20.
4. Design different types of masonry walls for different load considerations.



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6CE04 : (iv) Solid And Hazardous Waste Management

Course Outcomes: -

At the end of the subject the students will be able -

1. To identify and interpret the criteria for the classification of a substance as a solid/hazardous wastes.
2. An ability to recognize waste minimization and source reduction, assess and describe the procedure for solid and hazardous waste identification and characterization and various waste processing options.
3. Define and elucidate the management, treatment and disposal of hazardous wastes.
4. Skill to assess and develop physical/chemical/biological treatment techniques for the control of hazardous wastes.
5. Skill to address and describe solid waste management including landfill operation.
6. Ability to design and execute land reclamation projects.

6CE04 : (v) Traffic Engineering & Management

Course outcomes:

At the end of the subject the students will be able –

1. To explain the road characteristics & traffic planning.
2. To analyze traffic capacity of roads & intersection by different methods.
3. To design different types of road intersections & use of visual aids for roads.
4. To use knowledge of traffics safety & environmental hazards.
5. To recommend suitable traffic management system and traffic regularity measures
6. To apply the knowledge of Intelligent Transportation System to traffic management system.



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(Open Elective II)
6CE05 : (i)Environmental Management

Course Outcomes:

At the end of the course the student will:

1. Be aware of different environmental problems, their causes and effects.
2. Have knowledge regarding different environmental policies & management plans.
3. Have thorough knowledge about Environmental Legislation and Acts.
4. Acquire information about various agencies for Environmental Managements in India.
5. Have knowledge regarding different systems working for Environmental Management.

6CE05 : (ii) Human Resource Development & Organizational Behavior

Course outcomes:

At the end of the subject the students will be able -

1. To understand the concept of Management and Organization.
2. To understand types of Organsiation and Its structure.
3. To develop himself/ herself as per the need and requirement of work and self updation.
4. To develop better skills related to leadership, team behavior, ethics at working place .
5. To analyze job opportunity and future in it .
6. To understand expectations for job evaluation , assessment of work and growth in the field.

6CE05 : (iii) Introduction To Earthquake Engineering

Course outcomes:

At the end of the subject the students will be able to -

1. Identify type of earthquake, its properties
2. Earthquake resistance planning
3. Apply knowledge of seismic bands in masonry structure construction
4. Solve engineering problems in the context of Earthquake Engineering.



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SEMESTER SEVENTH

7CE01: STRUCTURAL ANALYSIS – II

Course outcomes: At the end of the subject the students will be able -

1. To decide what is required to be analyzed depending upon type of structural element.
2. To know about degree of freedom, Condition of equilibrium and determinacy of element.
3. To understand reason for failure and permissible limits for safety.
4. To understand the concepts of Kani's
5. To apply the knowledge of beam analysis for practical analysis and design purpose.
6. To make application of various analysis methods for actual structural member analysis and design.

7CE02: GEOTECHNICAL ENGINEERING – II

Course Outcomes: At the end of the subject the students will be able –

1. To select the appropriate soil investigation method and get true sub soil parameters used for selection of type of foundation.
2. To determine the bearing capacity of shallow foundation.
3. To calculate the lateral earth pressure on retaining wall
4. To find bearing capacity of well foundation and design of pile foundation.
5. To evaluate the settlement of different types of foundation.
6. To suggest the suitable method of ground improvement.

7CE03 : HYDRAULICS ENGINEERING

Course Outcomes: Student shall be able to-

1. Illustrate the flow pattern in the open channels, criteria for formation hydraulics jump.
2. Identify different types of GVF profiles and methods.
3. Compute of water hammer pressures in pipe.
4. Design penstocks and surge tanks, understand causes of water hammer.
5. On completion of the course, learner will be able to analyse and design Canal and will provide proper Cross drainage works and canal structure
6. On completion of the course, learner will be able to identify and provide suitable river training their methods and construction of guide bund

7CE04: ENVIRONMENTAL ENGINEERING – II

Course Outcomes: -

1. Define and explain the significance of terms and parameters frequently used in wastewater Treatment.
2. Evaluate the influence of the different parameter in design and treatment of wastewater treatment plant (wastewater characteristics).
3. Basic methodology for wastewater treatment (screening, grit chambers, sedimentation, biological treatment and chemical treatment)
4. Able to describe low cost treatment methods, viz., Oxidation pond, aerated lagoon, phytoremediation and root zone technology.
5. Able to describe anaerobic treatment processes as anaerobic digester, up flow anaerobic sludge blanket and design of units as septic tank with up flow filters and soak pit.
6. Able to explain industrial waste water treatment facilities

7CE05 : (PROFESSIONAL ELECTIVE III)

(i) ANALYSIS AND DESIGN OF STRUCTURES FOR EARTHQUAKE AND WIND

Course outcomes: At the end of the subject the students will be able to -

1. Identify type of earthquake, its properties
2. Do earthquake resistance planning
3. Apply knowledge of seismic bands in masonry structure construction.
4. To analyze and design buildings to resist seismic and wind forces
5. Solve engineering problems in the context of Earthquake Engineering.


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7CE05 : PROFESSIONAL ELECTIVE III
(ii) ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE

Course Objectives: At the end of the course the student will :

1. Understand the concept and basic process of environmental impact assessment.
2. Have knowledge regarding Impact assessment methodologies and Components of EIA.
3. Be able to perform environmental auditing.
4. Have knowledge regarding Sustainable development & environmental management.

7CE05 (PROFESSIONAL ELECTIVE - III)
(iii) PAVEMENT DESIGN

Course outcomes: At the end of the subject the students will be able –

1. To explain basics of highway & airport pavement.
2. To carry out analysis of flexible pavement by various methods.
3. To carry out design of flexible pavement by various methods.
4. To carry out analysis of rigid pavement by various methods.
5. To carry out design of rigid pavement by various methods.
6. To apply IRC design parameters in design, maintenance, repair & rehabilitation for different types of pavement.

7CE05 : (PROFESSIONAL ELECTIVE - III)
(iv) WATER POWER ENGINEERING

Course Outcome:

Student shall be able to:

1. Describe the various sources of energy systems.
2. Classify the different power plants.
3. Identify the problems related to hydraulic pressure.



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SEMESTER VIII

8CE01: CONSTRUCTION PROJECT MANAGEMENT

Course outcomes: At the end of the subject the students will be able –

1. To understand meaning of Project and Project Management.
2. To understand the phases of Project Life Cycle and process of developing it.
3. To use and apply various planning tools like BAR chart, Milestone Chart, Networking Methods like CPM, PERT.
4. To compare and control the project at the time of execution.
5. To update projects and review the status of work. To optimize project using Network crashing method.
6. To understand the concept of Project Smoothing/ leveling. To plan and develop the project using Project Planner software's.
7. To understand importance and application of various management like Quality, Safety, Risk handling and Inventory. To turn good manager at individual and organizational level.

8CE02: CONSTRUCTION ECONOMICS & ESTIMATING – COSTING

Course outcomes: At the end of the subject the students will be able -

1. Determine need and basics of Estimation and Construction Economics.
2. Carry out estimation by various methods.
3. Write and understand specification of materials and items of construction.
4. Carry out rate analysis of basic construction material and apply calculation logic for other construction materials.
5. Use of CSR for Estimation work and carry out estimation of residential, Commercial building, Flexible and Rigid Roads, Water Tank, Septic tank etc.
6. Understand need, purpose and process of valuation.
7. Understand and carry out Bidding and tendering process.

8CE03 : PROFESSIONAL ELECTIVE - IV (i) ADVANCED DESIGN OF STEEL STRUCTURES

Course outcomes: At the end of the subject the students will be able –

1. To explain the methods of design of foot bridge.
2. To design transmission tower line.
3. To design steel chimney and its foundation.
4. To design the truss bridge.
5. To design the plate girder.
6. To design lattice girder and steel tanks.

8CE03: PROFESSIONAL ELECTIVE - IV (ii) ADVANCED PRESTRESS CONCRETE STRUCTURES

Course outcomes: At the end of the subject the students will be able –

1. Explain the general behavior of PC sections under external load.
2. Explain behavior of Prestress concrete members and Losses in Prestress steel.
3. Analyze & Design of Prestress concrete flexural members.
4. Analyze & Design of Prestress concrete for shear.
5. Analyze & Design of Prestress concrete Water Tank.



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8CE03 : PROFESSIONAL ELECTIVE - IV
(iii) ADVANCED WATER TREATMENT

Course Outcomes:

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

1. In-depth knowledge of physical chemical unit processes for advanced water treatment.
2. consider the application of this in research projects, and to contribute to the development of new theories and methods in the field.
3. Select or construct appropriate treatment schemes to remove certain pollutants present in water or waste water.
4. Developed conceptual schematics required for the treatment of water.
5. Translate pertinent forcing criteria into physical and chemical treatment system.
6. Provide recommendations of appropriate treatment processes for upgrading water and treatment efficiency

8CE03 : PROFESSIONAL ELECTIVE - IV
(iv) Industrial Waste Water Treatment

Course Outcomes:

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

1. Distinguish between the quality of domestic and industrial water requirements and Wastewater quantity generation.
2. Understand the industrial process, water utilization and waste water generation.
3. Acquire the knowledge on operational problems of common effluent treatment plants.
4. Impart knowledge on selection of treatment methods for industrial wastewater.
5. Specify design criteria for physical, chemical, and biological unit operations.
6. Define the Principles of pollution prevention and mechanism of oxidation processes. Suggest the suitable technologies for the treatment of wastewater.
7. Discuss about the wastewater characteristics. Design the treatment systems.

8CE03: PROFESSIONAL ELECTIVE - IV
(v) STRUCTURAL ANALYSIS BY MATRIX METHOD

Course outcomes: At the end of this course students will be able to-

1. Analyze simple structure using flexibility method.
2. Analyze simple structure using stiffness method (structure approach)
3. Analyze structure (truss, continuous beam, plane frame etc.) using stiffness method (member approach)
4. Understand basic programming/ flowchart aspects of structural analysis programs.

8CE04 : PROFESSIONAL ELECTIVE - V
(i) ADVANCED GEOTECHNICAL ENGINEERING

Course Outcomes: At the end of the subject the students will be able –

1. To explain the structure of different clay mineral groups and their physical properties.
2. To calculate the seepage discharge in anisotropic medium.
3. To compute the degree of consolidation of soil.
4. To recommend suitable type of foundation for expansive soils.
5. To analyze the stability of infinite and finite slope.
6. To suggest the suitable method of soil stabilization and to recognize the major geo-synthetics applications and their significance.


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8CE04: PROFESSIONAL ELECTIVE V
(ii) ADVANCED STRUCTURAL ANALYSIS

Course outcomes: At the end of the subject the students will be able to -

1. Formulate the equation of motion for dynamics analysis of structures
2. Demonstrate an understanding the assumptions and limitations of the structural dynamics theories.
3. Find the response of SDOF systems with and without damping
4. Find the response of SDOF systems subjected to free vibration, harmonic, and arbitrary excitations. Solve engineering problems in the context of structural dynamics.
5. Students will be able to differentiate, analyze structures on firm base and elastic base foundations.
6. By virtue of stress-strain relationship, advance aspects of stress-strain resultants allied with plates and shell can be understood.

8CE04 : PROFESSIONAL ELECTIVE V
(iii) ADVANCED DESIGN OF R. C. C. STRUCTURES

Course outcomes: At the end of the subject the students will be able -

1. To analyze and design of Flat slab.
2. To analyze and design retaining wall.
3. To analyze and design of combined footing.
4. To analyze and design of simple structure.
5. To analyze and design of portal frame.
6. To analyze and design of water tank.



8CE04 : PROFESSIONAL ELECTIVE V
(iv) ADVANCED WASTEWATER ENGINEERING

Course Outcomes: At the end of the course students will:

1. Have knowledge regarding different types and sources of wastewater.
2. Apply advanced technologies in Wastewater treatment.
3. Select the most appropriate types of membrane processes for tertiary treatment of wastewater.
4. Apply advanced oxidation processes to treat concentrated non biodegradable wastewater.
5. Learn sludge handling and disposal processes.

8 CE04 : PROFESSIONAL ELECTIVE V
(v) CONSTRUCTION EQUIPMENT AND MACHINERY

Course outcomes:

At the end of the subject the students will be able -

1. To recognize the various terms related to the tools that are required for any construction work.
2. To decide which machine or tool can be implemented as per the project life cycle stage.
3. To understand the survey process with help of Total station and will be able to analyze the performance of basic minor tools and machinery
4. To understand various equipments like excavators, shovels, mixers, compactors , crane , hoist , lift etc.

8CE04 : PROFESSIONAL ELECTIVE - V
(vi) FINITE ELEMENT METHOD

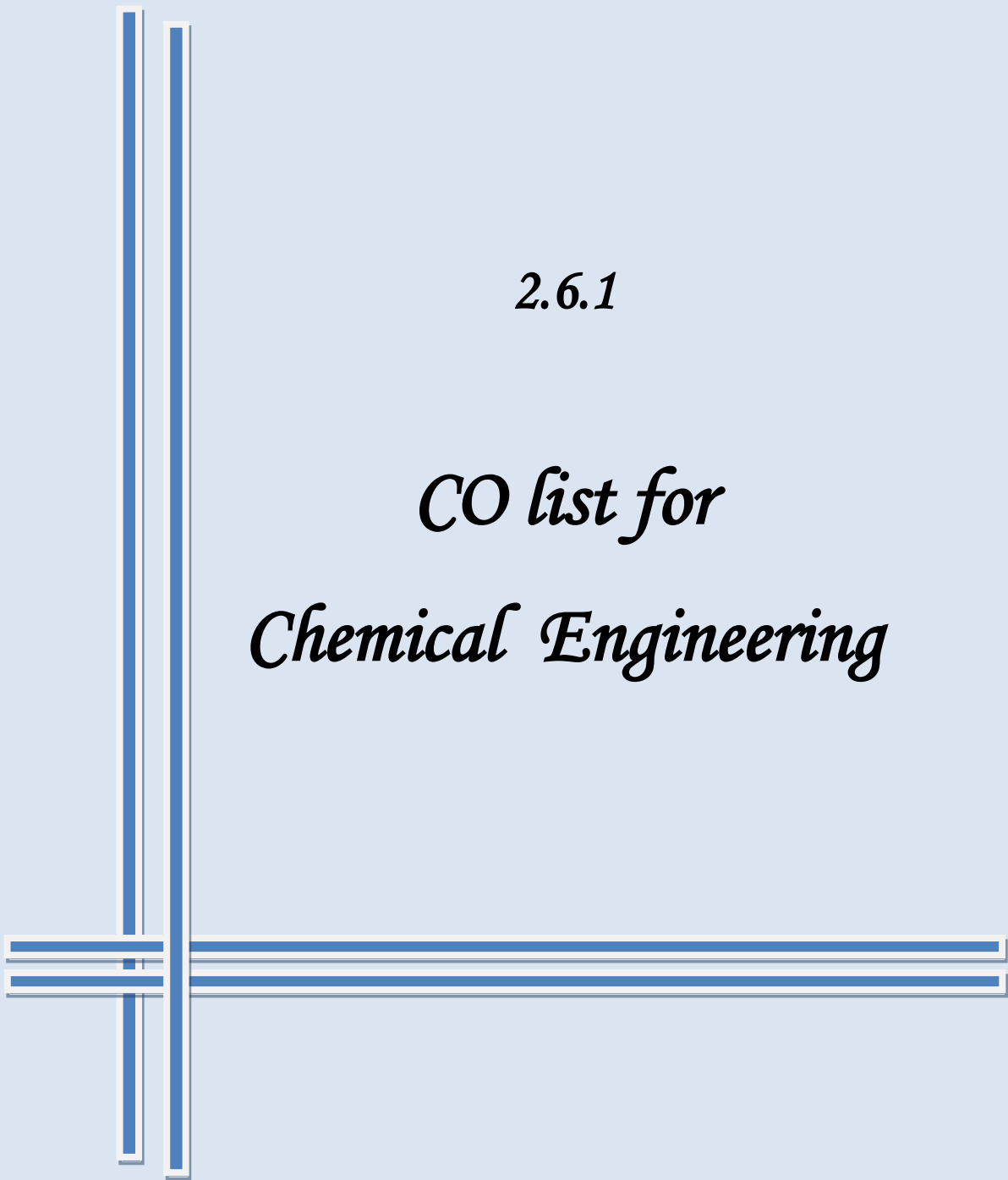
Course outcomes:

At the end of the subject the students will be able to -

1. Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer.
2. Formulate and solve problems in one dimensional structures including trusses, beams and frames.
3. Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axis-symmetric and plate bending problems.
4. Implement and solve the finite element formulations using software.



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*CO list for
Chemical Engineering*

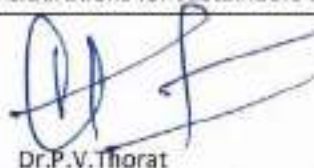
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College of Engineering & Technology, Akola
PROGRAM OUTCOMES, PROGRAM SPECIFIC OUTCOMES & COURSE OUTCOMES
Department of Chemical Engineering
PROGRAM OUTCOMES (POs)

SN	Details
1	Engineering Knowledge: Apply the knowledge of basic sciences and Engineering fundamentals to solve Chemical Engineering problems.
2	Problem Analysis: Analyze the complex Chemical Engineering problems and give solutions related chemical & allied industries.
3	Design/Development of Solutions: Identify the chemical engineering problems, design and formulate solutions to solve both industrial & social related problems.
4	Conduct Investigations of Complex Problems: Design & conduct experiments, analyze and interpret the resulting data to solve Chemical Engineering problems.
5	Modern Tool Usage: Apply appropriate techniques, resources and modern engineering & IT tools and softwares for the design, modeling, simulation and analytical studies.
6	The engineer and Society: Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7	Environment and Sustainability: Understand the relationship between society, environment and work towards sustainable development.
8	Ethics: Understand their professional and ethical responsibility and enhance their commitment towards best engineering practices.
9	Individual and Team Work: Function effectively as a member or a leader in diverse teams, and competent to carry out multidisciplinary tasks.
10	Communication: Communicate effectively in both verbal & non-verbal and able to comprehend & write effective reports.
11	Project Management and Finance: Understand the Chemical Engineering and management principles to the multidisciplinary projects in whatsoever position they are employed.
12	Life-long Learning: Recognize the need of self education and life-long learning process in or keep abreast with the ongoing developments in the field of Chemical Engineering.

Department of Chemical Engineering
PROGRAM SPECIFIC OUTCOMES (PSOs)

1.	The graduate will be competent in applying the knowledge of basic sciences & Chemical Engineering to multidisciplinary fields.
2.	The graduate will be able to apply the technical knowledge to solve the problems of Chemical allied industries and society.
3.	The graduate will be able to develop chemical Engineering solutions based on social health, safety, cultural and Environmental considerations for sustainable development.


 Dr. P. V. Thorat

Head, Chemical Engineering

Department of Chemical Engineering

COURSE OUTCOMES

B.Tech.(Chemical Engineering) III Sem

Subject Name	Course Outcome
3CH02 Process Instrumentation	1.To deal with basics of Measurement system, principles of process parameters like methods of measurements & various type of errors in measurement system 2. To learn the operating principles, construction & working of instruments for measurement of Temperature, to Calibrate & Maintain measuring devices selection of best suitable temperature sensor & their application as per Industrial requirements 3. Understand the concept of the operating principles, construction & working of Various Pressure sensors, to Calibrate & Maintain measuring devices selection of best suitable pressure sensor & their application as per Industrial requirements 4. To learn the operating principles, construction & working of flow measuring devices, their Calibration, selection & their application as per Industrial requirements 5. To deal with the analysis of principles, construction & working of various level sensors, their Calibration, selection & their application as per Industrial requirements. 6. Understand the concept of principles, construction & working of various pH & humidity sensors, their Calibration, selection & their application as per Industrial requirements.
3CH04 Chem.Engg. Thermo-I	1.Understand the fundamentals of Thermodynamics, concept of Energy Changes & its relation with work, Work Concept and apply for calculation of 2.Understand the concept of conservation laws, Apply the knowledge for calculation of various Energy terms like work, heat, enthalpy, energy changes 3.Understand the concept of Entropy, Apply the concept to heat change & process direction. Able to formulate the Problem and solving methodologies. 4.Apply the concept of Carnot cycle on refrigeration methods. Able to Design, formulate the Problem and solving methodologies. 5.Apply the concept of thermodynamical energy properties on fluid. Able to Analyse the Problem and solving methodologies. 6.Apply the concept of law of conservation on various energy conversion equipment's like engine, boilers, Pumps Etc.
3CH05 Process Calculations	1.Understand the concept of First law, Second law of thermodynamics, equation state, Concept of Heat Capacity, and Entropy, And calculations of E, W, q, H, entropy changes 2.Apply thermodynamic principles to understand fugacity, partial molar properties, chemical potential, and activity coefficients for non-ideal fluid systems. 3.Apply thermodynamic principles of Colligative properties, Vapour liquid equilibrium, concept of Ideal and non-ideal systems. 4.Apply the concept of Phase equilibria in non reacting, binary, and ternary systems. 5.Apply the concept of statistical thermodynamics, thermodynamic probability, and its relation with entropy, distribution laws. 6.Chemical Equilibrium, feasibility of reactions, Le chateliers principle


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COURSE OUTCOMES

B.Tech.(Chemical Engineering) V Sem

Subject Name	Course Outcome
5CH01 Heat Transfer	<p>1.Understand the Importance of modes of heat transfer in chemical process industries& Fourier's law Heat transfer through plane, cylindrical and spherical walls, Thermal insulation, critical and economic thickness. Extended surface equipments, types, their design & operation.</p> <p>2.Apply Heat transfer by convection, film concept, individual and overall coefficients and factors affecting them. Natural and forced convection dimensional analysis applied to heat transfer. Dittus-Bolter equation. Limitations and application</p> <p>3.Heat transfer by parallel and counter current flow, concept of log mean temperature difference, rate of heat transfer. Heat transfer by film wise and drop wise condensation in horizontal & vertical tube</p> <p>4.Heat exchange equipments and their design, double pipe, parallel, counter current, shell and tube heat exchangers, condensers, fouling factors, concepts of transfer units in heat exchangers, NTU concept for heat exchangers.</p> <p>5.Boiling & Evaporators : Classification ,types and field applications of evaporators single and multiple effect evaporators</p> <p>6.Heat transfer by radiation, concept of black body, Law of radiation ,view factors, luminous and non-luminous gases. Recent developments in heat transfer</p>
5CH02 Chem. Engg. Pro-I (ICT)	<p>1.Students are able to understand unit operations and processes carried out in the Sugar, Starch Soap and Detergent industries</p> <p>2.Students are able to understand unit operations and processes carried out in the Paper and cement industries</p> <p>3.Students are able to understand the manufacturing of Synthesis and fuel Gas and its application in different industries.</p> <p>4.Students have comprehensive pictures and idea of different operations and process carried out in industries</p> <p>5.Students are able to understand importance of energy and the will get it utilise by using the knowledge of electrochemistry</p> <p>6.Students are able to apply their knowledge to modify, design and develop the different operations</p>
5CH04 Material Sc. & Engg	<p>1.Gen introduction to material science, classification, properties. Basic properties of material & stress strain curve.</p> <p>2.Different types of materials testing like destructive non destructive test. Study of materials % it's effect on properties of material.</p> <p>3.Metals & alloys, ferrous non ferrous metals, basic iron ore it's type. Diff types of steel , manufacturing, properties, & uses.</p> <p>4.Corrosion, it's defination, factors affecting it, all prevention methods of corrosion.</p> <p>5.Polymers, it's classification, strcture, source, type of polymers, & plastics material, manufacturing, structure, properties & application of various engineering plastics.</p> <p>6.Glass & Ceramies, compositon, manufacturing, properties & applications.</p>


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Department of Chemical Engineering**COURSE OUTCOMES****B.Tech.(Chemical Engineering) VII Sem**

Subject Name	Course Outcome
7CH01 Chem. Engg. Op-III(MT-II)	
7CH02 Chem.Rea.Engineering-I	1.Students are able to understand all in detail about the basics of reaction Mechanism, Chemical Kinetics & Rate of Reaction 2.Students are able to Formulate the rate of reaction by using design equation by different methods 3.Students are able to apply the rate equation for the design of different reactor like MFR,PFR etc. 4.Students have comprehensive idea to solve the complex problem related with reactors designs 5.Students are able to Analyse arrangement of reactors for proper reaction mechanism 6.Students are able to apply their knowledge to modify, design and develop the different reactors
7CH03 Process Dy. & Control	
7CH04 Prof.Elective-I (IWT)	1.The students will have the knowledge of Types of pollution, Effluent and other standards, waste minimisation, Bioassay studies, Environment legislation and waste minimisation. Process modification and environmental audit. 1 2.The students will be able to apply conventional treatment methods to waste water.11 3.The student will be able to design, develop and understand biological treatment methods.7 4.The student shall understand methods for removal of phosphorus and advance water treatment methods.3 5.The student shall have the understanding of characteristics , production and treatment flow diagram for different industries like Petro-chemical industries, Refineries, Pharmaceutical, Textiles, Metallurgical industries, Power industries, Fertilizer plants, Cement industry.4 6.The student shall have the understanding of characteristics , production and treatment flow diagram for different industries Pulp and paper industry, Agro-industries, Sugar – Distilleries, Food processing industry, pickles, dairy, Leather tanning-5
7CH05 Plant Des.& Proj. Engg.	


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COURSE OUTCOMES

B.Tech.(Chemical Engineering) IV Sem

Subject Name	Course Outcome
4CH01 Fluid Flow Operation	<p>1.Properties of fluids and their classification. Fluid statics: Forces on fluids, pressure depth relationship for compressible and incompressible fluids. Forces on submerged bodies. Rigid body motion, pressure measurements, Euler's equation.</p> <p>2.Kinematics of flow, Description of velocity field, Stream functions, Angular velocity, Fluids in circulation, Fluid flow: Laminar and turbulent flows, Equations of Continuity and Motion in laminar flows and its applications for the calculation of velocity profiles, shear stresses, power, etc. in various engineering applications. Dimensional analysis;</p> <p>3.Dynamics of flow , Bernoulli's Equation and engineering applications, Conservation of mass, momentum and energy; Mechanical energy balance ,Basics of Turbulent flows, equations of continuity and motion for turbulent flows: Prandtl mixing length theory,, Turbulent pipe flow, basis of Universal velocity profile and its use.</p> <p>4.Flow measuring devices for chemical plants: Orifice meter, Venturi meters, Rotameter, Pitot tube and Notches.</p> <p>5.Fluid moving machinery such as pumps like reciprocating pumps, rotary pumps, Centrifugal pumps, blowers, compressors, vacuum systems, etc. ,</p> <p>6.Flow past immersed bodies, Particle Dynamics, flow through packed bed and fluidized Bed. Introductory concepts of two-phase flow.</p>
4CH02 Chem. Engg. Thermo-II	<p>1.Understand and use the different physical Quantities, System of units in Chemical process industries. The students are able to understand the concept of process study at molecular like and the concept of Mole, atoms ad expression of quantities</p> <p>2.Apply the law of conservation of masses in chemical process engineering. Understand the gas laws, calculate the amount of raw material and product for chemical process without chemical reaction.</p> <p>3.Apply the law of conservation of masses in chemical process engineering. Understand the stoichiometry equation and their relations calculate the amount of raw material and product</p> <p>4.Apply the law of conservation of Energy in chemical process engineering. Understand the concept of heat capacity & its calculation calculate the amount of raw material & product for chemical process.</p> <p>5.Apply the law of conservation of Energy in chemical process engineering. Understand the concept of Hess's Law, heat calculations and calculation of the amount of raw material and product for chemical process.</p> <p>6.Understand the concept of Fuel combustion, HCV, NCV, Calculations in chemical Industries.</p>
4CH04 Applied Phy. Chemistry	<p>1.Evaluate the properties of non-ideal gases, intermolecular forces, critical phenomenon & probability consideration of molecular speed in gases.</p> <p>2.Understand and evaluate the rate, order, energy of activation of simple and complex chemical reactions.</p> <p>3.Understand the fundamental concepts of surface phenomenon, catalysis, mechanism of industrially important catalytic reaction</p> <p>4.Understand the ion transport & electrical properties of conducting solutions, solve problems involving transport number, electrode potential & EMF of cells.</p> <p>5.Use of thermodynamic functions to understand the spontaneity of chemical reaction & Thermodynamic equilibrium. Rationalize bulk properties and processes using thermodynamic consideration.</p> <p>6.Distinguish the ranges of electromagnetic spectrum used for exciting different molecular energy levels in spectroscopic techniques for analysis of compounds use of laws of photochemistry for determination of quantum yield of reactions in qualitative analysis.</p>
4CH05 Chem. Engg. Op-I (MO)	<p>1.General introduction to chem. Engg , size reduction, it's need, stages, various equipment used, screen analysis.</p> <p>2.Sedimentation,classifiers, gravity settling, types of classifiers, thickner's ,conveyer belt, it's principle working,operation & applications.</p> <p>3.Mixing Agitation- it's type, working principle, flow pattern, impellers, mixing index, degree of mixing, detail working of banbury, muller, kneader mixers.</p> <p>4.Filtration, its type constant pressure, constant rate vacuume,plate & frame filter it's principle working, application &limitations.</p> <p>5.Cyclone separator it's principle contruction, working mechanism. centrifugal separator, centrifuge & hydro cyclone it's principle working construction & application</p> <p>6.Adsorption,theory, it's type, application. Natural & industrial adsorbents. Fixed &fluidized bed. Langmuir's Freundlich's equation, adsorption in fixed beds.</p>

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Department of Chemical Engineering

COURSE OUTCOMES

B.Tech.(Chemical Engineering) VI Sem

Subject Name	Course Outcome
6CH01 Chem. Engg. Op-II(MT-I)	
6CH02 Chem. Engg. Pro.-II(OCT)	1.Students are able to understand all in detail about the biological fermentation process and apply its knowledge in alcohol manufacturing. 2.Students are able to understand different polymerisation reactions and learn about the modern technique used 3.Students are able to understand design a process flow diagram for different product formation 4.Students have comprehensive pictures and idea of different operations and process carried out in industries 5.Students are able to Analyse the process flow and to do the development in the same 6.Students are able to apply their knowledge to modify, design and develop the different operations
6CH03 Comp.Prog.& App.	1.Find the solution of ordinary differential equation of first order by Euler, Taylor and Runge-Kutta methods 2.Derive Least – Squares curve fitting procedures, fitting a straight line, fitting a parabola, nonlinear curve fitting, Curve fitting by a sum of exponentials. 3.Students will be able to find the solution of linear systems by using Direct methods, Matrix inversion method, Gaussian 4.Compare different methods in numerical analysis with accuracy. 5.Develop skills in analysing the methods of interpolating a given data, properties of interpolation. 6.Students will be able to Design and Construct the program in modular programming working in team.
6CH04 Pro.Equip.Des.& Draw	



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COURSE OUTCOMES
B.Tech.(Chemical Engineering) VIII Sem

Subject Name	Course Outcome
8CH01 Transport Phenomena	<ol style="list-style-type: none"> 1.Revise & Understand the basics & the concepts of various transfer properties & mechanism. Flow properties & flow kinetics, Newtonian & Non Newtonian fluids 2. Understand the concept of control volume, overall mass/momentum/energy balance their equations, Bernoulli's equation, equations of change, Component balance and their application 3. Understand the concept of Equation of Continuity, differential balance equations, Navier Stokes equation, Flow through various shapes, temperature distribution in body and their applications 4. Understand the concept of boundary layer theory, various flow patterns, Thermal boundary layer and Von Karman's equations with their applications 5. Develop skills in analysing the Turbulent flow mechanism, Various Analogies of transfer processes. 6. Review classical mass transfer problems, various theories of mass transfer and their applications
8CH02 Chem. Reaction Engg-II	<ol style="list-style-type: none"> 1. Students are able to understand RTD function for different reaction and reactors 2. Students are able to understand Formulate the rate of reaction for heterogeneous reaction 3. Students are able to understand the kinetics of Fluid-fluid reaction to formulate the rate equation for the same and also able to design a reactors for the same 4. Students are able to understand the kinetics of Fluid-Solid reaction to formulate the rate equation for the same and also able to design a reactors for the same 5. Students are able to Solve a complex problem of reactors for its design also able to understand the catalysed reactions mechanism 6. Students are able to apply their knowledge to modify, design and develop the different catalytic reactors
8CH03 System Modelling	
8CH04 Prof.Elective-II (PCT)	<ol style="list-style-type: none"> 1. The students will have the knowledge of feedstocks, cracking, classification and sources of petrochemicals. 1,3,7 2. The students will be able to understand and design the production of first generation petrochemicals and also apply their knowledge for drawing the flow diagram of process. 11,1,3,7,10 3. The students will be able to understand and design the production of first generation petrochemicals and also apply their knowledge for drawing the flow diagram of process. 1,3,7,10,11 4. The students will be able to understand and design the production of first generation petrochemicals and also apply their knowledge for drawing the flow diagram of process. 1,3,7,10,11 5. The student shall have the understanding and design of petroleum proteins, synthetic detergents, resin, rubber chemicals, explosives TNT and RDX. 4,1,3,7,10 6. The student shall have the ability to do technological forecasting about petroleum and petrochemicals. 1,7,5

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