

MARTHANDAM COLLEGE OF ENGINEERING AND TECHNOLOGY**DEPARTMENT OF CIVIL ENGINEERING****Course Outcomes – Odd Semester 2022-23**

Sl. No.	Semester	Theory/ Practical	Course Code / Course Name
1)	3	Theory	MA3351 -Transforms and Partial Differential Equations
2)	3	Theory	ME3351-Engineering Mechanics
3)	3	Theory	CE3301-Fluid Mechanics
4)	3	Theory	CE3302-Construction Materials and Technology
5)	3	Theory	CE3303-Water Supply and Wastewater Engineering
6)	3	Theory	CE3351-Surveying and Levelling
7)	3	Practical	CE3361-Surveying and Levelling Laboratory
8)	3	Practical	CE3311-Water and Wastewater Analysis Laboratory
9)	3	Practical	GE3361-Professional Development
10)	5	Theory	CE3501-Design of Reinforced Concrete Structural Elements
11)	5	Theory	CE3501-Design of Reinforced Cement Concrete Elements
12)	5	Theory	CE3502-Structural Analysis I
13)	5	Theory	EN8491-Water Supply Engineering
14)	5	Theory	CE3591-Foundation Engineering
15)	5	Theory	GE8071Disaster Management
16)	5	Theory	OA1551-Environment & Agriculture
17)	5	Practical	GE6563-Soil Mechanics Laboratory
18)	5	Practical	CE3512-Water and Waste Water Analysis Laboratory
19)	5	Practical	CE3513-Survey Camp
20)	7	Theory	CE3701 -Estimation, Costing and Valuation Engineering
21)	7	Theory	CE3702 -Railways, Airports, Docks and Harbor Engineering
22)	7	Theory	CE3703-Structural Design and Drawing
23)	7	Theory	CE3030-Municipal solid Waste Management
24)	7	Practical	CE3711-Creative and Innovative Project (Activity Based Subject Related)
25)	7	Practical	CE3712-Industrial Training

Course Outcomes – EVEN Semester 2022-23

Sl. No.	Semester	Theory/ Practical	Course Code / Course Name
1)	4	Theory	CE3401-Applied Hydraulics Engineering
2)	4	Theory	CE3402-Strength of Materials
3)	4	Theory	CE3403-Concrete Technology
4)	4	Theory	CE3404-Soil Mechanics
5)	4	Theory	CE3405-Highway and Railway Engineering
6)	4	Theory	GE3451-Environmental Sciences and Sustainability
7)	4	Practical	CE3411-Hydraulic Engineering Laboratory
8)	4	Practical	CE3412-Materials Testing Laboratory
9)	4	Practical	CE3413-Soil Mechanics Laboratory
10)	6	Theory	CE8601-Design of Steel Structural Elements
11)	6	Theory	CE8602-Structural Analysis-II
12)	6	Theory	CE8603-Irrigation Engineering
13)	6	Theory	CE8604-Highway Engineering
14)	6	Theory	EN8592-Waste water Engineering
15)	6	Practical	CE8611-Highway Engineering Laboratory
16)	6	Practical	CE8612-Irrigation and Environmental Engineering Drawing
17)	6	Practical	HS8581-Professional Communication
18)	8	Theory	CE8018-Geo-Environmental Engineering
19)	8	Theory	CE8020-Maintenance, Repair and Rehabilitation of Structures
20)	8	Practical	CE8811-Project Work
21)	8	Practical	CE8712-Industrial Training

MA3351-Transforms and Partial Differential Equations	
COs	Course Outcome: The students, after the completion of the course, are expected to
CO1	To introduce the basic concepts of PDE for solving standard partial differential equations.
CO2	To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
CO3	To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations
CO4	To acquaint the student with Fourier transform techniques used in wide variety of situations
CO5	To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

ME3351-Engineering Mechanics	
COs	Course Outcome: The students, after the completion of the course, are expected to
CO1	Illustrate the vectorial and scalar representation of forces and moments
CO2	Analyse the rigid body in equilibrium
CO3	Evaluate the properties of distributed forces
CO4	Determine the friction and the effects by the laws of friction
CO5	Calculate dynamic forces exerted in rigid body

CE3301-Fluid Mechanics	
COs	Course Outcome: The students, after the completion of the course, are expected to
CO1	Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions.
CO2	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.
CO3	Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.
CO4	Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.
CO5	Explain the concept of boundary layer and its application to find the drag force exerted by the fluid on the flat solid surface.

CE3302-Construction Materials and Technology	
COs	Course Outcome: The students, after the completion of the course, are expected to
CO1	Identify the good quality brick, stone and blocks for construction.
CO2	Recognize the market forms of timber, steel, aluminium and applications of various composite materials.

CO3 Identify the best construction and service practices such as thermal insulations and air conditioning of the building

CO4 Select various equipment's for construction works conditioning of building

CO5 Understand the construction planning and scheduling techniques

CE3303-Water Supply and Wastewater Engineering

COs Course Outcome: The students, after the completion of the course, are expected to

CO1 Understand the various components of water supply scheme and design of intake structure and conveyance system for water transmission.

CO2 Understand on the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations.

CO3 Understand the process of conventional treatment and design of water and waste water treatment system and gain knowledge of selection of treatment process and biological treatment process.

CO4 Ability to design and evaluate water distribution system and water supply in buildings and understand the self-purification of streams and sludge and septage disposal methods

CO5 Able to understand and design the various advanced treatment system and knowledge about the recent advances in water and wastewater treatment process and reuse of sewage

CE3351-Surveying and Levelling

COs Course Outcome: The students, after the completion of the course, are expected to

CO1 Introduce the rudiments of various surveying and its principles.

CO2 Imparts knowledge in computation of levels of terrain and ground features

CO3 Imparts concepts of Theodolite Surveying for complex surveying operations

CO4 Understand the procedure for establishing horizontal and vertical control

CO5 Imparts the knowledge on modern surveying instruments

Laboratory

CE3361-Surveying and Levelling Laboratory

COs Course Outcome: The students, after the completion of the course, are expected to

CO1 Impart knowledge on the usage of basic surveying instruments like chain/tape, compass and levelling instruments

CO2 Able to use levelling instrument for surveying operations

CO3 Able to use theodolite for various surveying operations

CO4 Able to carry out necessary surveys for social infrastructures

CO5 Able to prepare planimetric maps

CE3311-Water and Wastewater Analysis Laboratory

COs Course Outcome: The students, after the completion of the course, are expected to

CO1 Calibrate and standardize the equipment.
CO2 Collect proper sample for analysis.
CO3 To know the sample preservation methods.
CO4 To perform field-oriented testing of water, wastewater.
CO5 To perform coli form analysis.

GE3361-Professional Development \$
Cos Course Outcome: The students, after the completion of the course, are expected to
CO1 Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
CO2 Use MS EXCEL to perform data operations and analytics
CO3 Use MS EXCEL to record, retrieve data as per requirements
CO4 Use MS EXCEL to visualize data for ease of understanding
CO5 Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects

5 th. Semester B.E. Civil

CE8501 Design of Reinforced Cement Concrete Elements
COs Course Outcome: The students, after the completion of the course, are having the ability to
CO1 Understand the various design methodologies for the design of RC elements.
CO2 Know the analysis and design of flanged beams by limit state method and sign of beams for shear, bond and torsion
CO3 Design the various types of slabs and staircase by limit state method.
CO4 Design columns for axial, uniaxial and biaxial eccentric loadings
CO5 Design of footing by limit state method

CE8502 Structural Analysis I
COs Course Outcome: The students, after the completion of the course, are expected to
CO1. Analyse continuous beams, pin-jointed indeterminate plane frames and rigid plane frames by strain energy method
CO2. Analyse the continuous beams and rigid frames by slope deflection method
CO3. Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway
CO4. Analyse the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method
CO5. Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames

COs Course Outcome: The students, after the completion of the course, are expected to
CO1: Gain an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
CO2: Gain knowledge in various unit operations and processes in water treatment
CO3: design the various functional units in water treatment
CO4: understand water quality criteria and standards, and their relation to public health
CO5: design and evaluate water supply project alternatives on basis of chosen criteria.

CE8591 Foundation Engineering
Course Outcome: The students, after the completion of the course, are expected to
CO1 Understand the site investigation, methods and sampling
CO2 Get knowledge on bearing capacity and testing methods
CO3 Design shallow footings
CO4 Determine the load carrying capacity, settlement of pile foundation
CO5 Determine the earth pressure on retaining walls and analysis for stability

GE8071 Disaster Management
Course Outcome : The students, after the completion of the course, are expected to
CO1: Differentiate the types of disasters, causes and their impact on environment and society
CO2: Assess vulnerability and various methods of risk reduction measures as well as mitigation.
CO3: Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.
CO4: Examine the mitigation measures and recovery for different types of disaster
CO5: Understand about the disasters based on case studies

OAI551 Environment and Agriculture
Course Outcome: The students, after the completion of the course, are expected to
CO1- Understand the role of environment in the current practice of agriculture and concerns of sustainability
CO2- Study the various impacts of environment due to various agricultural method
CO3- Understand the role of environment in the context of climate change
CO4-Ecological context of agriculture and its concerns will be understood.
CO5-Understand the role of environment in the context of emerging global issues

Laboratory

CE8511 Soil Mechanics Laboratory
Course Outcome : The students, after the completion of the course, are expected to
CO1 Conduct tests to determine the index properties of soils
CO2 Conduct tests to determine the density of soils
CO3 Conduct tests to determine the compaction properties of soils
CO4 Conduct tests to determine engineering properties of soils
CO5 Characterize the soil based on their properties.

CE8512 Water and Waste Water Analysis Laboratory
COs Course Outcome: The students, after the completion of the course, are expected to
CO1: Quantify the pollutant concentration in water and wastewater
CO2: Suggest the type of treatment required
CO3: Suggest the amount of dosage required for the treatment
CO4: Examine the conditions for the growth of micro-organisms
CO5: Quantify the sludge produced

CE8513 Survey Camp
Course Outcome: The students, after the completion of the course, are expected to
CO1 Acquire practical knowledge to carryout Triangulation including general field marking for various engineering projects and Location of site etc.
CO2 Acquire practical knowledge to carryout levelling for various engineering projects and Location of site etc.
CO3 Acquire practical knowledge on Theodolite surveying for various engineering projects and Location of site etc.
CO4 Acquire practical knowledge on Tacheometry surveying for various engineering projects and Location of site etc.
CO5 Acquire practical knowledge on Total Station surveying for various engineering projects and Location of site etc.

7 th. Semester B.E. Civil

CE8701 Estimation, Costing and Valuation Engineering	
COs	Course Outcome: The students, after the completion of the course, are having the ability to
CO1 - Estimate the quantities for buildings	
CO2 - Rate Analysis for all Building works, canals, and Roads and Cost Estimate	
CO3 - Understand types of specifications, principles for report preparation, tender notices types	
CO4 - Gain knowledge on types of contracts	
CO5 - Evaluate valuation for building and land	

CE8702 Railways, Airports, Docks and Harbour Engineering	
COs	Course Outcome: The students, after the completion of the course, are having the ability to
CO1. Understand the methods of route alignment and design elements in Railway Planning and Constructions	
CO2. Understand the Construction techniques and Maintenance of Track laying and Railway stations	
CO3. Gain an insight on the planning and site selection of Airport Planning and design	
CO4. Analyse and design the elements for orientation of runways and passenger facility systems	
CO5. Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted	

CE8703 Structural Design and Drawing	
Course Outcome:	The students, after the completion of the course, are having the ability to
CO1- Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls	
CO2- Design and draw flat slab and bridges as per code provisions	
CO3- Design and draw reinforced concrete and steel water tanks	
CO4- Design and draw the various steel trusses	
CO5- Design and detail the various Gantry girders	

GE 8077 Total Quality Management	
COs	Course Outcome: The students, after the completion of the course, are having the ability to
CO1. enumerate and justify the dimensions of product quality and service quality	
CO2. justify strategic quality planning and performance appraisal	
CO3. explain the concept of six sigma and benchmarking process	
CO4. understand the importance of cost of quality and quality loss	
CO5. understand the importance of various quality standardization organization	

OML751 Testing of Materials
Course Outcome: The students, after the completion of the course, are expected to
CO1 Identify suitable testing technique to inspect industrial component
CO2 Possess the ability to use mechanical testing technique and know its applications and limitations
CO3 Possess the ability to use non-destructive testing technique and know its applications and limitations
CO4 Possess the ability to use material characterization testing technique and know its applications and limitations
CO5 Possess the ability to use thermal and chemical testing technique and know its applications and limitations

Laboratory

CE8711 Creative and Innovative Project
Course Outcome: The students, after the completion of the course, are expected to
CO1 Demonstrate a sound technical knowledge of their selected project topic.
CO2 Undertake problem identification, formulation and solution.
CO3 Design engineering solutions to complex problems utilizing a systems approach
CO4 Communicate with engineers and the community at large in written and oral form
CO5 Conduct an engineering project

CE8712 Industrial Training
COs Course Outcome: The students, after the completion of the course, are expected to
CO1. Understand the intricacies of implementation textbook knowledge into practice
CO2. Understand the concepts of developments and implementation of new techniques
CO3. Communicate with engineers and the community at large in written and oral forms
CO4. Undertake problem identification, formulation and solution.
CO5. Demonstrate the knowledge, skills and attitudes of a professional engineer

Even Semester 2022-23

4th. Semester B.E. Civil

CE3401 –Applied Hydraulic Engineering
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Describe the basics of open channel flow, its classification and analysis of uniform flow in steady state conditions with specific energy concept and its application
CO2 Analyse steady gradually varied flow, water surface profiles and its length calculation using direct and standard step methods with change in water surface profiles due to change in grades.
CO3 Derive the relationship among the sequent depths of steady rapidly varied flow and estimating energy loss in hydraulic jump with exposure to positive and negative surges.

CO4 Design turbines and explain the working principle
CO5 Differentiate pumps and explain the working principle with characteristic curves and design centrifugal and reciprocating pumps.

CE3402-Strength of material
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Understand the concepts of stress and strain, principal stresses and principal planes.
CO2 Determine Shear force and bending moment in beams and understand concept of theory of simple bending.
CO3 Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.
CO4 Analyse propped cantilever, fixed beams and continuous beams for external loadings and support settlements.
CO5 Determine the stresses due to Unsymmetrical bending of beams, locate the shear centre, and study the various theories of failure.

CE3403-Concrete Technology
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Understand the requirements of cement, aggregates and water for concrete
CO2 Select suitable admixtures for enhancing the properties of concrete
CO3 Design concrete mixes as per IS method of mix design
CO4 Determine the properties of concrete at fresh and hardened state.
CO5 Know the importance of special concretes for specific requirements.

CE3404-Soil Mechanics
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Demonstrate an ability to identify various types of soils and its properties, formulate and solve engineering Problems
CO2 Show the basic understanding of flow through soil medium and its impact of engineering solution
CO3 Understand the basic concept of stress distribution in loaded soil medium and soil settlement due to consolidation
CO4 Show the understanding of shear strength of soils and its impact of engineering solutions to the loaded soil medium and also will be aware of contemporary issues on shear strength of soils.
CO5 Demonstrate an ability to design both finite and infinite slopes, component and process as per needs and specifications.

CE3405-Highway and Railway Engineering
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Plan a highway according to the principles and standards adopted in various institutions in India.
CO2 Design the geometric features of road network and components of pavement.

CO3 Test the highway materials and construction practice methods and know its properties and able to perform pavement evaluation and management.
CO4 Understand the methods of route alignment and design elements in railway planning and constructions.
CO5 Understand the construction techniques and maintenance of track laying and railway stations

CE3451-Environmental Sciences and Sustainability
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2 To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3 To identify and apply the understanding of renewable and non - renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4 To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5 To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

Laboratory

CE3411- Hydraulics Engineering Laboratory
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Apply Bernoulli equation for calibration of flow measuring devices.
CO2 Measure friction factor in pipes and compare with Moody diagram
CO3 Determine the performance characteristics of rotodynamic pumps.
CO4 Determine the performance characteristics of positive displacement pumps.
CO5 Determine the performance characteristics of turbines.

CE3412-Material Testing Laboratory
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Determine the mechanical properties of steel.
CO2 Determine the physical properties of cement
CO3 Determine the physical properties of fine and coarse aggregate.
CO4 Determine the workability and compressive strength of concrete.
CO5 Determine the strength of brick and wood.

CE3413- Soil Mechanics Laboratory
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Conduct tests to determine the index properties of soils
CO2 Determine the insitu density and compaction characteristics.
CO3 Conduct tests to determine the compressibility, permeability and shear strength of soils.
CO4 Understand the various tests on Geosynthetics.

6 th. Semester B.E. Civil

CE8601 Design of Steel Structural Elements
COs Course Outcome: The students, after the completion of the course, are expected to
CO1: Understand the concepts of various design philosophies
CO2: Design common bolted and welded connections for steel structures
CO3: Design tension members and understand the effect of shear lag
CO4 : Understand the design concept of axially loaded columns and column base connections
CO5: Understand specific problems related to the design of laterally restrained and unrestrained steel beams

CE8602 Structural Analysis II
COs Course Outcome: The students, after the completion of the course, are expected to
CO1- Draw influence lines for statically determinate structures and calculate critical stress resultants
CO2 - Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams
CO3 - Analyse three hinged, two hinged and fixed arches
CO4 - Analyse the suspension bridges with stiffening girders
CO5 - Understand the concept of Plastic analysis and the method of analysing beams and rigid frames

CE8603 Irrigation Engineering
Course Outcome: The students, after the completion of the course, are expected to
CO1 Have knowledge and skills on crop water requirements
CO2 Understand the methods and management of irrigation
CO3 Gain knowledge on types of Impounding structures
CO4 Understand methods of irrigation including canal irrigation
CO5 Get knowledge on water management on optimization of water use

CE8604 Highway Engineering
Course Outcome: The students, after the completion of the course, are expected to
CO1 Get knowledge on planning and aligning of highway

CO2 Geometric design of highways
CO3 Design flexible and rigid pavements
CO4 Gain knowledge on Highway construction materials, properties, testing methods
CO5 Understand the concept of pavement management system, evaluation of distress and maintenance of pavements

EN8592 Wastewater Engineering
Course Outcome: The students, after the completion of the course, are having the
CO1- ability to estimate sewage generation and design sewer system including sewage pumping stations
CO2- required understanding on the characteristics and composition of sewage, self-purification of streams
CO3- ability to perform basic design of the unit operations and processes that are used in sewage treatment
CO4- Understanding about the standard methods for disposal of sewage
CO5- knowledge on sludge treatment and disposal

CE8005 Air Pollution And Control Engineering
Course Outcome: The students, after the completion of the course, are expected to
CO1 Have an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
CO2 Have the ability to identify, formulate and solve air and noise pollution problems
CO3 Have the ability to design stacks and particulate air pollution control devices to meet applicable standards
CO4 Have the ability to select control equipment's
CO5 Have the aability to ensure quality, control and preventive measures

Laboratory

CE8611 Highway Engineering Laboratory
COs Course Outcome: The students, after the completion of the course, are having the
CO1. Ability to understand the properties of aggregate with different tests
CO2. Ability to understand the properties of bitumen with different tests
CO3. Ability to understand the properties of bituminous mixes with different tests
CO4. Ability to understand the importance of Marshall stability value
CO5. techniques to characterize various pavement materials through relevant tests.

CE8612 Irrigation and Environmental Engineering Drawing
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 design and draw various units of impounding structures
CO2 design and draw various units of cross drainage works

CO3 design and draw various units of canal regulation structures
CO4 design and draw various units of Municipal water treatment plants
CO5 design and draw various units of sewage treatment plants.

HS8581 Professional Communication
Course Outcome: The students, after the completion of the course, are expected to
CO1 Make effective presentations
CO2 Participate confidently in Group Discussions.
CO3 Attend job interviews and be successful in them
CO4 Develop adequate Soft Skills required for the workplace
CO5 Enhance the Employability and Career Skills.

8th. Semester B.E. Civil

CE8018 Geo-Environmental Engineering
Course Outcome: The students, after the completion of the course, have the ability to
C01 Assess the contamination in the soil
C02 Understand the current practice of waste disposal
C03 Prepare the suitable disposal system for particular waste
C04 Select suitable remediation methods based on contamination
C05 Select suitable remediation methods based on contamination

CE8020 Maintenance, Repair and Rehabilitation of Structures
Course Outcome: At the end of the course students will have the ability to
CO1 Understand the importance of maintenance and assessment method of distressed structures
CO2 Understand the strength and durability properties, their effects due to climate and temperature
CO3 Understand recent development in concrete
CO4 Understand the techniques for repair and protection methods
CO5 Understand repair, rehabilitation and retrofitting of structures and demolition methods

Laboratory

CE8811 PROJECT WORK
COs Course Outcome: The students, after the completion of the course, are expected to
CO1 Demonstrate a sound technical knowledge of their selected project topic.
CO2 Undertake problem identification, formulation and solution.
CO3 Design engineering solutions to complex problems utilising a systems approach
CO4 Communicate with engineers and the community at large in written and oral form
CO5 Conduct an engineering project