DEPARTMENT OF MECHANICAL ENGINEERING

OMDAYAL GROUP OF INSTITUTIONS

Program Outcomes

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Course Outcomes

PROGRAM OUTCOMES

PO 1	**:**	**ENGINEERING KNOWLEDGE**: Apply the knowledge of mathematics, science, engineering fundamentals, and an Engineering specialization to the solution of complex engineering problems.
PO 2	**:**	**PROBLEM ANALYSIS:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**:**	**DESIGN / DEVELOPMENT OF SOLUTIONS:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**:**	**CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** Use research- based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**:**	**MODERN TOOL USAGE:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering Activities with an understanding of the limitations.
PO 6	**:**	**THE ENGINEER AND SOCIETY:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Professional engineering practice.
PO 7	**:**	**ENVIRONMENT AND SUSTAINABILITY:** Understand the impact of the professional engineering Solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**:**	**ETHICS:** Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering practice.
PO 9	**:**	**INDIVIDUAL AND TEAMWORK:** Function effectively as an individual, and as a member or leaderin 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 the engineering and Management principles and apply these to one's own work, as a member and leader ina team, to manage projects and in multi-disciplinary 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

1. **Foundation of Engineering:**

   Though the Program is designed for Mechanical Engineering but to become an excellent engineer Communication skill, Knowledge of mathematics, basic science and basic engineering is essentially needed. Hence the outcome is designed apply this basic engineering knowledge to design and conduct experiments, as well as to analyze and interpret data.

   Ability to design and realize preliminary and basic mechanics, other basic engineering components and systems to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

2. **In depth understanding of fundamental mechanical systems:**

   Students would be made to capable to understand the fundamentals, analyze, and develop with visionary zeal in the conventional mechanical Engineering arena. The outcome is so designed that students shall have complete knowledge of Control, operations and design of Mechanical system, Flow of fluid and fluid machinery, analysis of Thermal Power System with energy flow, Knowledge of advance and primary manufacturing processes with tool design, understanding of fundamental and machine drawing with design software knowledge, efficient development of mechanical based systems of varying complexity.

3. **Conception of recent trends:**

   Students are to be made proficient of understanding an assortment of advanced applications of mechanical technology and design of mechanical systems to make the energy efficient utilization of different form of energy. Not only limited to this but also have the sense of energy crisis to realize the need of harnessing of energy from alternative and renewable energy resources.

4. **Invite innovation:**

   Adaptation shall be embedded among the students that one has the ability to employ modern mechanical equipments, environments, and hardware and software platforms in cultivating innovative ideas which leads to the pathway to be an entrepreneur, a professional and a zest for higher studies.

COURSE OUTCOMES

Name of the Subject: Engineering Mechanics	
Subject Code: ES ME 301	
Year: 2nd (New Syllabus)	**Semester:** 3rd
Course Outcomes:	At the end of this course students will be able to 1. Use scalar and vector analytical techniques for analysing forces in statically determinate structures. 2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems. 3. Apply basic knowledge of Maths and Physics to solve real-world problems. 4. Understand measurement error, and propagation of error in processed data. 5. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts). 6. Understand basic dynamics concepts – force, momentum, work and energy. 7. Understand and be able to apply Newton's laws of motion. 8. Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution. 9. Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces). 10. Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy. 11. Attain an introduction to basic machine parts such as pulleys and mass-spring systems.
Name of the Subject: Thermodynamics	
Subject Code: PC ME 301	
Year: 2nd (New Syllabus)	**Semester:** 3rd
Course Outcomes:	After completing this course, the students will be able to: 1. Apply energy balance to systems and control volumes, insituations involving heat and work interactions. 2. Evaluate changes in thermodynamic properties of substances. 3. Evaluate the performance of energy conversion devices. 4. Differentiate between high grade and low grade energies.
Name of the Subject: Manufacturing Processes	
Subject Code: PC ME 302	
Year: 2nd (New Syllabus)	**Semester:** 3rd
Course Outcomes:	Upon completion of this course, students will be able to understandthe different conventional and unconventional manufacturing methods employed for making different products.

Name of the Subject: Materials Engineering	
Subject Code: ES ME 401	
Year: 2nd (New Syllabus)	**Semester:** 4th
Course Outcomes:	After completing this course, the students will be able to: 1. Identify crystal structures for various materials and understandthe defects in such structures. 2. Understand how to tailor material properties of ferrous and non-ferrous alloys. 3. How to quantify mechanical integrity and failure in materials.
Name of the Subject: Applied Thermodynamics	
Subject Code: PC ME 401	
Year: 2nd (New Syllabus)	**Semester:** 4th
Course Outcomes:	1. After completing this course, the students will get a good understanding of various practical power cycles and heat pump cycles. 2. They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines, and reciprocating air compressors. 3. They will be able to understand phenomena occurring in high speed compressible flows.
Name of the Subject: Fluid Mechanics & Fluid Machines	
Subject Code: PC ME 402	
Year: 2nd (New Syllabus)	**Semester:** 4th
Course Outcomes:	Upon completion of this course, students will be able to: 1. Mathematically analyze simple flow situations. 2. Evaluate the performance of pumps and turbines.
Name of the Subject: Strength of Materials	
Subject Code: PC ME 403	
Year: 2nd (New Syllabus)	**Semester:** 4th
Course Outcomes:	After completing this course, the students will be able to: 1. Recognize various types loads applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components 2. Evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
Name of the Subject: Metrology and Instrumentation	
Subject Code: PC ME 404	
Year: 2nd (New Syllabus)	**Semester:** 4th
Course Outcomes:	Upon successful completion of the course, student will have: 1. Understand the working of linear and angular measuring instruments. 2. Know the fundamentals of limits and limit gauges, various methods for measurement of screw thread and surface roughness parameters and the working of optical measuring instruments. 3. Acquire an overview of mechanical measurement systems and principle of instruments for motion and dimension measurement. 4. Get basic idea about working principle and applications of devices for measurement of force and torque; strain and stress and temperature.

Name of the Subject: Dynamics of Machines	
Subject Code: ME 501	
Year: 3rd (Old Syllabus)	**Semester:** 5th
Course Outcomes:	On successful completion of the course the student will be able to: 1. Understand the issues related to balancing of reciprocating androtating machineries. 2. Understand the working of gyroscopes and effect of gyroscopiccouples on different machine. 3. Know the use of flywheels in IC engines and Punch presses. 4. Understand the use and working principle of various governors. 5. Understand about various aspects of mechanical vibration and its control.
Name of the Subject: Heat Transfer	
Subject Code: ME 502	
Year: 3rd (Old Syllabus)	**Semester:** 5th
Course Outcomes:	After completion of this course the students will be able to: 1. Apply various laws of heat transfer to solve practical problems related to steady state and unsteady state heat conduction, convection and radiation. 2. Estimate temperature distribution and rate of heat transfer in various in-field heat transfer problems. 3. Design or size various types of heat transfer equipment, such as: car radiator, evaporator, condenser etc. 4. Analyze the performance of heat transfer equipment. 5. Compare the performance and select the proper type of heat exchanges for a given heat transfer problem.
Name of the Subject: Design of Machine Elements	
Subject Code: ME 503	
Year: 3rd (Old Syllabus)	**Semester:** 5th
Course Outcomes:	On completion of this course a student will be in a position to: 1. Apply various static failure criteria in the design and analysis ofmechanical components. 2. Apply various fatigue failure criteria in the design and analysisof mechanical components. 3. Design knuckle, cotter, welded, riveted and bolted joints as wellas power screws. 4. Design power transmission shafts carrying various elements. 5. Design various types of shaft couplings. 6. Design belt and chain drives. 7. Design helical compression and multi-leaf springs. 8. Analyses, calculate and solve various problems related to design of machine elements.

Name of the Subject: Metrology and Measurement	
Subject Code: ME 504	
Year: 3rd (Old Syllabus)	**Semester:** 5th
Course Outcomes:	On completion of this course a students will be able to 1. Understand the working principle of different measurement processes. 2. Understand different instruments used in measurement system. 3. Know the about the limit, fit and tolerance. 4. Understand the different between angular and linear metrology. 5. Understand the various type of gauge. 6. Know about the surface metrology.
Name of the Subject: Applied Fluid Mechanics	
Subject Code: ME 505B	
Year: 3rd (Old Syllabus)	**Semester:** 5th
Course Outcomes:	After completion of the course, the students will be able to: 1. Understand the importance of specific energy curve for an open channel, and how to draw the same. The importance of Froude number for an open channel. 2. Analyses the phenomena of hydraulic jump with the help of specific energy curve. 3. Get clear idea about compressible fluid flow analysis by realizing the difference between compressible and incompressible flow model. 4. Analyses convergent divergent nozzles and its function. 5. Visualises potential flow. 6. Get clear concept of dimensional analysis and to apply the same technique to understand the significance of several non- dimensional terms used in turbo machines. 7. Understand the basic working principle of turbo machines. 8. Identify different losses in Turbo machines. 9. Select an appropriate class of turbo machine for a particular application 10. Analyses different performance characteristics of various fluid machines. 11. Understand various design and off design criterion of geometrically similar and dissimilar pumps while installed in series and parallel, to match the system requirements.
Name of the Subject: Production & Operations Management	
Subject Code: HU 611	
Year: 3rd (Old Syllabus)	**Semester:** 6th
Course Outcomes:	On completion of this course a students will be able to 1. Understand the working principle of Inventory System. 2. Realize the reason behind the Forecasting. 3. Know the process of PERT/CPM methods. 4. Understand the Product development. 5. Understand the MRP/MPS systems. 6. Realize the production scheduling in any manufacturing industry.

Name of the Subject: Internal Combustion Engines and Gas Turbines	
Subject Code: ME 601	
Year: 3rd (Old Syllabus)	**Semester:** 6th
Course Outcomes:	After completion of this course the students will be able to 1. Explain the function of all the major components of an Internal Combustion Engine and the effects of operating conditions on their performance. 2. Estimate the various performance parameters of an IC Engine. 3. Analyze the performance of a compression ignition engine and spark ignition engine under the given operating conditions. 4. Apply the first law of thermodynamics and estimate the various losses of an engine. 5. Optimize the engine variables to control the emissions and to get maximum output from the engines. 6. Interpret the deviation of actual performance of an engine from the ideal performance. 7. Understand the operation of gas turbine and its applications.
Name of the Subject: Machining Principles & Machine Tools	
Subject Code: ME 602	
Year: 3rd (Old Syllabus)	**Semester:** 6th
Course Outcomes:	On completion of this course a students will be able to 1. Understand the cutting tool dimension. 2. Realize the material property of cutting tool. 3. Know the process LATHE/DRILL operation. 4. Understand the chip formation process. 5. Understand the tool wear principle.
Name of the Subject: Machine Design	
Subject Code: ME 603	
Year: 3rd (Old Syllabus)	**Semester:** 6th
Course Outcomes:	On completion of this course a student will be in a position to: 1. Apply various failure criteria in the design and analysis of mechanical components. 2. Design single and multi plate friction clutches, cone clutches and centrifugal clutches. 3. Design block brakes, band brakes and internal expanding brakes. 4. Design spur, helical, bevel and worm gears. 5. Design thick and thin cylinders. 6. Design flywheels for punching press and internal combustion engines. 7. Design sliding and rolling contact bearings. 8. Analyses, calculate and solve various problems related to machine design

Name of the Subject: Air Conditioning & Refrigeration	
Subject Code: ME 604A	
Year: 3rd (Old Syllabus)	**Semester:** 6th
Course Outcomes:	After completion of this course the students will be able to 1. Explain the advantages and limitations of various conventional and nonconventional refrigeration systems and select the best possible system for a given in-field problem. 2. Identify all the major components of a refrigeration system and explain their functions. 3. Explain the various psychometric processes used to maintain the desired condition in a room. 4. Estimate the total heat load of an air-conditioned room using psychometric chart and design the components of the system accordingly. 5. Analyze the performance of a refrigeration system.
Name of the Subject: Turbo Machinery	
Subject Code: ME 605C	
Year: 3rd (Old Syllabus)	**Semester:** 6th
Course Outcomes:	After completion of the course, the students will be able to: 1. Understand the basic working principle of turbo machines. 2. Identify different losses in Turbo machines. 3. Select an appropriate class of turbo machine for a particularapplication. 4. Design and analysis several hydro turbines and several rotodynamic pump. 5. Get the concept of two dimensional cascade theory. 6. Design and get clear concept of radial and axial compressibleflow machine like compressor and turbine. 7. Get the concept of surging and chocking of compressor. 8. Get the utility of affinity law used in turbo machines.
Name of the Subject: Power Plant Engineering	
Subject Code: ME 701	
Year: 4th (Old Syllabus)	**Semester:** 7th
Course Outcomes:	After completion of the course, the students will be able to 1. Understand the general layout of modern thermal power plant,Site selection, and Present status of power generation in India. 2. Understand and analyses the basic and advanced thermodynamic cycles used in modern steam power plant. 3. Understand the overall mechanism and design of the coal and ash handling system. 4. Learn the combustion mechanism and will able to perform proximate and ultimate analysis of the fuel used in power plant. 5. Understand the design and development of Steam turbines andnozzle. 6. Learn the origin of several heat losses, its analytical and practical measurements, and also the different efficiencies ofthe plant. 7. To realise the necessity of treated water its source and the feed water treatment plant. 8. Learn the basic concept of power plant economics and importance of SLDC and CLDC.

Name of the Subject: Advanced Manufacturing Technology	
Subject Code: ME 702	
Year: 4th (Old Syllabus)	**Semester:** 7th
Course Outcomes:	On completion of this course a students will be able to 1. Understand the working principle of different machine. 2. Understand different cutting tools and its applications. 3. Know the process of non-traditional machining. 4. Understand the cutting tool development. 5. Understand the advanced machining systems line CNC. 6. Know about the different program like APT, CNC program.
Name of the Subject: Maintenance Engineering	
Subject Code: ME 703A	
Year: 4th (Old Syllabus)	**Semester:** 7th
Course Outcomes:	After completion of this course the students will be able to 1. Understand the principal and objective of Maintenance Engineering. 2. Describe the various category of maintenance. 3. Discuss the various condition monitoring techniques. 4. Explain the repair methods. 5. Explain the use of material handling equipments.
Name of the Subject: Renewable Energy Systems	
Subject Code: ME 703B	
Year: 4th (Old Syllabus)	**Semester:** 7th
Course Outcomes:	After completion of this course the students will be able to 1. Understand the present energy scenario across the globe. 2. Realize the potential of various renewable energy resources (solar, wind, biomass, wave, and tidal, ocean, geothermal) in power generation, heating, and cooling applications in Indian subcontinent. 3. Interpret the advantages and limitations of various renewable sources of energy. 4. Analyze the performance of solar thermal and photovoltaic systems. 5. Develop the scheme of solar thermal systems for the applications like space heating and cooling, cooking, water desalination etc.
Name of the Subject: Advanced Welding Technology	
Subject Code: ME 704B	
Year: 4th (Old Syllabus)	**Semester:** 7th
Course Outcomes:	On completion of this course a students will be able to 1. Understand the working principle of different welding processes. 2. Understand different position of welding. 3. Know the process of modern welding mechanism. 4. Understand the different welding tools development. 5. Understand the limitations of welding. 6. Know about the different material used in welding process.

Name of the Subject: Industrial Robotics	
Subject Code: ME 802B	
Year: 4th (Old Syllabus)	**Semester:** 8th
Course Outcomes:	On completion of this course a students will be able to 1. Understand the working principle of industrial robotics. 2. Realize the reason behind the automation in modern industry. 3. Know the process of different production methods. 4. Understand the kinematics of robotics. 5. Understand the different application of robotics. 6. Know about the different robotics program.
Name of the Subject: Energy Conservation & Management	
Subject Code: ME 802C	
Year: 4th (Old Syllabus)	**Semester:** 8th
Course Outcomes:	After completion of the course, the students will be able to: 1. Understand the World Energy Scenario and world energy use resources, Energy cycle on earth etc. 2. Contribute to energy conservation policy, regulations and business practices. 3. Improve the thermal efficiency by designing suitable systems for heat recovery and co-generation 4. Develop innovative energy efficiency solutions and demand management strategies. 5. Use the energy audit methods learnt to save energy expenditure.
Name of the Subject: Safety & Occupational Health	
Subject Code: ME 803A	
Year: 4th (Old Syllabus)	**Semester:** 8th
Course Outcomes:	By the end of this course: 1. Students will be able to recognize and evaluate occupational safety and health hazards in the workplace. 2. Students will be able to determine appropriate hazard controls following the hierarchy of controls. 3. Students will furthermore be able to analyze the effects of workplace exposures, injuries and illnesses, fatalities 4. Students will furthermore be able to analyze the methods to prevent incidents using the hierarchy of controls, effective safety and health management systems and task oriented training. 5. Students will be able to identify relevant regulatory and national consensus standard along with best practices that are applicable.
Name of the Subject: Automobile Engineering	
Subject Code: ME 803D	
Year: 4th (Old Syllabus)	**Semester:** 8th
Course Outcomes:	By the end of this course students will able to understand the following things: 1. Engineering analysis of the automobile and its sub-systems. 2. Application of engineering principles to automotive design. 3. Familiarization with modelling and analysis methods. 4. Familiarization with the automotive industry and its terminology.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

OMDAYAL GROUP OF INSTITUTIONS

Program Outcomes

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Course Outcomes

Program Outcomes:

PO1	**:**	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**:**	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**:**	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**:**	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**:**	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**:**	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**:**	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**:**	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**:**	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	**:**	**Communication**: 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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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

Course Name: Programming for problem solving (ES-CS201):

Course Outcomes:

ES-CS201.1 : To formulate simple algorithms for arithmetic and logical problems.

ES-CS201.2 : To translate the algorithms to programs (in C language).

ES-CS201.3 : To test and execute the programs and correct syntax and logical errors.

ES-CS201.4 : To implement conditional branching, iteration, and recursion.

ES-CS201.5 : To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

ES-CS201. : To use arrays, pointers, and structures to formulate algorithms and programs.

ES-CS201.7 : To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

ES-CS201.8 : To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ES-CS201.1	2	3	1	1	1	1	2	3	-	2	3	1
ES-CS201.2	3	1	2	1	2	1	-	-	3	2	2	2
ES-CS201.3	2	3	2	2	2	-	2	3	3	2	3	2
ES-CS201.4	2	3	3	2	-	2	1	2	2	3	1	-
ES-CS201.5	3	3	2	2	1	2	1	-	3	3	2	1
ES-CS201.6	3	2	2	1	3	-	-	1	2	-	-	2
ES-CS201.7	2	1	2	2	-	3	-	1	-	2	2	-
ES-CS201.8	2	3	1	1	1	-	-	2	1	-	3	1

1: Slightly 2: Moderately 3: Substantially

Course Name: Data Structure & Algorithm (PCCCS301)

Course Outcomes:

PCC-CS301.1 : Differentiate how the choices of data structure & algorithm methods impact theperformance of program.

PCC-CS301.2 : Solve problems based upon different data structure & also write programs.

PCC-CS301.3 : Identify appropriate data structure & algorithmic methods in solving problem.

PCC-CS301.4 : Discuss the computational efficiency of the principal algorithms for sorting, searching andhashing.

PCC-CS301.5 : Compare and contrast the benefits of dynamic and static data structures implementations.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PCC-CS301.1	3	3	1	3	1	1	2	1	2	2	3	3
PCC-CS301.2	3	3	3	1	2	1	-	-	3	2	2	2
PCC-CS301.3	3	3	3	2	2	3	2	3	3	2	3	2
PCC-CS301.4	2	3	3	2	2	2	1	2	2	3	1	1
PCC-CS301.5	3	3	2	2	1	2	1	-	3	3	2	2

1: Slightly 2: Moderately 3: Substantially

Course Name: Computer Organization (PCC-CS302)

Course Outcomes:

At the completion of the course, students will be able to…

PCC-CS302.1 : Understand basic structure of digital computer, stored program concept and differentarithmetic and control unit operations.

PCC-CS302. : Understand basic structure of different combinational circuits multiplexer, decoder, encoderetc.

PCC-CS302.3 : Perform different operations with sequential circuits.

PCC-CS302.4 : Understand memory and I/O operations & design of ALU.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PCC-CS302.1	3	3	2	2		1	2					
PCC-CS302.2	3	3										
PCC-CS302.3	2	1	3	3	3				1			
PCC-CS302.4	3	2	3	2	2	2	2		1		2	2

1: Slightly 2: Moderately 3: Substantially

Course Name: Computer Architecture (PCC-CS402)

Course Outcome:

At the completion of the course, students will be able to…

PCC-CS402.1 : Use various metrics to calculate the performance of a computer system.

PCC-CS402.2 : Identify the addressing mode of instructions.

PCC-CS402.3 : Determine which hardware blocks and control lines are used for specific instructions

PCC-CS402.4 : Analyses clock periods, performance, and instruction throughput of single-cycle multicycle, and pipelined implementations of a simple instruction set.

PCC-CS402.5 : Detect pipeline hazards and identify possible solutions to those hazards.

PCC-CS402.6 : Show how cache design parameters affect cache hit rate.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PCC CS402.1	1	2	1	1		2	2				2	2
PCC CS402.2	3	3										
PCC CS402.3	2	3					1					
PCC CS402.4	3	2	2	2	2							2
PCC CS402.5	2	1	1	1			2					
PCC CS402.6	1	1										

1: Slightly 2: Moderately 3: Substantially

Course Name: Formal Language & Automata Theory (CS403)

Course Outcome:

CS403.1 : The student will be able to define a system and recognize the behavior of a system. They will be able to minimize a system and compare different systems.

CS403.2 : Student will convert Finite Automata to regular expression.

CS403.3 : Students will be able to check equivalence between regular linear grammar and FA.

CS403.4 : Students will understand the characteristics, construction, and application of Push Down Automata.

CS403.5 : Students will be able to minimize context free grammar.

CS403.6 : Student will be able to check equivalence of CFL and PDA.

CS403.7 : Students will be able to design Turing machine.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS403.1	3	3	3	-	-	-	-	-	3	3	-	1
CS403.2	3	3	3	-	-	-	-	-	3	3	-	1
CS403.3	3	3	3	-	-	-	-	-	3	3	-	1
CS403.4	3	3	3	-	-	-	-	-	3	3	-	1
CS403.5	3	3	3	-	-	-	-	-	3	3	-	1
CS403.6	3	3	3	-	-	-	-	-	3	3	-	1
CS403.7	3	3	3	-	-	-	-	-	3	3	-	1

1 Slightly 2. Moderately 3. Substantially

Course Name: Design & Analysis of Algorithm (CS501)

Course Outcomes

CS 501.1 : Analyze the asymptotic performance of algorithms.

CS 501.2 : Understand divide-and-conquer paradigm and explain when an algorithmic design situation callsfor it.

CS 501.3 : Understanding the dynamic programming paradigm

CS 501.4 : Understanding greedy paradigm.

CS 501.5 : Explain the major graph algorithms and their analyses.

CS 501.6 : Analyze randomized algorithms.

CS 501. : Understand NP Completeness

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS501.1	2	3		2	2	2	1	2	2			3
CS501.2		1	2	3	3		2			1	2	2
CS501.3	2	3	2	2		2		3	1	2	2	
CS501.4	1	1	3		2	1	2		2	3	3	2
CS501.5	1	3		2	1			3	1	2	1	1
CS501.6	2	2	2	3	1	2	2	2	2		2	
CS501.7	1	2			2		3		1	2		1

1: Slightly 2: Moderately 3: Substantially

Course Name: Object Oriented Programming (CS504D)

Course Outcomes

CS504D.1 : Students will be able to learn different object-oriented concepts like inheritance, encapsulation, polymorphism etc.

CS504D.2 : Students will be able to implement different object-oriented concepts using Java.

CS504D.3 : Students will be able to learn programming using string and array in Java.

CS504D.4 : Students will be able to code multithreaded programming.

CS505D.5 : Students will be able to write codes of exception handling.

CS505D.6: Students able to write graphics programming using applet and swing.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS504D.1	3	3	3		2	3			3	3	3	3
CS504D.2	3	3	3		2	3			3	3	3	3
CS504D .3	3	3	3		2	3			3	3	3	3
CS504D.4	3	3	3		2	3			3	3	3	3
CS504D.5	3	3	3		2	3			3	3	3	3
CS504D.6	3	3	3		2	3			3	3	3	3

1: Slightly 2: Moderately 3:Substantially

Course Name: Database Management

System (CS601)Course Outcomes

CS601.1 : Students will be able to learn the importance of the subject related to current software industry.

CS601.2 : Students will learn different concepts of schemas, instances, keys, constraints etc.

CS601.3 : Students will learn to draw ER Diagram to design database.

CS601.4 : Students will be able to minimize redundant data while maintaining the dependency preservation and lossless decomposition properties of the database using normalization.

CS601.5 : Students will learn how concurrent transactions works successfully.

CS601.6 : Students will learn to optimize query execution time using indexing and other techniques.

CS601.7 : Students will be able to write SQL and PL/SQL code for real life application.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS601.1	3	3	3			3			3	3	3	3
CS601.2	3	3	3			3			3	3	3	3
CS601 .3	3	3	3			3			3	3	3	3
CS601.4	3	3	3			3			3	3	3	3
CS601.5	3	3	3	1		3			3	3	3	3
CS601.6	3	3	3	2		3			3	3	3	3
CS601.7	3	3	3	1	3	3	1		3	3	3	3

1. **Slightly 2. Moderately 3. Substantially**

Course Name: Computer Networks (CS 602):

Course Outcomes

Upon completion of this module, students will be able to:

CS602.1 : Have a good understanding of the OSI Reference Model and have a good knowledge of Layers.

CS602.2 : Describe, analyze and compare a number of datalinks, network, and transport layer protocols.

CS602.3 : Analyze the requirements for a given organizational structure and select the most appropriatenetworking architecture and technologies.

CS602.4 : Specify and identify deficiencies in existing protocols, and then go onto formulate new and betterprotocols.

CS602.5 : Have a working knowledge of datagram and internet socket programming.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS602.1	2	3		2	2	2	3		2	2	1	1
CS602.2	3	1	2	3	3		1	2	3	3		3
CS602.3	2	3	2	2		2	3	2	2		1	2
CS602.4	1	1	3		2	1	1	3		2		
CS602.5	1	3		2	1	1	3		2	1	1	2

1: Slightly 2: Moderately 3: Substantially

Course Name: CS 603 (Operating System)

Course Outcomes

CS603.1 : Describe the main components of a computer and understand how these are managedby the operating system.

CS603.2 : Demonstrate the concepts, structure and design of operating systems and its impact on applicationsystem design and performance.

CS603.3 : Demonstrate competence in recognizing and using operating system features.

CS603.4 : Discuss the issues involved in the management and security of an operating system.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS603.1	3	2	2	3	3	1	3	2	1	3	2	3
CS603.2	3	3	2	3	3	2	3	2	1	2	3	3
CS603.3	2	3	3	3	2	1	2	2	2	3	3	2
CS603.4	2	2	2	3	3	3	3	3	2	2	3	3

1: Slightly 2: Moderately 3: Substantially

Course Name: CS 604B(Computer Graphics)

Course Outcomes

CS604B.1 : To list the basic concepts used in computer graphics.

CS604B.2 : To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.

CS604B.3 : To describe the importance of viewing and projections.

CS604B.4 : To understand typical graphics pipeline.

CS604B.5 : To design an application with the principle

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS604B.1	3	3	-	-	2	-	-	3	2	2	2	1
CS604B.2	3	3	3	3	2	-	-	1	3	2	2	3
CS604B.3	3	3	3	2	1	1	1	1	-	-	2	2
CS604B.4	2	2	1	1	2	-	-	-	2	2	1	-
CS604B.5	2	2	3	3	3	1	-	-	1	2	2	1

1: Slightly 2: Moderately 3: Substantially

Course Name: CS 701(Software Engineering)

Course Outcomes

At the completion of the course, students will be able to…

CS701.1 : Identifying the key activities in Software Engineering and compare different process models.

CS701.2 : Identifying different software project planning activities.

CS701.3 : Systematic approaches of software requirements analysis and specification, and software design.

CS701.4 : Different approaches of software coding, documentation, and testing.

CS701.5 : Concepts of software quality, software maintenance and configuration management.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS701.1	3	1	1									
CS701.2	2	3	2	3		3	3	2		2	2	3
CS701.3	2	3	3	3	3	2			3			
CS701.4	3	2	3	2	3	1		2	3		2	
CS701.5	1	1	2	2			2				2	

1: Slightly 2: Moderately 3: Substantially

Course Name: CS 702(Compiler Design)

Course Outcomes

CS702.1 : Study Different Phases of Compilation

CS702.2 : Elimination of Ambiguity from a Grammar and Design Unambiguous Grammars

CS702.3 : Understanding Different Types of Parsers

CS702.4 : Studying the Issues of Code Generation

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS702.1	3	3	3	2	3	1	2	2	2	3	3	2
CS702.2	3	3	3	2	2	2	2	2	2	2	3	2
CS702.3	3	3	3	2	3	1	2	2	2	2	3	2
CS702.4	3	3	3	2	2	1	2	2	2	2	2	3

1: Slightly 2: Moderately 3: Substantially

Course Name: Artificial Intelligence (CS703C)

Course Outcomes

CS703C.1 : Understand the various searching techniques, constraint satisfaction problem and exampleproblems- game playing techniques.

CS703C.2 : Apply these techniques in applications which involve perception, reasoning, and learning.

CS703C.3 : Explain the role of agents and how it is related to environment and the way of evaluating it andhow agents can act by establishing goals.

CS703C.4 : Acquire the knowledge of real world Knowledge representation

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS703C.1	2	1	2	2			3	2	3		2	2
CS703C.2		2			1	2	2		1	2	3	3
CS703C.3	2		3	1	2	2		2	3	2	2	
CS703C.4	1	2		2	3	3	2	1	1	3		2

1: Slightly 2: Moderately 3: Substantially

Course Name: Data Warehousing & Data Mining (CS704C)

Course Outcomes

After completion of this course, the students would be able to:

CS704C.1 : Distinguish different Data Warehouse and Data Mart architectures.

CS704C.2 : Compare ER modeling vs. dimensional modeling.

CS704C.3 : Design a Data Warehouse.

CS704C.4 : Extract, Transform and Load data in Data Warehouse.

CS704C.5 : Analyze data of data warehouse using On-Line Analytic Processing (OLAP) operations.

CS704C.6 : Detect clusters from data (clustering).

CS704C.7 : Predict class labels of data (classification).

CS704C.8 : Finding the relationship between various items (association).

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS704C.1	3	3	3		2	2			3	3	3	3
CS704C.2	3	3	3		2	2			3	3	3	3
CS704C.3	3	3	3		2	2			3	3	3	3
CS704C.4	3	3	3		2	2			3	3	3	3
CS704C.5	3	3	3		2	2	1		3	3	3	3
CS704C.6	3	3	3	3	2	2	1		3	3	3	3
CS704C.7	3	3	3	3	2	2	1		3	3	3	3
CS704C.8	3	3	3	3	2	2	1		3	3	3	3

1. Slightly 2. Moderately 3. Substantially

Course Name: Internet Technology (CS705A)

Course Outcomes

CS705A.1 : Having Idea about Internet, Intranet and Extranet

CS705A.2 : Getting Idea about Different Types of Protocol for Internet Technology

CS705A.3 : Understanding Classfull and Classless IP Addressing

CS705A.4 : Understanding Security Issues, Threads and Attacks

CS705A.5 : Understanding Implementations in HTML, JSP and PERL

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS705A.1	3	1	-	-	1	1	-	-	3	3	3	2
CS705A.2	3	2	-	1	-	-	3	2	1	3	3	3
CS705A.3	3	1	1	-	1	1	3	2	3	3	3	2
CS705A.4	3	3	2	-	3	2	3	2	3	3	3	3
CS705A.5	3	3	2	-	3	2	3	2	3	3	3	3

1: Slightly 2: Moderately 3: Substantially

Course Name: Cryptography & Network Security (CS801D)

Course Outcomes

CS801D.1 : Classify the symmetric key encryption techniques

CS801D.2 : Illustrate various Public key cryptographic techniques

CS801D.3 : value the authentication and hash algorithms.

CS801D.4 : Summarize the intrusion detection and its solutions to overcome the attacks.

CS801D.5 : Discuss authentication applications and Basic concepts of system level security

CS801D.6 : Concepts of virus Trojan Horse and Worm

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS 801D.1	3	3	3	2	2	3	1	1	2	3	3	1
CS 801D.2	3	3	3	2	2	3	1	1	2	3	3	1
CS 801D.3	3	3	2	2	1	3	1	-	-	-	2	-
CS 801D.4	3	2	3	2	1	-	-	1	1	-	3	1
CS 801D.5	3	3	3	3	3	1	1	-	-	2	1	1
CS 801D.6	2	2	1	2	1	-	-	-	-	-	2	1

1: Slightly 2: Moderately 3: Substantially

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Course Name: E-Commerce (CS802E)

Course Outcomes

CS802E.1 : Understand the basic concepts and technologies used in the field of management information systems.

CS802E.2 : Have the knowledge of the different types of management information systems and understand the processes of developing and implementing information systems.

CS802E.3 : Be aware of the ethical, social, and security issues of information systems.

CS802E.4 : Analyze the impact of E-commerce on business models and strategy.

CS802E.5 : Explain the process that should be followed in building an E-commerce presence.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS802E.1	3	3	2	2	2	2	2	2	2	2	3	1
CS802E.2	3	3	2	3	3	3	2	2	2	1	2	2
CS802E.3	3	3	3	2	3	2	3	3	2	3	2	2
CS802E.4	3	3	3	3	3	3	2	2	2	3	3	3
CS802E.5	3	3	2	3	3	2	3	2	3	3	3	3

1: Slightly 2: Moderately 3: Substantially

Course Name: Computer Networks (EC703C)

Course Outcomes

Upon completion of this module, students will be able to:

EC703C.1 : Have a good understanding of the OSI Reference Model and have a good knowledge of layers.

EC703C.2 : Describe, analyze and compare a number of datalink, network, and transport layer protocols.

EC703C.3 : Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

EC703C.4 : Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols.

EC703C.5 : Have a working knowledge of datagram and internet socket programming.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC703C.1	2	3		2	2	2	3		2	2	1	1
EC703C.2	3	1	2	3	3		1	2	3	3		3
EC703C.3	2	3	2	2		2	3	2	2		1	2
EC703C.4	1	1	3		2	1	1	3		2		
EC703C.5	1	3		2	1	1	3		2	1	1	2

1: Slightly 2: Moderately 3: Substantially

Course Name: Database Management System (EC705C)

Course Outcomes

EC 705C.1: Understanding fundamentals of database.

EC 705C.2: Knowing various Data Models.

EC 705C.3: Understanding transactions.

EC 705C.4: Query Optimization.

EC 705C.5: Implementing SQL queries.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC 705C.1	3	2	1	3	2	1	2	1	2	3	2	2
EC 705C.2	2	1	2	2	1	1	1	2	3	3	2	2
EC 705C.3	3	3	3	3	2	2	3	-	2	2	3	1
EC 705C.4	2	2	2	2	2	1	-	1	1	3	2	1
EC 705C.5	3	3	3	1	2	2	2	-	2	3	3	2

1: Slightly 2: Moderately 3: Substantially

Course Name: Computer Education (ARCH301)

Course Outcomes

ARCH301.1: Understanding basics of computer.

ARCH301.2: Understanding fundamental of programing.

ARCH301.3: Implementing C programing.

ARCH301.4: Number system and conversion.

ARCH301.5: Design truth table and logic gates.

Mapping between CO and PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
ARCH301.1	3	2	-	2	2	-	1	2	2	3	3	3
ARCH301.2	3	3	2	-	2	-	-	3	3	3	3	3
ARCH301.3	3	3	3	-	2	-	2	3	3	3	3	2
ARCH301.4	3	3	3	-	-	-	1	2	2	3	1	2
ARCH301.5	2	2	2	-	1	-	1	1	3	3	2	2

1: Slightly 2: Moderately 3: Substantially

DEPARTMENT OF CIVIL ENGINEERING

OMDAYAL GROUP OF INSTITUTIONS

Program Outcomes

&

Course Outcomes

CO-PO AND MAPPING

ENVIRONMENTAL POLLUTION AND CONTROL (Code: CE801A)

Prerequisites: Environmental Science

Course Outcomes: At the end of the course, the student will be able to:

CO1 : To learn about the air pollutants, sources and its effects.

CO2 : To have a clear understanding on the air quality standards and its techniques.

CO3 : To find the Properties of air pollution and its control measures.

CO4 : To learn about the effects and the sources of noise pollution constructions

CO5 : Determine quantity of industrial waste water, quality and treatment methods for different industrial wastewater.

CO6 : To environmental impact of air and water pollution, pollution control acts.

Mapping of Course outcomes with Program outcomes

Program outcomes → / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1				2	3					
CO 2			3						1			2
CO 3		2		3			3		3			
CO 4	3							2	2			
CO 5				3					3			
CO6	3	2		2						2	2	3

1: Slightly 2: Moderately 3: Substantially

PAVEMENT DESIGN (OLD SYLLABUS) (Code: CE802D)

Prerequisites : Highway Engineering, Concrete Technology & RCC Design

COURSE OUTCOMES:

At the end of the course, students would be able to -----

CO 1 : Introduce students to the basic types and behavior of highway materials.

CO 2 : Expose students to the general aspects of pavement structural design, flexible or rigid.

CO 3 : Expose students to the analysis concepts and procedures for stresses, strains and deflection in pavements.

CO 4. : Introduce students to commercially available software in the area of pavement structural design.

Mapping of Course outcomes with Program outcomes

Program outcomes → / Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	-	-	-	-	-	-	-	1	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	-	2	-
CO 3	-	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	-	-	-	-	-	-	-	2	-	-	-
CO 5	-	-	-	-	-	-	-	-	-	-	-	-
CO 6	-	-	-	-	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

PROJECT-II (R.C.C Design) Code: CE(PROJ)892

Prerequisites: Advance analysis of concrete structure Engineering Drawing

Course Outcomes: At the end of the course, the student will be able to:

CO1 – Design of an Overhead R.C.C tank (INTZE Type)

Program outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course outcome												
CO 1	3	3	2	2	2	3	2	-	2	2	2	3

Mapping of Course outcomes with Program outcomes

PROGRAMME OUTCOMES (POS)

PO 1	**:**	**Engineering knowledge:** apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**:**	**Problem analysis:** identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**:**	**Design/development of solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**:**	**Conduct investigations of complex problems**: use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**:**	**Modern tool usage:** create, select, and apply appropriate techniques, resources, and modern engineering and it tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**:**	**The engineer and society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**:**	**Environment and sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**:**	**Ethics:** apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**:**	**Individual and team work:** function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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.

HYDRAULIC STRUCTURES Code: CE(PE)701C

Prerequisites : Fluid Mechanics, RCC Design of Structures COURSE OUTCOMES:

At the end of the course, students would be able to --------

CO1 : Plan and design diversion head works. To analyse the functioning of diversion head works and energy dissipation

CO2 : To design the hydraulic structures like regulators, cross drainage works, falls and outlets of irrigation

CO3 : Analyze gravity and earth dams.

CO4 : Design spillways and energy dissipations works devices

Mapping of Course outcomes with Program outcomes

Program outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course outcome												
CO 1	3	3	2	2	2	3	2	1	2	2	2	3

1: Slightly 2: Moderately 3: Substantially

Advanced Structural Analysis Code: CE704A

Prerequisites: Physics, Mathematics I & II and Engineering Mechanics, Structural Analysis.

Course Outcomes: At the end of the course, the student will be able to:

CO1: Analyse the statically indeterminate structures
CO2: Do matrix analysis of structure with axial elements
CO3: Do matrix analysis of beams and grids
CO4: Do matrix analysis of planes and space frames
CO5: Familiar with the theory of elasticity

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	3	3	-	-	-	-	-	-	1
CO 2	3	3	3	3	3	-	-	-	-	-	-	1
CO 3	3	3	3	3	3	-	-	-	-	-	-	1
CO 4	3	3	3	3	3	-	-	-	-	-	-	1
CO 5	3	3	3	3	3	-	-	-	-	-	-	1

1: Slightly 2: Moderately 3: Substantially

PAVEMENT DESIGN Code: CE(PE)705B

Prerequisites : Highway Engineering, Concrete Technology & RCC Design

COURSE OUTCOMES:

At the end of the course, students would be able to ---------

CO1 : Introduce students to the basic types and behaviour of highway materials.

CO2 : Expose students to the general aspects of pavement structural design, flexible or rigid.

CO3 : Expose students to the analysis concepts and procedures for stresses, strains and deflection in pavements.

CO4 : Introduce students to commercially available software in the area of pavement structural design.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	-	-	-	-	-	-	-	1	-	-	1
CO 2	-	-	-	-	-	-	-	-	-	-	2	1
CO 3	-	-	-	-	-	-	-	-	-	-	2	1
CO 4	-	-	-	-	-	-	-	-	2	-	-	1
CO 5	-	-	-	-	-	-	-	-	-	-	-	1

1: Slightly 2: Moderately 3: Substantially

PROJECT-I Code: CE(PROJ)-792

Prerequisites:, Structural Analysis .Design concept of different RCC Members and Civi Engineering Drawings

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Analysis of all parts of a building including all loading patterns as per relevant IS Codes
CO2 : Design of different members of a buildings based on the analysis
CO3 : Analysis of a steel framed building including all loading patterns as per relevant IS Codes
CO4 : Design of different members of a buildings based on the analysis
CO5 : Formation of a engineering project drawings in both concrete and steel projects

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	2	2	2	2	1	2	2	2	3
CO 2	3	3	3	2	2	2	2	1	2	2	2	3
CO 3	3	3	3	2	2	2	2	1	2	2	2	3
CO 4	3	3	3	2	2	2	2	1	2	2	2	3
CO 5	3	3	3	2	2	2	2	1	2	2	2	3

1: Slightly 2: Moderately 3: Substantially

PROGRAMME OUTCOMES

PO1	**:**	**Engineering knowledge:** apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**:**	**Problem analysis:** identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**:**	**Design/development of solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**:**	**Conduct investigations of complex problems**: use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**:**	**Modern tool usage:** create, select, and apply appropriate techniques, resources, and modern engineering and it tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**:**	**The engineer and society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**:**	**Environment and sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**:**	**Ethics:** apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**:**	**Individual and team work:** function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**:**	**Communication:** 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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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.

CONSTRUCTION ENGINEERING AND MANAGEMENT

Prerequisites : Introduction to Civil Engineering, Building Construction & Concrete Technology

Course outcome:

At the end of the course, students would be able to-----

1. The understanding & to determine the quantity of buildings require the knowledge of drawings. This knowledge will be useful to the student to prepare the construction schedule. They should also able to present the knowledge in a way that it is understandable by others.
2. The Construction check lists is closely associated with the knowledge of Construction materials and engineering laboratory tests for different types of works etc. The student will able to analyzes critical path, and resource allocation, towards the end of the course. They should also able to present the knowledge in a way that it is understandable by others.
3. The students should have the knowledge to quality control monitoring in the project, project safety management and construction project information. They should also able to present the knowledge in a way that it is understandable by others.

CO1 : Understand the different types of standard/special equipment used in the construction industry and learn the different sources of equipment, economic life and depreciation cost of equipment.
CO2 : Determine owning and operating costs, evaluate maintenance and repair costs.
CO3 : Understand the various equipment related to earth moving, drilling and blasting, pile driving, pumping, stone crushing, air compressors, equipment for moving materials etc.
CO4 : Understand the complex processes involved in the construction of tunnels.
CO5 : Understand various soil stabilization techniques such as sand drains and stone columns, use of geotextiles and chemicals, diaphragm wall, rock anchors, foundation grouting, etc.
CO6 : Understand the concept of mass concreting, vacuum concreting and modern slip forms and to understand different types of cladding and their arrangements.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	2	1	-	2	2	3	1	-	2	-
CO 2	-	-	2	1	-	2	2	3	1	-	2	2
CO 3	-	2	2	1	-	2	2	3	1	-	2	2
CO 4	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	-	-	-	-	-	-	-	-
CO 6	-	-	-	-	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Engineering Economics, Estimation &Costing Code: CE((PC) 602

Prerequisites: CE(ES)392 Computer-aided Civil Engineering Drawing

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses and understand the measures of National Income
CO2 : Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives and Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses
CO3 : Understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure
CO4 : Quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
CO5 : Understand how competitive bidding works and how to submit a competitive bid proposal.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	-	-	-	-	-	-	-	3	1
CO 2	3	-	-	-	-	-	-	-	-	-	3	1
CO 3	3	-	1	-	-	-	-	-	-	-	2	1
CO 4	3	-	1	-	-	-	-	-	-	-	2	1
CO 5	3	-	-	-	-	-	-	-	-	-	3	1

1: Slightly 2: Moderately 3: Substantially

WATER RESOURCE ENGINEERING

Prerequisites : Physics, Mathematics, Introduction to Civil Engineering & Engineering Hydrology

COURSE OUTCOME:

At the end of the course, students would be able to -----

CO1 : To describe the basic principles and design parameters of the irrigation

CO2 : To select the appropriate method for irrigation network based on specific field

CO3 : Collect data and calculate the demand of water for agricultural land.

CO3 : To design the hydraulic structures like canals

CO4 : Investigate and control level of sedimentation in reservoir.

CO5 : To detect the water logged area due to over irrigation

CO6 : Apply their knowledge on ground water, well hydraulics to estimate safe yield Methods

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	-	2	1	1	-	-	-	1	-
CO 2	3	-	-	-	-	1	1	-	-	-	1	-
CO 3	3	-	1	-	2	1	1	-	-	-	1	-
CO 4	3	-	1	-	2	1	1	-	-	-	1	-
CO 5	3	-	-	-	-	1	1	-	-	-	1	-
CO 6	-	-	-	-	1	1	1	-	-	-	1	-

1: Slightly 2: Moderately 3: Substantially

Design of Steel structure

Prerequisites: Strength of Materials, Structural Analysis, Mathematical Methods and Engineering Mechanics.

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Identify the material properties of structural steel, moreover the student will identify different bolted and welded connections, analyse and design them for axial and eccentric load.
CO2 : Design different steel sections subjected to axial compression and tension following IS code of practice.
CO3 : Comprehend the differences between laterally supported and unsupported flexural members. Designing of the flexural members using IS code of practice.
CO4 : Analyse and design of rolled and built up compression members along with base connection subject to axial compression, bending and tension.
CO5 : Calculate shear force and bending moment on rolled and built up girders, dimension the section and finally design it following IS design guidelines.
CO6 : Identify different components of gantry system, calculate lateral and vertical loads acting on the system, dimension the components and design them.
CO7 : Design different components of an industrial building.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	3	-	3	2	2	2	3	-	2	3
CO 2	3	1	-	3	-	-	1	-	-	-	1	-
CO 3	3	1	-	3	-	-	1	-	-	-	1	-
CO 4	3	1	-	3	-	-	1	-	-	-	1	-
CO 5	3	1	-	3	-	-	1	-	-	-	1	-
CO 6	2	-	3	2	-	-	-	-	-	-	1	-
CO 7	-	-	3	2	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Design of Steel Structure (Seasonal) Code: CE(PC) 604

Prerequisites: Basic knowledge of steel structure design including connection details and Civi Engineering Drawing

Course Outcomes: At the end of the course, the student will be able to:
CO1 : Design of a Steel Structure frame work including truss members, purlins, bottom ties, grid beams
CO2 : Design of Steel Columns
CO3 : Design of bracings
CO4 : Design of Foundation
CO5 : Connection details including drawings

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	1	1	2	-	-	1	2	3	3
CO 2	3	3	2	1	1	2	-	-	1	2	3	3
CO 3	3	3	2	1	1	2	-	-	1	2	3	3
CO 4	3	3	2	1	1	2	-	-	1	2	3	3
CO 5	3	3	2	1	1	2	-	-	1	2	3	3

1: Slightly 2: Moderately 3: Substantially

PROGRAMME OUTCOMES

PO1	**:**	**Engineering knowledge:** apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2	**:**	**Problem analysis:** identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**:**	**Design/development of solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**:**	**Conduct investigations of complex problems**: use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**:**	**Modern tool usage:** create, select, and apply appropriate techniques, resources, and modern engineering and it tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**:**	**The engineer and society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**:**	**Environment and sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**:**	**Ethics:** apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**:**	**Individual and team work:** function effectively as anindividual, and as a member or leader in diverse teams, and in multidisciplinary 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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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.

Foundation Engineering Code : CE(PE)601

Pre-requisites: Introduction to Civil Engineering [CE(HS)302], Soil Mechanics I [CE(PC)401], Soil MechanicsII [CE(PC)504]

Course Outcomes

After going through this Course, the students will be able to:

CO1 : Determine the load carrying capacity of pile foundation.
CO2 : Compute the efficiency and settlement of pile group.
CO3 : Understand different subsoil exploration methods and interpret field and laboratory test data to obtain design parameters for geotechnical analysis.
CO4 : Correlate bearing capacity of shallow foundation from field test data.
CO5 : Analyse and design sheet pile structure on the basis of earth pressure theories.
CO6 : Understand and apply various types of ground improvement methods for solving complex geotechnical problems.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2					-	-	-	-	-
CO 2	3	3	2					-	-	-	-	-
CO 3	3	3	2	2	2			-	-	-	-	-
CO 4	3	1						-	-	-	-	-
CO 5	3	3	3					-	-	-	-	-
CO 6	3	2			1		2	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

STRUCTURAL ANALYSIS II

Prerequisites: Mechanics of Materials Engineering Mechanics, Strength of Materials

Course Outcomes:

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

CO1 : Apply the Slope Deflection and Moment Distribution Method to analyze indeterminate structure

CO2 : Develop and analyze the concept of suspension bridge and stiffen girders

CO3 : Apply and analyze the concepts of curved beam, analysis in hooks, rings and Bow girders

CO4 : Develop the concept bending in unsymmetrical beams

CO5 : Develop the fundamental concept of plastic analysis using kinametic method and apply them in frame and continuous beam analysis

CO6 : Develop and analyze the portal frame using portal and cantilever method, Develop and analyze the indeterminate structures (continuous beam and frame) using flexibility and stiffness matrix method.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	3	-	-	-	1	-	-	-	-
CO 2	3	-	-	3	-	-	-	1	-	-	-	-
CO 3	3	-	-	3	-	-	-	1	-	-	-	-
CO 4	3	-	-	3	-	-	-	1	-	-	-	-
CO 5	3	-	2	3	-	-	-	-	-	-	-	-
CO 6	3	-	2	3	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	3	-	-	-	1	-	-	-	-
CO 2	3	-	-	3	-	-	-	1	-	-	-	-
CO 3	3	-	-	3	-	-	-	1	-	-	-	-
CO 4	3	-	-	3	-	-	-	1	-	-	-	-
CO 5	3	-	2	3	-	-	-	-	-	-	-	-
CO 6	3	-	2	3	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Water Resource Engineering: Code CE(PC)693

Pre-requisites: Engineering Hydrology[CE(PC)502], Water Resource Engineering [CE(PC)603]

Course Outcomes

After going through this Course, the students will be able to:

CO1 : Delineate the watershed of any reservoir using DEM.

CO2 : Determine the average rainfall over a catchment.

CO3 : Use the rain gauge properly for a specified purpose.

CO4 : Measure the rate of infiltration of water through the soil.

CO5 : Measure the sunshine hours in a particular day.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	-	3	-	-	-	-	-	-	-
CO 2	3	2			2	-	-	-	-	-	-	-
CO 3	1	-	-	-	2	-	-	-	-	-	-	-
CO 4	3	1	-	-	3	-	-	-	-	-	-	-
CO 5	2	-	-	-	2	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Quantity Survey Sessional Code : CE(PC)695

Pre-requisites: None

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Do cost estimate of single storied building, boundary wall, U.G. Reservoir, Septic Tank, Road etc.

CO2 : **Do** Bar bending schedule of R.C.C. structures, viz. Foundation, Columns, Lintels, chajja, slab, beam, staircase etc.

CO3 : Do analysis of Rates of different items of construction works.

CO4 : Know Specification of works and mode of measurements.

CO5 : Do Valuation of properties, Sinking Fund, Depreciation, Deferred income, Freehold and Leasehold property, Mortgage, Rent fixation etc.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	2	2	2	-	-	2	2	2	2
CO 2	3	3	3	2	2	2	-	-	2	2	2	2
CO 3	3	2	3	1	3	2	-	-	2	2	2	2
CO 4	2	2	2	2	1	2	-	-	2	2	2	2
CO 5	2	2	2	1	1	2	-	-	2	2	2	2

1: Slightly 2: Moderately 3: Substantially

DESIGN OF RC STRUCTURES

Prerequisites: Concrete Technology and Mechanics of Materials.

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Understand material properties and design methodologies for reinforced concrete structures

CO2 : Assess different type of loads and prepare layout for reinforced concrete structures.

CO3 : Identify and apply the applicable industrial design codes relevant to the design of reinforced concrete members

CO4 : Analyse and design of various structural elements of reinforced concrete building like beam, slab, column, footing and staircase.

CO5 : Assessment of serviceability criteria for reinforced concrete beam and slab

CO6 : Prepare structural drawing and detailing and produce design calculations and drawing in appropriate professional format

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	1	2	3	-	-	-	1	-	-	-	-
CO 2	3	1	2	3	-	-	-	1	-	-	-	-
CO 3	3	1	3	3	-	-	-	1	-	-	-	-
CO 4	3	1	3	3	-	-	-	1	-	-	-	-
CO 5	3	1	3	3	-	-	-	1	-	-	-	-
CO 6	3	1	3	3	-	-	-	1	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

STRUCTURAL ANALYSIS 1 Code: CE(PC) 503

Prerequisites: Mechanics of Materials, Engineering Mechanics, Strength of Materials

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Distinguish between stable and unstable and statically determinate and indeterminate

CO2 : Apply equations of equilibrium to structures and compute the reactions

CO3 : Calculate the internal forces in cable and arch type structures

CO4 : Evaluate and draw the influence lines for reactions, shears and bending moments in beams due to moving load

CO5 : Use of approximate method for analysis of statically indeterminate structure.

CO6 : Calculate the deflections of truss structures and beams.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	3	-	-	-	1	-	-	-	-
CO 2	3	-	-	3	-	-	-	1	-	-	-	-
CO 3	3	-	-	3	-	-	-	1	-	-	-	-
CO 4	3	-	-	3	-	-	-	1	-	-	-	-
CO 5	3	-	2	3	-	-	-	-	-	-	-	-
CO 6	3	-	2	3	-	-	-	-	-	-	-	-
CO 7	3	-	2	3	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Soil Mechanics II Code: CE(PC)504

Pre-requisites: Soil Mechanics I [CE(PC)401]

Course Outcomes

After going through this Course, the students will be able to:

CO1 : Assess the compaction and consolidation characteristics of soil for solving geotechnical problems.
CO2 : Calculate earth pressure on rigid retaining walls (cantilever type) from geotechnical engineering consideration.
CO3 : Evaluate the bearing capacity of shallow foundation by applying established theory.
CO4 : Estimate settlement in soils by different methods.
CO5 : Compute safety of dams and embankments on the basis of various methods of slope stability analysis.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	2	-	-	-	-	-	-	-	-
CO 2	3	3	2	2	-	-	-	-	-	-	-	-
CO 3	3	3	2	1	-	-	-	-	-	-	-	-
CO 4	3	2	1	-	-	-	-	-	-	-	-	-
CO 5	3	3	1	2	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Environmental Engineering-I Code : CE(PC)505

Prerequisites: Chemistry and Engineering Hydrology

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Define the basic concepts and terminologies of waste water engineering and hazardous waste management.

CO2 : Describe different house plumbing systems for water supply and waste water disposal.

CO3 : Apply the methods of quantifying sanitary sewage and storm sewage.

CO4 : Solve different mathematical problems regarding different components of sewerage system

CO5 : Compare between different waste water samples based on their physical, chemical and biological characteristics.

CO6 : Design different unit processes and operations involved in wastewater treatment.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	2	3	-	-	2	-	-	-	-	-
CO 2	3	3	3	-	-	-	2	-	-	-	-	-
CO 3	2	2	-	-	-	3	2	-	-	-	-	-
CO 4	3	2	-	3	2	-	2	1	-	-	-	-
CO 5	2	-	2	3	-	-	-	2	-	-	-	-
CO 6	3	-	3	2	-	-	-	-	-	-	1	-

1: Slightly 2: Moderately 3: Substantially

Transportation Engineering Code: CE(PC)506

Pre-requisites: Basic Science, Introduction to Civil Engineering, Surveying.

The objective of this course is appreciate of the need for lifelong learning through the discussion of recent changes and studies of highway and transportation engineering, also have the ability to apply knowledge of mathematics, science, and engineering to understand the design techniques and equipment used in highway engineering.

Course Outcomes:

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

CO1 : Plan and prioritize highway networks with consideration of finance and socio-economic condition.

CO2 : Design highway geometrics and understand use of modern software.

CO3 : Design traffic Intersections with traffic control devices.

CO4 : Design flexible and rigid pavements.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	2	3	-	-	2	-	-	-	-	-
CO 2	3	3	3	-	-	-	2	-	-	-	-	-
CO 3	2	2	-	-	-	3	2	-	-	-	-	-
CO 4	3	2	-	3	2	-	2	1	-	-	-	-
CO 5	2	-	2	3	-	-	-	2	-	-	-	-
CO 6	3	-	3	2	-	-	-	-	-	-	1	-

1: Slightly 2: Moderately 3: Substantially

ENVIRONMENTAL ENGINEERING LAB CODE: CE(PC)-595

Prerequisites : Knowledge of Environmental Engineering, Biology for engineers, Chemistry and Physics Laboratory.

C**OURSE OUTCOMES:-**

At the end of the course, the student is expected to be aware of

CO1 : The procedure for quantifying quality parameters for water and waste water

CO2 : Have a fundamental knowledge to conduct various quality tests on water and wastewater

CO3 : Have a well-founded knowledge to assess the suitability of water for drinking and irrigation purpose.

CO4 : Acquire skills in assessing the suitability of water for concreting works.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	2	3	-	-	2	-	-	-	-	-
CO 2	3	3	3	-	-	-	2	-	-	-	-	-
CO 3	2	2	-	-	-	3	2	-	-	-	-	-
CO 4	3	2	-	3	2	-	2	1	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Computer Applications in Civil Engineering Code: CE(PC)597

Prerequisites : ES-CS291 Programming for Problem Solving, CE(ES)392 Computer-aided Civil Engineering Drawing

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Use the computer as a problem-solving tool

CO2 : Identify and formulate Civil Engineering problems solvable by computers.

CO3 : Solve sets of linear equations and determine roots and nonlinear equations and able perform their application in civil engineering

CO4 : Use various software used in industries for analysis and design.

CO5 : Develop programs for Civil Engineering analysis and design problems.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	1	3	-	-	-	-	-	-	1
CO 2	3	3	3	1	3	-	-	-	-	-	-	1
CO 3	3	3	3	1	3	-	-	-	-	-	-	1
CO 4	3	3	3	1	3	-	-	-	-	-	-	1
CO5	3	3	3	1	3	-	-	-	-	-	-	1

1: Slightly 2: Moderately 3: Substantially

Soil Mechanics Laboratory Code : CE(PC)594

Pre-requisites : Soil Mechanics I[CE(PC)401], Soil Mechanics II [CE(PC)504

Course Outcomes

After going through this Course, the students will be able to:

CO1 : Identify different types of soil by visual inspection.

CO2 : Determine natural moisture content and specific gravity of various types of soil.

CO3 : Estimate in-situ density by core-cutter method and sand replacement method.

CO4 : Analyse grain-size distribution and Atterberg limits for soil.

CO5 : Perform laboratory test to determine permeability and compaction characteristics of soil.

CO6 : Determine shear strength parameter of soil by unconfined compression test and vane shear test.

CO7 : Determine shear strength parameter by direct shear test.

CO8 : Perform triaxial test to determine the shear strength parameter of soil.

CO9 : Determine California Bearing Ratio of soil.

CO10 : Prepare technical laboratory report.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	2	3	-	-	-	-	-	-	-
CO 3	3	1	-	2	3	-	-	-	-	-	-	-
CO 4	3	2	-	2	3	-	-	-	-	-	-	-
CO5	3	2	-	2	3	-	-	-	-	-	-	-
CO6	3	3	-	2	3	-	-	-	-	-	-	-
CO7	3	2	-	1	3	-	-	-	-	-	-	-
CO8	3	2	-	1	3	-	-	-	-	-	-	-
CO9	3	2	-	2	3	-	-	-	-	-	-	-
CO10	3	-	-	3	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

CIVIL ENGINEERING – SOCIETAL& GLOBAL IMPACT Code : CE(HS)401

Prerequisite : Introduction to Civil Engineering and Energy science & Engineering.

SKILLS: Aware of the importance of Civil Engineering and impact on the society. Aware of the impact of Civil Engineering for various fields of human endeavour. Innovative thinking to ensure sustainability

Course Objective:

The course is designed to provide a better understanding of the impact which Civil Engineering has on the Society at large and on the global arena. Civil Engineering projects have an impact on the Infrastructure, Energy consumption and generation, Sustainability of the Environment, Aesthetics of the environment, Employment creation, Contribution to the GDP, and on a more perceptible level, the Quality of Life. It is important for the civil engineers to realise the impact which this field has and take appropriate precautions to ensure that the impact is not adverse but beneficial. The objectives of this course is understand need of these sources due to crisis of conventional sources and the familiarize with non- conventional sources

COURSE OUTCOMES:

At the end of the course, students would be able to -----

CO1 : Outline the role of Civil engineering in evolution and revolution of mankind and globally present status of development in India.

CO2 : Estimate the level of resource utilization for present and future infrastructural projects using various tools/methods.

CO3 : Infer the necessity of different conventional as well as futuristic infrastructural projects.

CO4 : Incorporate the goal of sustainable development to minimize the potential impacts on the global environment.

CO5 : Associate various measures for enhancing the build environment, thereby improving quality of life of the occupants.

CO6 : Evaluate the potential of Civil Engineering for employment creation and its contribution to the GDP.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	-	-	-	-	2	1	1	-	-	1	-	-
CO 2	-	-	-	-	-	1	1	-	-	1	-	-
CO 3	-	-	-	-	2	1	1	-	-	1	-	-
CO 4	-	-	-	-	2	1	1	-	-	1	-	-
CO5	-	-	-	-	-	1	1	-	-	1	-	-
CO6	-	-	-	-	1	1	1	-	-	1	-	-

1: Slightly 2: Moderately 3: Substantially

Environmental Engineering-I Code : CE(PC)402

Prerequisites: Chemistry and Engineering Hydrology.

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Define the basic concepts and terminologies of water supply engineering and solid waste

CO2 : Describe and differentiate the surface and groundwater sources; and composition and characteristics of municipal solid waste.

CO3 : Apply the methods of quantifying water requirement and MSW generation.

CO4 : Solve different mathematical problem regarding different components of water supply system

CO5 : Compare between different water samples based on their physical, chemical and biological characteristics. CO6design different unit processes and operations involved in water treatment and MSW management.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	-	-	2	3	-	-	-	-	-	-	-	-
CO 2	3	3	3	-	-	-	2	-	-	-	-	-
CO 3	2	2	-	-		3	2	-	-	-	-	-
CO 4	3	2	-	3	2	-	2	1	-	-	-	-
CO5	2	-	2	3	-	-	-	2	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Soil Mechanics I Code : CE(PC)401

Pre-requisites: Engineering Mechanics

Course Outcomes (COs)

After going through this Course, the students will be able to:

CO1 : Classify soil as per grain-size distribution curve and understand the index properties of soil.

CO2 : Apply the concept of total stress, effective stress and pore water pressure for solving geotechnical problems.

CO3 : Assess the permeability of different types of soil and solve flow problems.

CO4 : Estimate the seepage loss, factor of safety against piping failure using flownet related to any hydraulic structure.

CO5 : Determine vertical stress on a horizontal plane within a soil mass subjected to different types of loading on the ground surface and also the maximum stressed zone or isobar below a loaded area.

CO6 : Apply the concept of shear strength to analyse different geotechnical problems and determine shear strength parameters from lab and field tests.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO6	3	2	1	-	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Introduction to Solid Mechanics Code: CE(ES)402

Pre-requisites : Engineering Mechanics [CE(ES)301], Basic Calculus

Course Outcomes

After going through this Course, the students will be able to:

CO1 : To identify the equilibrium conditions and elastic properties of axially loaded bars through stress-strain and force displacement curve.
CO2 : To identify the principal stress and principal plain through Mohr circle.
CO3 : TO calculate the hoop and meridi0nal stresses in thin cylinders and spherical shells.
CO4 : TO identify different degrees of freedoms for support conditions like hinge, roller and fixed constraints.
CO5 : To calculate bending moment, shear force and deflection of beams for uniformly distributed, concentrated, linearly varying and external concentrated moment.
CO6 : To calculate the member forces in a plane truss using method of joint and method of sections.
CO7 : To identify torsional moment and twist on a circular shaft and calculate the shear stress.
CO8 : To know the concept of strain energy due to axial load, bending and shear.
CO9 : To know the buckling load of columns using Euler's theory for different support constraints.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO6	3	3	-	-	-	-	-	-	-	-	-	-
CO7	3	3	-	-	-	-	-	-	-	-	-	-
CO8	3	2	-	-	-	-	-	-	-	-	-	-
CO9	3	2	-	-	-	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Computer Surveying and Geomatics Code: CE(PC)403

Prerequisites: Concept of Geometry and Basic Science

Course Outcomes : At the end of the course, the student will be able to:

CO1. : Principal of surveying and levelling
CO2. : Triangulation and Advance surveying
CO3. : Photogrammetric Surveying including Arial Photogrammetric
CO4. : Remote sensing
CO5. : Digital Image processing

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	3	1	-	-	2	2	2	2
CO2	3	3	1	1	3	1	-	-	2	2	2	2
CO3	3	3	1	1	3	2	1	-	2	2	2	2
CO4	3	3	1	1	3	2	1	-	2	2	2	2
CO5	3	3	1	1	3	2	1	-	2	2	2	2

1: Slightly 2: Moderately 3: Substantially

PO1	**:**	**Engineering knowledge:** apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**:**	**Problem analysis:** identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**:**	**Design/development of solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**:**	**Conduct investigations of complex problems:** use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**:**	**Modern tool usage:** create, select, and apply appropriate techniques, resources, and modern engineering and it tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**:**	**The engineer and society:** apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**:**	**Environment and sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**:**	**Ethics:** apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**:**	**Individual and team work:** function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**:**	**Communication:** 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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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.

CONCRETE TECHNOLOGY Code: CE(PC)404

Prerequisites : Building Materials, Introduction to Civil Engineering.

COURSE OUTCOMES: At the end of the course, students would be able to -----

CO1 : Identify the materials used to make concrete; including their sources, production and properties

CO2 : Describe and carry out tests relevant to the use of fresh and hardened concrete

CO3 : To design concrete mix with and without admixtures

CO4 : Classify the different types of concrete based on their applications

CO5 : To identify the various concreting methods to place the concrete on site

CO6 : Perform various NDT on concrete structures and to study crack repair and rehabilitation of concrete structures

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	2	2	1	-	-	-	-	-
CO2	2	2	1	2	2	-	-	-	-	-	-	-
CO3	2	2	2	1	-	-	2	-	-	-	-	2
CO4	-	-	2	-	2	2	-	-	-	-	-	2
CO5	2	-	2	-	3	-	-	-	2	-	2	-
CO6	3	3	-	-	-	2	2	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

SURVEYING &GEOMATICS LABORATORY Code: CE(PC) 493

Prerequisites: Basic Sciences (Physics, Mathematics), Introduction to Civil Engineering.

Course Outcomes : At the end of the course, the student will be able to :

CO1 : State the interdependency and advancement of different surveying methods

CO2 : Comprehend the working principles of different surveying and geomatics instruments and experiments

CO3 : Execute the different methods of surveying and geomatics to measure the features of interest

CO4 : Examine the results obtained from the surveying and geomatics experiments

CO5 : Critically appraise the different techniques of surveying and geomatics in measuring and assessing the features of interest

CO6 : Design and construct solutions for real world problems related to surveying and geomatics.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	2	2	-	2	3	1	-	3
CO2	3	3	3	3	3	1	-	2	3	3	-	3
CO3	2	3	3	2	3	2	-	2	3	3	-	3
CO4	2	3	3	3	-	-	-	2	-	-	-	1
CO5	3	1	-	-	3	-	-	-	-	3	-	3
CO6	3	3	3	2	3	3	1	2	3	3	-	3

1: Slightly 2: Moderately 3: Substantially

Concrete Technology Code: CE(PC)494

Pre-requisites : Concrete technology [CE(PC)404]

Course Outcomes (COs)

After going through this Course, the students will be able to:

CO1 : Demonstrate the method and findings of tension and compression tests on concrete.

CO2 : Understand the concept of different tests on hardened concrete.

CO3 : Find out mix proportion of high grade of concrete.

CO4 : Measure the workability of concrete mix.

CO5 : Understand the different properties of cement.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	1	1	-	-	-	-	-	-	-
CO2	3	2	-	1	1	-	-	-	-	-	-	-
CO3	3	2	-	1	1	-	-	-	-	-	-	-
CO4	3	2	-	1	1	-	-	-	-	-	-	-
CO5	3	2	-	1	1	-	-	-	-	-	-	-

1: Slightly 2: Moderately 3: Substantially

Introduction to Civil Engineering Code: CE(HS)302

Prerequisites: Basic Science knowledge

Course Outcomes: At the end of the course, the student will be able to :

CO1 : Understand basic disciplines of civil engineering, History of civil engineering and ancient monuments and the concept of national planning for construction and infrastructure development.
CO2 : Understand the fundamentals of architecture & town planning, fundamentals of building materials and construction management.
CO3 : Understand the fundamentals of environmental engineering and sustainability.
CO4 : Understand the basic concepts of Geotechnical, hydraulics, water resource and ocean engineering.
CO5 : Understand the fundamentals of Power plant structure, structural engineering, surveying and traffic & transportation engineering.
CO6 : Understand the fundamentals of repairs and rehabilitation of structures.
CO7 : Understand the basic principles of computational method, IT, IOT in civil engineering.
CO8 : Understand the application of civil engineering knowledge in industry, basics of professionalism

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-		-	-	-	-	-
CO2	2	-	-	-	-	-	1	-	-	-	2	-
CO3	2	1	-	-	-	-	2	-	-	-	-	-
CO4	2	1	-	-	-	-	1	-	-	-	-	-
CO5	2	1	1	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-
CO7	2	1	-	-	1	-	-	-	-	-	-	-
CO8	1	-	-	-	-	-	-	3	-	-	2	-

1: Slightly 2: Moderately 3: Substantially

ENERGY SCIENCE & ENGINEERING Code : CE(ES)302

Prerequisite : Basic Science Subjects

To familiarize with the all forms of renewable energy Resources. The objectives of this course is understand need of these sources due to crisis of conventional sources and the familiarize with non conventional sources. To impart knowledge on the atmosphere and its present condition and, global warming. To learn the green buildings concepts applicable to alternate design. To learn sufficient knowledge on energy monitoring methods and optimal regulations. To Comprehend the techniques available for energy conservation in electrical utilities.

Course Outcome

On completion of the course students will be able to

CO1 : To get a familiar knowledge in various forms of energy resources. Explain renewable energy sources & systems.

CO2 : Apply engineering techniques to build solar, wind, tidal, geothermal, bio-fuel, fuel cell, Hydrogen and sterling engine.

CO3 : Analyze and evaluate the implication of renewable energy. Concepts in solving numerical problems pertaining to solar radiation geometry and wind energy systems.

CO4 : Technical aspects of Global Warming will make them understand the impact they have on climate will be familiar with climate responsive building design and basic concepts.

CO5 : Familiarized about the energy sources, energy acts, and energy auditing and energy management methods. Perform energy audit in an Industry

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	1	2	1	2	3	3	3
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	1	2	1	-	-	1	-	2	3	2
CO4	2	1	1	1	1	-	1	-	-	-	-	-
CO5	1	1	3	3	3	2	3	3	2	3	3	2

1: Slightly : Moderately 3: Substantially

Computer-Aided Civil Engineering Drawing Code: CE(ES)392

Prerequisites: knowledge in Geometrical Drawing, Computer Operation and Basic Engineering Drawing

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Operate standard Computer Aided Design software
CO2 : Study and interpret civil engineering drawing
CO3 : Gain knowledge on masonry brickwork
CO4 : Prepare details drawing of building
CO5 : Understand and prepare 3D modelling of buildings

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	1	1	2	1	2	3	3	3
CO2	2	1	2	1	1	-	-	-	-	-	-	-
CO3	1	1		-	-	-	-	1	-	2	3	2
CO4	2	1	2	-	1	-	1	-	-	-	-	-
CO5	1	1	2	-	1	2	3	3	1	3	3	2

1: Slightly : Moderately 3: Substantially

PO1	**:**	**Engineering knowledge:** apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**:**	**Problem analysis:** identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**:**	**Design/development of solutions:** design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**:**	**Conduct investigations of complex problems:** use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
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P10	**:**	**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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
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.

Structure IV Code: ARCH 601

Prerequisites : Structure I, Structure II

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Design riveted, bolt and welded connections including beam end connections
CO2 : Design truss members
CO3 : Design builds up beams and columns
CO4 : Design of base-plate, gusset plate and concrete footings for steel columns, grillage foundation.
CO5 : Design of M.S. Plate girders and compound columns.

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	-	-	3	2	2	3
CO2	3	3	2	3	3	2	-	-	3	3	2	3
CO3	3	3	2	2	2	2	-	-	3	2	2	2
CO4	3	3	3	3	3	2	-	-	3	3	2	3
CO5	3	2	2	2	2	2	-	-	2	2	2	1

1: Slightly : Moderately 3: Substantially

Survey Practical Code: ARCH 683

Prerequisites: Basic knowledge of theory of Levelling and Theodolite Traverse Survey

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Understand the working principle of Survey instruments.

CO2 : Calculate horizontal and vertical angles, distances and levels

CO3 : Estimate measurement of errors and apply corrections

CO4 : Prepare Contour Maps for given area, Long section and cross section of Roadwork.

CO5 : Entry of Field Book and Level Book and Report writing.

Structure III Code: ARCH 502

Prerequisites : Structure I, Structure II

Course Outcomes : At the end of the course, the student will be able to:

CO1 : Design the Reinforced Concrete beams using limit state method

CO2 : Design Reinforced Concrete slabs and staircases

CO3 : Design of columns and shallow foundation and simple retaining wall

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	-	-	3	2	2	3
CO2	3	3	2	3	3	2	-	-	3	3	2	3
CO3	3	3	2	2	2	2	-	-	3	2	2	2
CO4	3	3	3	3	3	2	-	-	3	3	2	3
CO5	3	2	2	2	2	2	-	-	2	2	2	1

1: Slightly : Moderately 3: Substantially

Structure I Code: ARCH 301

Prerequisites: Strength of Materials

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Principal stresses

CO2 : Deflection of beams by Conjugate beam Method

CO3 : Fundamental criteria of equilibrium, Column buckling theory

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	1	1
CO2	3	3	1	1	-	-	-	-	-	-	1	1
CO3	3	3	2	1	-	-	-	-	-	-	1	1

1: Slightly : Moderately 3: Substantially

Strength of Materials Code: ARCH 202

Prerequisites : Engineering Mechanics

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Evaluate the deformation in different materials due to axial loading

CO2 : Analyse indeterminate beams with lateral loading

CO3 : Determine the stresses in beam due to lateral loading

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-	-

1: Slightly : Moderately 3: Substantially

Strength of Materials Code: ARCH 103

Prerequisites : Engineering Mechanics

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Concept of engineering mechanics, system of forces, Moments and couples, condition of equilibrium

CO2 : Friction, Centre of Gravity, Moment of Inertia

CO3 : Rectangular and curvilinear motion

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	1
CO2	3	1	-	-	-	-	-	-	-	-	-	1
CO3	3	1	-	-	-	-	-	-	-	-	-	1

1: Slightly : Moderately 3: Substantially

Structure II Code : ARCH 401

Prerequisites: Structure I

Course Outcomes: At the end of the course, the student will be able to:

CO1 : Strain energy due to axial load, bending, shear and torsion

CO2 : Deflection of determinate structure by unit load method, deflection of portal beam three hinged arch & cables

CO3 : Analysis of indeterminate structure by Moment distribution method and slope deflection method

CO4 : Three and two hinged arches

CO5 : Effect of wind and earthquake analysis

Mapping of Course Outcomes with Programme Outcomes

Program outcomes / Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	-	-	-	-	1	-	-	1
CO2	3	3	3	1	-	-	-	-	1	-	-	1
CO3	3	3	3	1	-	-	-	-	1	-	-	1
CO4	3	3	3	1	-	-	-	-	1	-	-	1
CO5	3	3	3	1	-	-	-	-	1	-	-	1

1: Slightly : Moderately 3: Substantially

DEPARTMENT OF ELECTRICAL ENGINEERING

OMDAYAL GROUP OF INSTITUTIONS

Program Outcomes
&
Course Outcomes

PO1	**:**	**ENGINEERING KNOWLEDGE:** Apply the knowledge of mathematics, science, engineering fundamentals, and an Engineering specialization to the solution of complex engineering problems.
PO2	**:**	**PROBLEM ANALYSIS:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**:**	**DESIGN / DEVELOPMENT OF SOLUTIONS:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Public health and safety, and the cultural, societal, and environmental considerations.
PO4	**:**	**CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** Use research- based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis ofthe information to provide valid conclusions.
PO5	**:**	**MODERN TOOL USAGE:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering Activities with an understanding of the limitations.
PO6	**:**	**THE ENGINEER AND SOCIETY:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Professional engineering practice.
PO7	**:**	**ENVIRONMENT AND SUSTAINABILITY:** Understand the impact of the professional engineering Solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**:**	**ETHICS:** Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering practice.
PO9	**:**	**INDIVIDUAL AND TEAMWORK:** Function effectively as an individual, and as a member or leaderin diverse teams, and in multi-disciplinary settings.
P10	**:**	**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 the engineering and Management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary 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.

PROGRAM SPECIFIC OUTCOMES

1. **Foundation of Engineering:**
   Though the Program is designed for Electrical Engineering yet to become an excellent engineer Communication skill, Knowledge of mathematics, basic science and basic engineering is essentially needed. Hence the outcome is designed apply this basic engineering knowledge to design and conduct experiments, as well as to analyze and interpret data.
   Ability to design and realize preliminary and basic mechanics, other basic engineering components and systems to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
2. **In depth understanding of fundamental electrical systems:**
   Students would be made to capable to understand the fundamentals, analyze, and develop with visionary zeal in the conventional electrical Engineering arena. The outcome is so designed that students will have complete knowledge of Control, operations and design of Electrical system, electrical machinery, analysis of Power System with power flow diagram, Knowledge of advance in control system and primary power factor improvement design, understanding of fundamental and electrical machine design software knowledge, efficient development of electrical based systems of varying complexity.
3. **Conception of recent trends:**
   Students are to be made proficient of understanding an assortment of advanced applications of electrical technology and design of electrical systems to make the energy efficient utilization of different form of energy. Not only limited to this but also have the sense of energy crisis to realize the need of harnessing of energy from alternative and renewable energy resources.
4. **Invite innovation:**
   Adaptation shall be embedded among the students that one has the ability to employ modern Electrical equipments, environments, and hardware and software platforms in cultivating innovative ideas which leads to the pathway to be an entrepreneur, a professional and a zest for higher studies.
   complete knowledge of Control, operations and design of Electrical system, electrical machinery, analysis of Power System with power flow diagram, Knowledge of advance in control system and primary power factor improvement design, understanding of fundamental and electrical machine design software knowledge, efficient development of electrical based systems of varying complexity.
5. **Conception of recent trends:**
   Students are to be made proficient of understanding an assortment of advanced applications of electrical technology and design of electrical systems to make the energy efficient utilization of different form of energy. Not only limited to this but also have the sense of energy crisis to realize the need of harnessing of energy from alternative and renewable energy resources.
6. **Invite innovation:**
   Adaptation shall be embedded among the students that one has the ability to employ modern Electrical equipments, environments, and hardware and software platforms in cultivating innovative ideas which leads to the pathway to be an entrepreneur, a professional and a zest for higher studies.

COURSE OUTCOMES

Name of the Subject: BASIC ELECTRICAL ENGINEERING	
Subject Code: ES-EE 101	
Year:1st	**Semester:** 1st
Course Outcomes:	After completing this course, the students will be able to: To understand and analyze basic electric and magnetic circuits 1. To study the working principles of electrical machines and power converters. 2. To introduce the components of low voltage electrical installations
Name of the Subject: ELECTRIC CIRCUIT THEORY	
Subject Code: PC-EE 301	
Year:2nd	**Semester:**3rd
Course Outcomes:	After completing this course, the students will be able to: 1. Describe different type of networks, sources and signals with examples. 2. Explain different network theorems, coupled circuit and tools for solution of networks. 3. Apply network theorems and different tools to solve network problems. 4. Select suitable techniques of network analysis for efficient solution. 5. Estimate parameters of two-port networks. 6. Design filter circuits.
Name of the Subject: ANALOG ELECTRONICS	
Subject Code: PC-EE 302	
Year: 2nd	**Semester:** 3rd
Course Outcomes:	On completion of this course a student will be in a position to: 1. Describe analog electronic components and analog electronics circuits 2. Explain principle of operation of analog electronic components, filters, regulators and analog electronic circuits. 3. Compute parameters and operating points of analog electronic circuits. 4. Determine response of analog electronic circuits. 5. Distinguish different types amplifier and different types oscillators based on application. 6. Construct operational amplifier based circuits for different applications.
Name of the Subject: ELECTRO MAGNETIC FIELD THEORY	
Subject Code: PC-EE 303	
Year: 2nd	**Semester:** 3rd
Course Outcomes:	On completion of this course a students will be able to 1. Relate different coordinate systems for efficient solution of electromagnetic problems. 2. Describe mathematical s tools to solve electromagnetic problems. 3. Explain laws applied to electromagnetic field. 4. Apply mathematical tools and laws to solve electromagnetic problems. 5. Analyze electromagnetic wave propagation 6. Estimate transmission line parameters
Name of the Subject: Engineering Mechanics	
Subject Code: ES ME 301	
Year: 2nd	**Semester:** 3rd
Course Outcomes:	At the end of this course students will be able to 1. Explain the co-ordinate system, principle of three dimensional rotation, kinematics and kinetics of rigid bodies. 2. Elaborate the theory of general motion, bending moment, torsional motion and friction. 3. Develop free body diagram of different arrangements. 4. Solve problems with the application of theories and principle of motion, friction and rigid bodies. 5. Analyze torsional motion and bending moment.

Name of the Subject: ELECTRIC MACHINE-I	
Subject Code: PC-EE 401	
Year: 2nd	**Semester:** 4th
Course Outcomes:	After completing this course, the students will be able to: 1. Describe the function of different components of magnetic circuit, DC machines and transformers 2. Explain the principle of operation of different types of DC machines and transformers 3. Solve numerical problems of DC machines and transformers. 4. Estimate the parameters and efficiency of transformer. 5. Determine the characteristics of DC machines 6. Recommend methods to control output of DC machines.
Name of the Subject: DIGITAL ELECTRONICS	
Subject Code: PC-EE 402	
Year: 2nd	**Semester:** 4th
Course Outcomes:	1. Describe the function of different building blocks of digital electronics, semiconductor memories and programmable logic devices. 2. Explain the principle of operation of combinational and sequential digital circuits, A/D and D/A converter 3. Solve numerical problems of Boolean algebra, number system, combinational & sequential digital circuits and A/D and D/A converter. 4. Specify applications of combinational and sequential digital circuits. 5. Determine specifications of different digital circuits. 6. Design combinational and sequential digital circuits.
Name of the Subject: ELECTRICAL & ELECTRONICS MEASUREMENTS	
Subject Code: PC-EE 403	
Year: 2nd	**Semester:** 4th
Course Outcomes:	After completion of the course, the students will be able to: 1. explain the terms accuracy, precision, resolution, speed of response, errors in measurement, loading effect 2. describe methods of measurement of power, energy by instruments and resistance, capacitance and inductance by bridges and potentiometer 3. explain the principle of operation of analog meters, instrument transformer, digital multimeter, digital voltmeter, digital frequency meter, signal generator, strain gauge, LVDT and temperature transducers . 4. explain the different building block, principle of operation of oscilloscope and measurement techniques of voltage, current, frequency and phase by oscilloscope 5. solve numerical problems related to analog meters, instrument transformer, measurement of power, energy, resistance, inductance and capacitance 6. specify applications of analog and digital measuring instruments, sensors and transducers
Name of the Subject: THERMAL POWER ENGINEERING	
Subject Code: ES-EE 401	
Year: 2nd	**Semester:** 4th
Course Outcomes:	On completion of this course a student will be in a position to: 1. Describe the function of different components of boilers. Engines and turbines 2. Explain the principle of operation of different types of boilers, turbines, IC engines and Gas turbines. 3. Solve numerical problems of boilers, turbines, IC engines and Gas turbines. 4. Analyze the performance of boilers, engines and turbines. 5. Determine efficiency of boilers, engines and turbines. 6. Explain methods to control boiler, engines and turbines parameters.

Name of the Subject: ELECTRIC MACHINE –II	
Subject Code:PC-EE501	
Year: 3rd	**Semester:** 5th
Course Outcomes:	On successful completion of the course the student will be able to: 1. Describe the arrangement of winding of AC machines. 2. Explain the principle of operation of Induction machines, Synchronous machine sand special machines. 3. Solve numerical problems of Induction machines, Synchronous machines and Special machines. 4. Estimate the arameters and efficiency of Induction machines and Synchronous machines. 5. Determine the characteristics of Induction machines and Synchronous machines. 6. Select appropriate methods for starting, braking and speed control of Induction machines.
Name of the Subject: POWER SYSTEM-I	
Subject Code: PC-EE 502	
Year: 3rd	**Semester:** 5th
Course Outcomes:	After completion of this course the students will be able to: 1. ExplaintheprincipleofgenerationofElectricpowerfromdifferentsources 2. Determine parameter s of transmission lines and its performance 3. Explain the principle of formation of corona and methods of its reduction 4. Conduct electrical tests on insulators 5. Solvenumericalproblemsrelatedtooverheadtransmissionline,cable,insulators and tariff 6. Analyze overhead transmission line based on short medium and long lines.
Name of the Subject: CONTROL SYSTEM	
Subject Code: PC-EE 503	
Year: 3rd	**Semester:** 5th
Course Outcomes:	On completion of this course a student will be in a position to: 1. Develop mathematical model of mechanical, electrical, thermal, fluid system and different control system components like servomotors, synchros, potentiometer, tacho-generators etc. 2. Analyse stability of LTI system using routh hurtwitz(RH)criteria, rootlocus techniques in time domain and bode plot and nyquist technique in frequency domain. 3. Design different control law or algorithm slike proportional control, proportional plusderivative(PD)control,proportionalplusintegration(PI)control,andproportional plus integrationplusderivative(PID)controlandcompensatorslikelag,lead, lag-lead for LTI systems. 4. Apply state variable techniques for analysis of linear systems. 5. Analyze the stability of linear discrete system. 6. Solve numerical problems on LTI system modelling, responses, error dynamics and stability.
Name of the Subject: POWER ELECTRONICS	
Subject Code: PC-EE 504	
Year: 3rd	**Semester:** 5^{th}
Course Outcomes:	On completion of this course a students will be able to 1. Differentiate between sign all evel and power level devices. 2. Construct triggering and commutation circuits of SCR. 3. Explain the principle of operation of AC-DC,DC-DC and DC-AC converters 4. Analyse the performance of AC-DC,DC-DC and DC-AC converters. 5. Apply methods of voltage control and harmonic reduction to inverters. 6. Solve numerical problems of switching devices, AC-DC,DC-DC and DC-AC converters.

Name of the Subject: POWER PLANT ENGINEERING	
Subject Code:PC-EE501B	
Year: 3rd	**Semester:** 5th
Course Outcomes:	On completion of this course a students will be able to 1. Explain the principle of operational of Steam, Hydroelectric, Diesel, Gas turbine, Nuclear power and non-conventional power plant 2. Identify the cause of pollution for power generation and it sremed. 3. Suggest location to setup Steam, Hydroelectric, Diesel, Gas turbine andNuclear power plant. 4. Compare Steam, Hydroelectric, Diesel, Gas turbine, Nuclear power and non-conventional power plant. 5. Suggest methods of maintenance of Steam, Gas and Hydroelectricpower plants 6. Solve numerical problems of load estimation and economics of powerplants.
Name of the Subject: POWER SYSTEM-II	
Subject Code: PC-EE 601	
Year: 3rd	**Semester:** 6th
Course Outcomes:	After completion of this course the students will be able to 1. Represent power system components in line diagrams. 2. Determine the location of distribution substation. 3. Determine the performance of power system with the help of load flowvstudies. 4. Analyse faults in Electrical systems. 5. Determine the stability of Power system. 6. Explain principle of operation of different power system protectionequipments. 7. Solve numerical problems related to representation, load flow, faults, stabilty and protection of power system.
Name of the Subject: MICROPROCESSOR & MICROCONTROLLER	
Subject Code: PC-EE 602	
Year: 3rd	**Semester:** 6th
Course Outcomes:	On completion of this course a students will be able to 1. Explain the architecture of 8086 and 8051. 2. Do assembly language programming of 8086, 8051 3. Interface different peripheral with 8086 and 8051 4. Develop micro processor/ microcontroller based systems. 5. Compare microprocessor, microcontroller, PIC and ARM processors
Name of the Subject: DIGITAL CONTROL SYSTEM	
Subject Code: PC-EE 601A	
Year: 3rd	**Semester:** 6th
Course Outcomes:	On completion of this course a student will be in a position to: 1. Perform Z-transformation and inverse Z-transformation of systems. 2. Analyse and design digital control systems. 3. Design compensators for digital control system to achieve desired specifications. 4. Represent digital control systems using state space models. 5. Analyze the effect sampling on stability, controllability and observability.
Name of the Subject: ELECTRICAL MACHINE DESIGN	
Subject Code: PC-EE 601C	
Year: 3rd	**Semester:** 6th
Course Outcomes:	After completion of this course the students will be able to 1. Specify the rating of electrical machines with standard specifications. 2. Explain the principles of electrical machine design and carry out basicdesign of an ac machine. 3. Determine the various factors which influence the design of electrical,magnetic and thermal loading of electrical machines. 4. Explain the construction and performance characteristics of electricalmachines. 5. Use software tools to do design calculations.

Name of the Subject: INDUSTRIAL ELECTRICAL SYSTEMS	
Subject Code: PC-EE 602C	
Year: 3rd	**Semester:** 6th
Course Outcomes:	After completion of the course, the students will be able to: 1. Represent electrical wiring system for residential, commercial andindustrial consumers. 2. Determine the rating of components of residential and commercialelectrical systems. 3. Design lighting scheme for a residential and commercial premises. 4. Select transformer, switchgear, protection equipments for industrialelectrical systems. 5. Explain methods of automation of Industrial Electrical Systems 6. Solve numerical problems related to earthing system, lighting scheme,power factor correction.
Name of the Subject: DIGITAL SIGNAL PROCESSING	
Subject Code: OE-601A	
Year: 3rd	**Semester:** 6th
Course Outcomes:	After completion of the course, the students will be able to 1. Represent signals mathematically in continuous and discrete-time and in the frequencydomain. 2. Analyse discrete-time systems using z-transform. 3. Explain the Discrete-Fourier Transform (DFT) and the FFT algorithms. 4. Design digital filters for various applications. 5. Apply digital signal processing for the analysis of real-life signals.
Name of the Subject: COMMENICATION ENGINEERING	
Subject Code: OE-601B	
Year: 3rd	**Semester:** 6th
Course Outcomes:	On completion of this course a students will be able to 1. Compare the performance of AM, FM and PM schemes with reference to SNR 2. Explain noise as a random process and its effect on communication receivers 3. Evaluate the performance of ASK, FSK, PSK, BPSK, QPSK in a digital communication system 4. Identify source coding and channel coding schemes for a given communication link 5. Analyze various digital modulation methods 6. Compute band width requirement and probability of error in various digital modulation systems.
Course Outcomes:	After completion of this course the students will be able to 1. Understand the present energy scenario across the globe. 2. Realize the potential of various renewable energy resources (solar, wind, biomass, wave, and tidal, ocean, geothermal) in power generation, heating, and cooling applications in Indian subcontinent. 3. Interpret the advantages and limitations of various renewable sources of energy. 4. Analyze the performance of solar thermal and photovoltaic systems. 5. develop the scheme of solar thermal systems for the applications like space heating and cooling, cooking, water desalination etc

DEPARTMENT OF
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Course Outcomes

Analog Communication (EC 501)

Course Outcome:

1. The learner must be able to appreciate the need for modulation and calculate the antenna size for different carrier frequencies. From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, decide the type of generation method to be adopted. Solve problems.
2. After understanding the basic concepts the learner must be able to compare between the different demodulation methods, design an envelope detector, calculate the IF and image frequencies for the super heterodyne receivers given the carrier and modulating frequencies, calculate the oscillator frequency.
3. From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, and decide the type of generation method to be adopted. Solve problems.
4. Appreciate the importance of Multiplexing, find out their application areas. The learner must be able to calculate the Noise temperature & SNR for different systems, also compare between the performance of the different modulation methods by comparing their SNR.

Microprocessors & Microcontrollers (ECE-502)

Course Outcome:

1. Students will be able to understand the basic functioning of microprocessor.
2. They will be able to write programs for different applications using 8085 & 8086 microprocessors
3. They will be able to design memory systems and do programs for communication and peripheral interfacing.
4. Students become able to understand various Interrupts and their uses using 8085/8086 Microprocessor and 8051 Microcontroller
5. Students will also learn to interface 8255/8253/8251 peripheral chips and I/O devices with the same processors and controller.
6. It is expected that students will be able to design systems based on above mentioned processors and controller by means of efficient assembly language programming**.**

CONTROL SYSTEMS (EC503)

Course outcome:

MODULE 1: Students are expected to be capable of having the concepts of open loop & closed loop control systems, classifications, effect and characteristics of feedback system, mathematical models- differential equations, impulse response and transfer functions. They will also learn regarding the transfer function of linear system, block diagram representation of systems considering electrical systems, signal flow graph & reduction using mason's gain formula.

MODULE 2: Students will learn time response of first order system, transient response of second order system, time domain specifications , steady state response, error & error constant. They will also learn Routh's stability criterion and itlimitations, concept of Root locus technique.

MODULE 3: Students will be capable to plot Bode diagrams, determination of frequency domain specification, transfer functions, stability analysis, phase margin & gain margin. They will be able to make polar plots, Nyquist plots and learn stability analysis in frequency domain.

MODULE 4: Focuses on compensation techniques- lead, lag, lead-lag controllers design in frequency domain & PID controller. Students will have the concepts of state, state variables, state model & its derivation from block diagrams, solving the Time invariant state Equations, State Transition Matrix, Controllability and Observability.

Digital Communication (EC 601)

Course outcome:

1. The student must have a clear idea of Probability Theory and Random Processes. The learner must have a clear idea of Conditional probability, communication example, joint probability, statistical independence, random variable-continuous and discrete, cumulative distribution function, probability density function – Gaussian, Rayleigh and Rician, random process.
2. After understanding of Probability Theory and Random Processes learner must know the analogy between signal and vector, distinguishibility of signal, orthogonality and orthonormality, basis function, orthogonal signal space, Schwartz inequality, Gram-Schmidt orthogonalization procedure, response of the noisy signalat the receiver, maximum likelihood decision rule.
3. The learner must have a clear understanding of Digital Data Transmission techniques, PAM,PCM, Digital transmission components, source, multiplexer, line coder, regenerative repeater, concept of line coding.
4. Appreciate the importance of various digital modulation techniques: ASK, FSK and PSK, Coherent Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK), Minimum Shift Keying (MSK).

Digital Signal Processing (EC 602)

Course Outcome:

1. Students will have the concept of DT Signals, Sampling Theorem, classification ofDT signals and its properties.
2. Students will be have the concept of transformed domains, Z- transforms, inverse Z transforms, Discrete Fourier Transforms, & Inverse Discrete Fourier Transforms
3. They will be able to specify and design IIR & FIR digital filters
4. They will have the elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor

Telecommunication System (EC-603)

Course Outcome:

1. Students will have the concept of Telephone Systems
2. They will have the concept of Telecommunication Transmission Lines, Subscriber Loop Systems and Switching Systems.
3. They will be able to understand Stored Program Control & Traffic Engineering
4. They will get the knowledge of Modems and Their Standards IP Telephony

Antenna Theory & Propagation (EC-604A)

Course Outcome:

1. The Students will be able to understand
2. The concept of antenna fundamentals and its radiation.
3. Various antenna parameters.
4. Radiation fields, Characteristics and applications of various basic antennas.
5. Radiation fields, Characteristics and applications of various array antennas.
6. Radiation fields, Characteristics and applications of various special antennas.
7. Various methods of radio wave propagation and its effects, Friss Transmission Formula, SNR of a Radio Link.

Wireless Communication and Networks (EC 701)

Course Outcome:

1. The learner must be able to appreciate brief introduction to mobile wireless communication and systems, concept of cellular network, frequency reuse, channel assignment and handoff strategies. They also need a clear view of characteristics ofwireless channel and propagation path loss models.
2. After understanding the basic concepts wireless communication and systems, students must acquire the knowledge of Modern Mobile Wireless Communication Systems. Appreciate students with the importance of Multiple Access Technologies in cellular communication, Cellular Communication Networks and Systems, Overview of CDMA systems: IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS).
3. The learner must be known about Wireless Local Area Networks (WLAN): IEE 802.11 Standards and Protocols IEEE 802.11 standards, WLAN family, WLAN transmission technology, WLAN system architecture, Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA), Frequency Hopping Spread Spectra.
4. The learner must have a clear understanding of Mobile Internet Protocol Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Configuring PDP Addresses on Mobile Station, Mobility Classification, Seamless Terminal Mobility Management, Limitations of current TCP/IP networks for mobility support.

VLSI & Microelectronics (EC 702)

Course Outcome:

1. Students will be able to design, simulate, built and debug complex combinational and sequential circuits based on an abstract functional specification.
2. Students will be able to design fundamental units including adder, multiplexers, etc.
3. They will be able to design sequential logic circuits using CMOS logic.
4. Students will get the knowledge of Micro-electronic Processes for VLSI Fabrication

Embedded Systems (EC704B)

Course outcome:

1. Students are expected to have the overall concepts of Embedded system, microprocessor & microcontroller, hardware architecture of real time systems, understanding of Embedded system Vs General computing systems.
2. Students will learn several communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Internet embedded system network protocols, USB & Bluetooth.
3. Students will acquire knowledge on the fundamental issues in Hardware software code sign, Unified Modeling Language (UML), hardware Software trade-offs DFG model, state machine programming model & the model for multiprocessor system.
4. Students will learn Operating system basics, tasks, process and threads, multiprocessing and multitasking, task communication, task synchronization, qualities of good Real Time Operating Systems.
5. Students will get different examples of embedded system and applications. Popular microcontrollers used in embedded systems, sensors, actuators. After the completion of the course they are also expected to have Programming concepts and embedded programming in C, C ++, JAVA.

Digital Image Processing (EC 801B)

Course Outcome:

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the spacial domain using various transformation function.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

Material Science & Engineering EC 802B

Course Outcome:

1. Explain importance of materials in materials science and engineering field.
    a. Relate between material and engineering.
    b. Classify materials according to their types.
    c. Describe basic definition and conception of materials and physical propertiesof materials.
    d. Follow new developments in materials application field.
2. Give information about atomic structure, atomic bonds, crystal structure, crystal geometry and crystal defects.
    a. Define structure of atoms.
    b. offer information about mass and count of atoms.
    c. explain atomic and molecular bonding and variety.
    d. define space lattice, unit cell, crystal systems and Bravais lattice.
    e. calculate unit cells and volumetric, planar and linear density values in unitcell.
3. Explain solidification, crystal defects and diffusion in solids.
    a. Explain solidification of metals and monocrystals.
    b. Describe crystal imperfections.
    c. Investigate atomic diffusion in solids.
4. Give information about electrical properties of materials.
    a. Examine electrical conductivity of solids.
    b. Describe energy model of electrical conductivity.
    c. Compare semiconductors and insulator materials.
5. Interpret mechanical properties of materials.
    a. Draw strain-stress graph.
    b. Make hardness experiments and calculations.
    c. Investigate fatique, creep behaviours of metals.
6. Give information about metal, polymer, ceramic and composite materials and their properties.
    a. Describe metallic materials and properties.
    b. Describe ceramic materials and properties
    c. Get information about polymer based materials and properties.
    d. Describe composite materials.
    e. Compare materials according to their properties

DEPARTMENT OF BASIC SCIENCE & HUMANITIES

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COURSE OUTCOME
FOR
BASIC SCIENCE & HUMANITIES

PAPER NAME - Effective Technical CommunicationPAPER CODE- CE- HU 301

After completion of the course the student will be able to

1. Recognize the social and professional contexts that shape language features and communication and apply it in academic and professional writing and speaking.
2. Critically read and interpret information and present points of view both in written andoral communication.
3. Participate in class and group discussions and engage in extemporaneous and prepared presentation of ideas through oral and power point presentations.
4. Will be able to summarise, write proposals and reports, prepare technical reports, writeemails and all formal correspondence with accuracy.
5. Will be able to successfully conduct meetings and negotiate withclients.

PAPER NAME: Special English PAPER CODE: Arch 101

After completion of the course the student will be able to

1. Recognize the social and professional contexts that shape language features andcommunication and apply it in academic and professional writing and speaking.
2. Critically read and interpret information and present points of view both in written andoral communication.
3. Participate in class and group discussions and engage in extemporaneous and prepared presentation of ideas through oral and power point presentations.
4. Will be able to summarise, write proposals and reports, prepare technical reports, writeemails and all formal correspondence with accuracy.
5. Will be able to prepare thesis report based on collected data and present the data inappropriate form.
6. Will be able to successfully conduct meetings and negotiate with clients.

PAPER NAME: HUMAN RESOURCE PAPER CODE: HU 605 B CSE + CE 605 B

After the completion of the course students will be able to-

1. Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
2. Administer and contribute to the design and evaluation of the performance management program.
3. Develop, implement, and evaluate employee orientation, training, and developmentprograms.
4. Facilitate and support effective employee and labour relations in both non-union and union environments.
5. Research and support the development and communication of the organization's total compensation plan.
6. Collaborate with others, in the development, implementation, and evaluation oforganizational and health and safety policies and practices.
7. Develop, implement, and evaluate organizational development strategies aimed atpromoting organizational effectiveness.
8. Manage own professional development and provide leadership to others in the achievementof ongoing competence in human resources professional practice.
9. Facilitate and communicate the human resources component of the organization's businessplan.
10. Conduct research, produce reports, and recommend changes in human resources practices.

PAPER NAME: ORGANIZATIONAL BEHAVIOUR PAPER CODE: HU 801 A

After completion of the course Students will be able –

1. To discuss the scientific foundations and the micro and macro approaches ofO.B.
2. To analyze and compare different models used to explain individual behavior related to motivation and rewards.
3. To identify personal dimensions of personality, job satisfaction, motivation andlearning
4. To identify the processes used to developing communication and resolvingconflicts.
5. To explain group dynamics and demonstrate skills required for workingin groups.(team skills)
6. To identify different leadership styles and the role of leaders in decisionmaking process.
7. To explain organizational culture and examine various organizational design.
8. To discuss the main problems about stress, power and politics and ethics and the implementation of organizational change.

PAPER NAME: MANAGEMENT I/ ORGANIZATIONAL BEHAVIOUR-PAPER CODE: CE MC 401

1. To understand the conceptual framework of the discipline of OB and itspractical application in the organizational set up.
2. To deeply understand the role of individuals, groups and structure inachieving organizational goals effectively and efficiently.
3. To critically evaluate and analyze various theories and models thatcontribute in the overall understanding of the discipline.
4. To develop creative and innovative ideas that could positively shape theorganization.
5. To accept and embrace in the working with ethical standards in theorganization.
6. To understand diversity in all its forms and work with challenges fromdifferent stakeholders.

PAPER NAME: VALUES AND ETHICS IN PROFESSIONPAPER CODE: HM EE 401

After completion of the course students will be able to-

1. To identify the importance of human values and skills for sustained happiness.
2. To strike a balance between profession and personal happiness/ goals.
3. To Understand the role of a human being in ensuring harmony in societyand nature.
4. To realize/ explain the significance of trust, mutually satisfying human behavior.
5. To distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
6. To develop appropriate technologies and management patterns to create harmony in personal and professional life.
7. To understand the basic perception of profession, professional ethics, various moral & social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
8. To be aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
9. To acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise intheir professional lives.

PAPER NAME: ENGLISH PAPER CODE: HM HU 201

After the completion of the course students will be able to-

1. Develop argument skills to critically interpret and analyse data from technical texts.
2. Express facts and concepts using complex constructions and an appropriate range of vocabulary.
3. Use appropriate vocabulary and grammatical structures without theinfluence of L 1.
4. Research on data and produce articles, reports and technical documents using audience friendly language.
5. Explain processes and give presentations with ease.
6. Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.
7. Collect, analyze, document, and report research clearly, concisely, logically, and ethically; understand the standards for legitimate interpretations of research data within scientific and technical communities.

COURSE OUTCOME

Dept: Computer Science & Engineering, 5thSem

Introduction to Industrial Management (Humanities III) HSMC-501

On completion of the course students will be able to

CO1 : Interpret given organization structure, culture, climate and major provisions of factory acts and laws.
CO2 : Explain material requirement planning and store keeping procedure.
CO3 : Plot and analyze inventory control models and techniques.
CO4 : Prepare and analyze CPM and PERT for given activities. CO5. List and explain PPC functions.

Dept: Computer Science & Engineering, 5thSem

Constitution of India Code: MC-CS501

CO1 : Understand the meaning and importance of Constitution
CO2 : Understand and analyse federalism in the Indian context.
CO3 : Explain about making of Indian Constitution - contribution of Constituent assembly on it.
CO4 : Describe the Salient (Outstanding) features of Indian Constitution.
CO5 : Describe the importance of Preamble of the Indian Constitution and its significance.
CO6 : Analyse Panchayathi Raj institutions as a medium of decentralization.

Dept: Civil Engineering, 5thSem

Constitution of India Code: CE(MC)501

CO1 : Understand the meaning and importance of Constitution
CO2 : Understand and analyse federalism in the Indian context.
CO3 : Explain about making of Indian Constitution - contribution of Constituent assembly on it.
CO4 : Describe the Salient (Outstanding) features of Indian Constitution.
CO5 : Describe the importance of Preamble of the Indian Constitution and its significance.
CO6 : Analyse Panchayathi Raj institutions as a medium of decentralization.

Dept: Electrical Engineering, 3rdSem

INDIAN CONSTITUTION Code: MC-EE 301

After completion of this course, the learners will be able to

1. Describe different features of Indian constitution and analyse federalism in the Indian context
2. Power and functioning of Union, state and local self-government structure, jurisdiction and function of Indian Judiciary.
3. Basics of PIL and guideline for admission of PIL.
4. Functioning of local administration starting from block to Municipal Corporation.
5. Identify authority to redress a problem in the profession and in the society.

Dept: Computer Science & Engineering 3rdSem

Economics for Engineers (Humanities-II) Code: HSMC-301

On completion of the course students will be able to

1. Make different economic decisions and estimate engineering costs by applying different cost estimation models.
2. Create cash flow diagrams for different situations and use different interest formulae to solve associated problems.
3. Take decisions regarding different engineering projects by using various criteria like rate of return analysis, present worth analysis, cost-benefit analysis etc.
4. Incorporate the effect of uncertainty in economic analysis by using various concepts like expected value, estimates and simulation.
5. Understand the concepts of depreciation and replacement analysis and solve associated problems.
6. Understand the process of inflation and use different price indices to adjust for its effect.
7. Apply the various concepts of Accounting like balance sheet and ratio analysis.
8. Understand the scope of Finance and the role of financial planning and management.

Dept: Mechanical Engineering

Essence of Indian Knowledge Tradition : MC ME501

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

1. Understand the concept of Traditional knowledge and its importance
2. Know the need and importance of protecting traditional knowledge.
3. Know the various enactments related to the protection of traditional knowledge.
4. Understand the concepts of Intellectual property to protect the traditional knowledge.

COURSE OUTCOME OF ODD SEM. SUBJECTS

Dept: Electrical Engineering

Values and Ethics Code : HM EE 401

1. The students identify the importance of human values and skills for sustained happiness.
2. The students strike a balance between profession and personal happiness/ goals.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. The students realize/ explain the significance of trust, mutually satisfying human behavior and enriching interaction with nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy toactualize a harmonious environment wherever they work.
6. The students develop/ propose appropriate technologies and management patterns tocreate harmony in professional and personal life.

Dept: Computer Science & Engg., Civil Engg. & Electronics & Communication Engg.

Principles of Management Code : (HU601)

1. Detailed idea on principles of management and administration.
2. Evolution of management and various behavioral science contributions.
3. To Understand fundamental concepts and principles of management, including the basicroles, skills, and functions of management.
4. Be familiar with interactions between the environment, technology, human resources,
5. organizations in order to achieve high performance.
6. Understand realistic and practical applications of management concepts.
7. Compare and contrast different types, roles and styles of managers across organizations.

Dept: Mechanical Engineering

Economics for Engineers Code : ME801HU

1. Deep understanding of the basics of Economics
2. Creating awareness about different economic activities like Demand and Supply whichare important for an engineer.
3. Development of analytical skill of engineers this will help to take decisions.
4. Better understanding of the market, so they can analyze the situation as per theRequirements
5. Understanding of the pre-requisites before investing capital and long term decisions
6. In-depth knowledge about Financial markets, National Income Accounting & Inflation /Deflation.

Dept: Architecture

Building Economics and construction Management (ARCH803)

1. On completion of the course students will be able to
2. To examine the economic feasibility of a project.
3. To explain the main responsibilities of a project manager and how to carry out these.
4. To equip the students with modern project approaches and project managementtechniques including the project crashing and resource allocation techniques.
5. To provide tools for project control and evaluation.
6. To provide the various methods for estimating the cost of the construction project.

Chemistry-I Code :BS-CH101/BS-CH201

After completion of this course, the learners will be able to

1. Analyse microscopic chemistry in terms of atomic and molecularorbitals and intermolecular forces.
2. Rationalise bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
4. Rationalise periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity.
5. List major chemical reactions that are used in the synthesis of molecules.

Dept. : Electrical Engineering

Biology for Engineers (BS- 301)

After completion of this course, the learners will be able to

1. Describe with examples the biological observations lead to major discoveries.
2. Explain the classification of kingdom of life/ the building blocks of life/ different techniques of bio physics used to study biological phenomena/ the role of imaging in the screening, diagnosis, staging, and treatments of cancer.
3. Identify DNA as a genetic material in the molecular basis of information transfer
4. Analyze biological processes at the reductionist level.
5. Apply thermodynamic principles to biological systems.
6. Identify microorganisms.

Biology BS-BIO301/ CE(BS)301/ BSC-401

After completion of this course, the learners will be able to

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological.
3. Highlight the concepts of recessiveness and dominance during the passage ofgenetic material from parent to offspring.
4. Convey that all forms of life have the same building blocks and yet themanifestations are as diverse as one can imagine.
5. Classify enzymes and distinguish between different mechanisms of enzyme action.
6. Identify DNA as a genetic material in the molecular basis of information transfer.
7. Analyse biological processes at the reductionistic level.

Environmental Sciences MC-401/ MC-EE-401

On completion of the course students will be able to

1. To understand the natural environment and its relationships with human activities.
2. To apply the fundamental knowledge of science and engineering to assess environmental and health risk.
3. To develop guidelines and procedures for health and safety issues obeying theenvironmental laws and regulations.
4. Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

Physics-I (BS-PH101/ BS-PH201)

After the completion of this course, students will be able:

1. To understand the basic concepts of mechanics
2. To interpret the intensity variation of light due to Polarization, interference and diffraction.
3. To understand Bragg's Law and introduction to the principles of lasers, types oflasers and applications.
4. To understand the various terms related to properties of materials such as,permeability, dielectrics, magnetism etc.
5. To formulate and solve the engineering problems on electromagnetism
6. Apply statistical Mechanics in case of Engineering Thermodynamics.
7. To explain fundamentals of quantum mechanics and apply it to problems on bound states.

Operations Research Code: - ME 705C (for Mechanical Engineering)

1. Set up decision models and use some solution methods for finding solutions ofproblems.
2. To formulate and apply LPP and solution of LPP by Graphical Method and SimplexMethod.
3. Methods of solving Transportation Problems and Assignment Problems.
4. To develop the network and to find the shortest path, critical path using PERT and CPM method, maximal flow of Network analysis by Floyd's Algorithm andFulkerson's Algorithm

5. To develop the modelling and mathematical skills to analytically determine queuing models and finding various parameters associated with the model andapplications of some real life situations.
6. Introduction to Non Linear Optimization and some methods of solving NLPP.

Operation Research Code: CE 605A (for Civil Engineering) & CS 605A (for Computer Science & Engineering)

1. To understand and to apply the formulation and Solution of Linear Programming Problem by Graphical and Simplex Method
2. Methods of solving Transportation Problems and Assignment Problems.
3. To develop the network and to find the shortest path, critical path using PERT and CPMmethod, maximal flow of Network analysis by Floyd's Algorithm and Fulkerson's Algorithm.
4. Understanding of EOQ Models of Deterministic and Probabilistic; Safety Stock; BufferStock and problems related to these.
5. Solve Simple Games using various techniques, use of mixed strategies, dominance, andgraphical methods to find the value of game.
6. To develop the modelling and mathematical skills to analytically determine queuing models and finding various parameters associated with the model and applications of somereal life situations.

Discrete Mathematics Code : CS 503 (for Computer Science & Engineering)

1. Explain and apply basic notions of symbolic logic, connectives, truth tables, equivalence of propositional formulae by truth tables and using properties, finding CNF and DNF.
2. Checking validity of arguments and Quantification.
3. Understanding the law of Mathematical Induction, Division Algorithm, and Greatest Common Divisor (GCD) and calculation of GCD by Division algorithm.
4. Understand the definitions of congruences, residue classes and least residues, congruence equations and application of congruences.
5. Understand Poset and Lattice and the relation between them.
6. Understand and Implementation of Counting Techniques and Graph Colouring and Matching.

Discrete Mathematics Code: - PCC-CS401(for Computer Science & Engineering)

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

1. Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove thesolution on based of a logical inference.
3. Classify its algebraic structure for a given a mathematical problem.
4. Evaluate Boolean functions and simplify expressions using the properties ofBoolean Algebra.
5. Develop the given problem as graph networks and solve with techniques of graph theory.

Mathematics-III(BS-M301)(for Electrical Engineering)

After completion of the course the learners will be able to: -

1. Explain basics of probability theories, rules, distribution and properties of Ztransforms.
2. Describe different methods of numerical analysis.
3. Solve numerical problems based on probability theories, numerical analysis and Z transform
4. Apply numerical methods to solve engineering problems.
5. Solve engineering problems using z transform and probability theory.

Mathematics –III, BS-M301 (ME) (for Mechanical Engineering)

Upon completion of the course students will:-

1. Students will be able to solve field problems in Engineering involving PDEs.
2. Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment.
3. Understand the basic ideas of statistics with different characterization of a univariate and bivariate data set.
4. Apply statistical tools for analyzing data samples and drawing inference on a given data set.

Mathematics-III (Differential Calculus) Code: BSC-301(for Computer Science & Engineering)

On completion of the course students will be able to:

1. Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Apply the rules of inference and methods of proof including direct and indirectproof forms, proof by contradiction, and mathematical induction.
3. Use tree and graph algorithms to solve problems
4. Evaluate Boolean functions and simplify expressions using the properties ofBoolean Algebra.

Mathematics-III (Transform and Discrete Mathematics) Code: CE(BS)302, (for Civil Engineering)

On completion of the course students will be able to

1. Develop the skill of evaluating Laplace and inverse Laplace transform to solveODEs and PDEs.
2. On completion of the course students will express a logic sentence in terms ofpredicates, quantifiers, and logical connectives.
3. Derive the solution for a given problem using deductive logic and prove thesolution on based of a logical inference.
4. Classify its algebraic structure for a given a mathematical problem.
5. Develop the given problem as graph networks and solve with techniques of graphtheory.

Mathematics –IIA, BS-M201 (for Computer Science & Engineering)

1. Learn the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment.
2. Understand the basic ideas of statistics with different characterisation of a univariate and bivariate data set.
3. Apply statistical tools for analysing data samples and drawing inference on a given data set.

Mathematics –II B, BS-M202 (for Computer Science & Engineering/ Electrical Engineering/ Mechanical Engineering)

1. Learn the methods for evaluating multiple integrals and their applications to differentphysical problems.
2. Understand different techniques to solve first and second order ordinary differentialequations with its formulation to address the modelling of systems and problems of engineering sciences.
3. Learn different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.
4. Apply different types of transformations between two 2- dimensional planes for analysisof physical or engineering problems.

Mathematics – II Code : ARCH 201 (for Architecture)

1. Understand different techniques to solve first and second order ordinary differentialequations with its formulation to address the modelling of systems
2. Apply statistical tools for analysing data samples and drawing inference on a given dataset.
3. To formulate and apply LPP and solution of LPP by Graphical Method and SimplexMethod.
4. Learn and apply the concept of geometrical two dimensions and three dimensions and evaluation of different types of problems of geometrical shapes.

Mathematics – I A BS-M101 (for Computer Science & Engineering)

1. Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
2. Understand the domain of applications of mean value theorems to engineeringproblems.
3. Learn different types of matrices, concept of rank, methods of matrix inversion and their applications.
4. Understand linear spaces, its basis and dimension with corresponding applications in the field of computer science.
5. Learn and apply the concept of eigen values, eigen vectors, diagonalisation of matrices and orthogonalization in inner product spaces for understanding physical and engineeringproblem

Mathematics IB Code : BS-M102 (for Civil Engineering/ Electrical Engineering/ Mechanical Engineering)

1. Apply the concept and techniques of differential and integral calculus to determine curvature and evaluation of different types of improper integrals.
2. Understand the domain of applications of mean value theorems to engineeringproblems.
3. Learn the tools of power series and Fourier series to analyze engineering problems and apply the concept of convergence of infinite series in many approximation techniques in engineering disciplines.
4. Apply the knowledge for addressing the real life problems which comprises of several variables or attributes and identify extreme points of different surfaces of higher dimensions.

Mathematics I Code : ARCH 102 (for Architecture)

1. Understand the different types of matrices, concept of rank, methods of matrix inversionand their applications.
2. Apply the concept and techniques of application of differential calculus to determine tangent and normal, curvature, envelope, asymptotes of any curve and evaluation of different types of problems of calculus.
3. Learn and apply the concept of differentiation and evaluation of different types of problems of differentiation.

DEPARTMENT OF ARCHITECTURE

OMDAYAL GROUP OF INSTITUTIONS

COURSE OUTCOME
FOR
ARCHITECTURE

1ST SEMESTER :

1. **LANGUAGE LAB. /TECHNICAL ENGLISH (ARCH 101)**

   Improvement of communicative and presentation skills and prepare the students.

2. **MATHEMATICS – I (ARCH 102)**

   Development of basic skill needed for studying related to analytical advanced subjects.

3. **ENGINEERING MECHANICS (ARCH 103)**

   The students will be able to apply the basic principles of mechanics and structural behavior to design and analyze structural elements in future projects.

4. **HISTORY OF ART & ARCHITECTURE (ARCH 104)**

   The students shall gain knowledge about the chronological development of Art & Architecture, the basic design elements, forms, materials, construction techniques and design principles developed under the socio-economic cultural and political influence during various time periods. The students can analyze the contributing factors for the design development of different styles during these time periods.

5. **ARCHITECTURAL DESIGN I (ARCH 181)**

   The students will have a basic idea of generating design concepts and represent the same in Architectural drawings using composition of different design elements, forms and basic design principles. Application of anthropometric data and standards in designing of space.

6. **ARCHITECTURAL GRAPHICS - I (ARCH 182)**

   Develop knowledge of drawing as a medium to visualize and communicate ideas. Application of various drawing tools and accessories used in drafting and lettering techniques. Imparting knowledge of representation of three-dimensional forms in design projects using graphical presentation skills.

7. **MODEL MAKING (ARCH 183)**

   Students will develop ability to understand and represent space by three-dimensional geometric/ abstract forms in scale. Develop skills of cutting and joining simple materials for model making.

8. **NSS/ ECA / NCC/ SPORTS (ARCH 184)**

   The students should emerge as healthy and socially conscious citizens capable of doing hard work under pressure and respond to the requirements of the society. This would also help in imparting a sense of responsibility and teamwork.

2nd SEMESTER :

1. **MATHEMATICS – II (ARCH 201)**

   Students will be capable to understand advanced analytic subjects in the curriculum.

2. **STRENGTH OF MATERIALS (ARCH 202)**

   Students will understand the structural behavior of beams under different conditions.

3. **HISTORY OF ARCHITECTURE-I (ARCH 203)**

   Students will understand the diversity of architecture in India and will gain knowledge about the design variables, construction techniques, materials and craftsmanship used in the historical buildings of Indian Subcontinent.

4. **MATERIALS AND CONSTRUCTION-I (ARCH 204)**

   Students will learn the uses, properties and applications of various constructional materials.

5. **ARCHITECTURAL DESIGN II (ARCH 281)**

   Students will gain basic skills for designing basic spaces and forms.

6. **ARCHITECTURAL GRAPHICS –II (ARCH 282)**

   Students will be able to develop Architectural Design through spatial ordering mechanisms and programmatic interpretation.

7. **Workshop Practice(ARCH-283)**

   Students will acquire skills to generate different architectural elements through prototype building.

8. **EDUCATIONAL TOUR (ARCH 284)**

   Students will get exposure to various types of historical as well as modern structures.

3rd SEMESTER :

1. **STRUCTURE – I (ARCH 301)**

   Shall equip the students with knowledge of basic structure, helping them to design simple building components.

2. **CLIMATOLOGY (ARCH 302)**

   Will be able to design climate responsive buildings considering the impact of climatic factors, comfort conditions, natural ventilation and day lighting.

3. **HISTORY OF ARCHITECTURE --- II (ARCH 303)**

   Students will be aware of the impact of Islamic influence on the development of architectural style for future application in appropriate context.

4. **MATERIALS AND CONSTRUCTION-II (ARCH 304)**

   The students will understand the basic components of a building with its construction details and develop the ability to integrate knowledge of properties and construction methods of these components in the design of simple projects.

5. **ARCHITECTURAL DESIGN III (ARCH 381)**

   Students will understand the relation of space, form and site considerations to develop designs for medium sized public buildings.

6. **Methods of Construction(ARCH 382)**

   Students will gain knowledge of constructional details of different building components which can be applied in future projects.

7. **COMPUTER EDUCATION (ARCH 383)**

   Getting idea about the history and basics of computer, its programming and architecture.

8. **MATERIAL TESTING WORK SHOP (ARCH 384)**

   Gain hands on experience about properties of basic building materials.

4th SEMESTER :

1. **STRUCTURE – II (ARCH 401)**

   Will equip students with knowledge of different theories for analysis of structural behaviour of structures.

2. **ACOUSTICS (ARCH 402)**

   Students will gain knowledge of basics architectural acoustic systems in buildings and acoustic principles and treatments and be equipped to design acoustic interiors and buildings.

3. **HISTORY OF ARCHITECTURE-III (ARCH 403)**

   Students will gain knowledge about the spatial and stylistic qualities, use of materials & technology and principles of composition associated with architecture during Classical to Renaissance period.
   An understanding of architecture as an outcome of various social, political and economic upheavals, and as a response to the culture and context.

4. **MATERIALS AND CONSTRUCTION --- III (ARCH 404)**

   The students will gain knowledge of cost effective and environmentally friendly materials, types and constructional details of building components like doors, windows and stairs and finishes for application in practical field

5. **ARCHITECTURAL DESIGN IV (ARCH 481)**

Students will learn to analyze different parameters and design Institutional buildings.

6. **METHODS OF CONSTRUCTION II(ARCH482)**

The students will learn to do detail drawings of the above mentioned basic components of a building.

7. **COMPUTER GRAPHICS – I (ARCH 483)**

The students will learn to express the representation of visual composition in 2D using digital tools, drafting, 3D visualization and rendering.

8. **EDUCATIONAL TOUR (ARCH 484)**

Students will learn and experience the architectural characteristics of various historical as well as contemporary buildings.

5th SEMESTER :

1. **STRUCTURES III (ARCH 501)**

Students will gain knowledge about design and detailing of concrete structural components.

2. **BUILDING SERVICES I (ARCH 502)**

Students will gain knowledge about water supply, sewerage, and waste disposal systems in buildings and develop the ability to conceptually plan/ design.

3. **HISTORY OF ARCHITECTURE – IV (ARCH 503)**

The students will have an insight into the development of Modern architecture and Arts & Crafts movement in Europe and America.

4. **MATERIALS AND CONSTRUCTION -- V (ARCH 504)**

The students will acquire knowledge of roofing, partitions and paneling in building construction and become familiar with advanced materials and construction techniques.

5. **ARCHITECTURAL DESIGN V (ARCH 581)**

The students will develop sensitivity in design approach in community oriented projects analyzing context, collective values and needs.

6. **MATERIALS AND CONSTRUCTION-III (ARCH 582)**

The students will learn detail drawings of the above mentioned building components for future practical applications.

7. **COMPUTER GRAPHICS II (ARCH 583)**

Exposure to software like 3D Max, Sketch-up and Photoshop will help students to prepare presentation drawings in 2D and 3D.

8. **SURVEY FIELD WORK (ARCH 584)**

Students will develop the ability to measure, draw, and represent all the physical parameters of a site.

6th SEMESTER :

1. **STRUCTURES IV (ARCH 601)**

Students will gain knowledge of analyzing and designing steel structures.

2. **BUILDING SERVICES II (ARCH 602)**

The student will understand the importance and working of lighting installation in buildings, and gain the ability to design basic electrical lighting and firefighting systems.

3. **HISTORY OF ARCHITECTURE – V (ARCH 603)**

The students will gain knowledge of neo-vernacular and contemporary architecture.

4. **LANDSCAPE DESIGN (ARCH 604)**

The student will understand the scope of landscape architecture, the elements used in landscape design and the impact of human activities on the environment and also the role of architect in mitigating it.

5. **ARCHITECTURAL DESIGN VI (ARCH 681)**

The students will learn design methods for site planning and give appropriate/ innovative design solutions for community buildings in urban environment.

6. **WORKING DRAWING(ARCH 682)**

The students will learn to use architectural terms and symbols; apply construction.

7. **ESTIMATION & VALUATION (ARCH 683)**

The students will be able to forecast the estimated value of a project and determine basic specifications of material and workmanship.

8. **EDUCATIONAL TOUR (ARCH 684)**

Students will learn and experience the architectural characteristics of various historical as well as contemporary buildings.

7th SEMESTER :

1. **STRUCTURE IN ARCHITECTURE (ARCH 701)**

Students will learn the behavioral pattern of different structural systems so as to incorporate those in their design.

2. **BUILDING SERVICES III (ARCH 702)**

Students will learn different air conditioning systems and types of lifts.

3. **BLDG. ECONOMICS & CONST. MANAGEMENT (ARCH 703)**

Students will learn to manage the economic aspect of construction.

4. **URBAN PLANNING & HUMAN SETTLEMENTS (ARCH 704)**

The student will gain knowledge about the nature, characteristics and evolution of human settlements and also the planning concepts of historical and contemporary towns. They will be aware of the current issues in urban planning and will be acquainted with land-use, zoning, types of development plan, etc.

The students will learn innovative design solutions for Institutional buildings/Housing in urban environment.

5. **INTERIOR DESIGN (ARCH 782)**

The students will gain knowledge about Ergonomics and furniture design and get an overall exposure to the ways in which interior spaces can be enriched through the design of specific components.

6. **ARCHITECTURAL ILLUMINATION (ARCH 783)**

The students understand the principles, laws, and recommended values of illumination in buildings with experiments for application in design projects.

8th SEMESTER :

1. **ENERGY EFFICIENT ARCHITECTURE (ARCH 801)**

Students will gain knowledge of alternative sources of energy and passive design considerations, day lighting and natural ventilation in design. They will also understand future trends in creating sustainable built environment.

2. **HOUSING & COMMUNITY PLANNING (ARCH 802)**

Students will have an overall view of the housing policies within India and third world countries.

3. **URBAN DESIGN (ARCH 803)**

Students will be aware of the evolution and characteristics of urban forms, their components and interdependencies and understand elements, principles, concepts & components of urban design.

4. **DISASTER MITIGATION (ARCH 804)**

The students will be aware about disasters and the strategies for disaster management and

mitigation. They will also understand the design guidelines in disaster resistant construction.

5. **ARCH. DESIGN VIII (ARCH 881)**

   The students will develop design approach in Institutional projects and also learn the details.

6. **THESIS PROGRAMMING (ARCH 882)**

   Students will equip themselves with the all-round knowledge to take up their thesis project in their final semester.

7. **OFFICE MANAGEMENT (ARCH 883)**

   Student will gain knowledge of the role of professional and statutory bodies and understand the role of an architect and professional ethics.

9th SEMESTER :

PROFESSIONAL TRAINING (ARCH 981)

Students will gain hands on knowledge of all aspects of Architectural Practice, specifically knowledge of design and details of varied types of buildings

10th SEMESTER :

ELECTIVES I & II :

1. **ADVANCED STRUCTURES (ARCH 1001A)**

   Students will understand concepts and applications of critical and advance structures for future applications.

2. **COST EFFECTIVE BUILDING TECHNOLOGY (1001B)**

   Students will learn cost effective materials and construction methods of sustainable and green building design.

3. **BUILDING MAINTENANCE (ARCH 1001C)**

   Students will learn important aspects of building maintenance.

4. **INDUSTRIAL ARCHITECTURE (ARCH 1001d)**

   Students will understand design aspects of industrial buildings and the codes affecting it.

5. **BARRIER FREE ARCHITECTURE (ARCH 1001e)**

   Students will understand the special design considerations for barrier free architecture and the guiding norms.

6. **ADVANCED LANDSCAPE (ARCH 1002a)**

   The students will understand the contemporary Landscape planning in urban scenario and assess the current trends for application in their design.

7. **VERNACULAR ARCHITECTURE (ARCH 1002b)**

   The students will gain knowledge about materials and methods of construction, planning and forms of vernacular architecture in different regions of the country.

8. **ENVIRONMENTAL PLANNING (ARCH 1002c)**

   The students will gain knowledge of the existing natural resources, various ecosystems the need for preserving the resources and the environmental legislations.

9. **CONSERVATION (ARCH 1002D)**

   The students will understand current trends in conservation, its need and the governing laws.

10. **RETROFITTING (ARCH 1002E)**

    The students will learn different methods of retrofitting for future application.

11. **ARCHITECTURAL THESIS (ARCH 1081)**

    The students will learn to handle a complete architectural design project at an advanced level and give a complete solution to the problem through design and details.