Saraswati College of Engineering

Department-CIVIL ENGINERRING

Semester-III

Scheme (R-16/R-19)-R-16

Subject- APPLIED MATHEMATICS-III   **Subject Code- CEC 301**

Course Outcomes

PO	PSO	Compe tancy	PI	Bloom's Level	CO	Description
1,2		1.1	1.1.2	5	1	Apply the concept of Laplace transforms and use to solve real integrals in engineering problems
1,2.3,4		3.1	3.1.6	3	2	Determine and develop Fourier series for real life problems and applications.
1,2,3		2.1	2.1.2	3,4	3	Identify the concept of inverse linear transform and compare to various functions and its applications
1,2,3		3.2	3.2.1	3	4	Apply properties of complex analysis and mapping and bilinear transformation
1,2,3		12.1	12.1.3	3	5	Solve partial differential equation such as vibration of string heat flow etc.
1,2,4,12		2.2	2.2.3	3	6	To identify theorem of complex integration and study of correlation and curve fitting

Course Objectives

Sr. No.	Description
1	Provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyse engineering problems.
2	To Study the basic principles of Laplace Transform, Fourier series, Complex variables.
3	Provide sound foundation in the mathematical fundamentals necessary to formulate, solve and analyse engineering problems.
4	To study properties of complex analysis and mapping and bilinear transformation
5	Formulate simple engineering problem as PDE & state the boundary conditions.
6	Apply statistical methods like correlation, regression analysis & curve fitting applied to construction management

Department-CIVIL ENGINERRING	
Semester-III	
Scheme R-16	
Subject- Surveying - 1	**Subject Code- CEC 302**
Course Outcomes	

PO	PSO	Compe tancy	PI	Bloom's Level	CO	Description
3	1	1.3	1.3.1	2	1	Measure Linear measurements, chaining, ranging and offsetting and apply corrections

1	1	4.3	4.3.3	2	2	Traversing by observing bearings, compute included angles and do corrections for Local Attraction
3	1	2.2	2.2.3	4	3	Measure vertical distances, determine RL and check.Identify & choose suitable types of levelling
4	2	2.4	2.4.1	3	4	Computation of areas and volumes- Plane Table Survey
1	2	4.3	4.3.3	3	5	Calculation of consecutive and independent co-ordinates. Draw the traverse. Prepare Gale's Table. Reproduce the omitted measurements
4	2	4.2	4.2.1	3	6	Preparation of Topographical map.
		COURSE OBJECTIVES				
1	Study techniques for measurement of distance, setting offsets. To study the functions of various instruments their least counts, possible errors, advantages and limitations.
2	Study the different types of bearings, making corrections for Local attraction
3	Know about the Benchmarks, computation of Reduced Levels and do the necessary check
4	Study various method for calculation of areas and volumes for fields with irregular boundary
5	Study how to measure horizontal, vertical angles and setting out of angles
6	Prepare Radial contouring.

Department-CIVIL ENGINEERING

Semester-III

Scheme (R-16)-

Subject-ENGINEERING
GEOLOGY   Subject Code-CE C-304

Course Outcomes

PO	PSO	Compe tancy	PI	Bloom's Level	CO	Description
2	1	2.4	2.4.4	2	1	Understand and explain the significance of geological studies of seismic waves, agents modifying earth's surface and rocks
3	1	4.3	4.3.2	2	2	Demonstrate the knowledge of geology to explain major geological processes
2	1	2.2	2.2.2	4	3	Distinguish minerals and rocks in terms of minerology and petrology.
2	1	2.1	2.1.1	3	4	Identify various geological structures, their origin and distribution.
3,6	2	4.1,7.2	4.1.4,7.2.2	3,5	5	Apply methods of geological investigation to check the suitability of geological condition for construction of dam and tunnel .
6	2	7.2	7.2.2	5,6	6	engineering project and study of geological disasters.

Course Objectives

Sr. No.	Description
1	Acquire basic knowledge of geology to understand its significance in various Civil Engineering projects.
2	Understand the 'theory of plate tectonics' and explain geology at global scale.
3	Learn types of minerals and rocks in detail to comment its suitability for any civil engineering project.
4	Subdivide structural geology to understand deformation structure and forces responsible.
5	and study of natural disaster.

						techniques and study some geological disasters.
6						

Department- Civil Engineering

Semester- III

Scheme (R-16)

Subject- Fluid Mechanics I

Subject Code- CEC305

Course Outcomes

PO	PSO	Comp etanc	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	1	1	Define various properties of fluids, state and explain different types of laws and principles of fluid mechanics.
1	1	1.3	1.3.1	2	2	Interpret different forms of pressure measurement and Calculate Hydrostatic Force and its Location and Compute force of buoyancy on a partially or fully submerged body nd analyse the stability of a floating body.
2	2	2.1	2.1.2	4	3	Distinguish velocity potential function and stream function and solve for velocity and acceleration of a fluid at a given location in a fluid flow.
1	1	1.2	1.2.1	2	4	Explain the concept of fluid kinematics & ideal fluid
2	1	2.2	2.2.3	3	5	Apply Euler's Equation of motion and Develop Bernoulli's equation.
3	1	3.1	3.1.6	5	6	Measure velocity and rate of flow using various devices

Course Objectives

Sr. No.	Description
1	Properties of fluids and basic concepts applicable to fluid mechanics and its relevance in civil engineering.
2	Fundamentals of hydrostatics viz. Pascal's law, hydrostatic law and determination of hydrostatic pressure and centre of pressure of surfaces
3	Principle of buoyancy and its application
4	The concept of fluid kinematics and ideal fluid flow.
5	Concepts of control volume, control surface and dynamics of fluid flow.
6	Various flow measuring devices and their applications

SE

Saraswati College of Engineering

Department-CIVIL ENGINERRING

Semester-IV

Scheme (R-16/R-19)-R-16

Subject- APPLIED MATHEMATICS-IV   **Subject Code- CEC401**

Course Outcomes

PO	PSO	Compet ancy	PI	Bloom's Level	CO	Description
1,2		1.1	1.1.3	3	1	Extend the concept of matrices to eigen value & eigen vector & use it to solve various engineering problem.
1,2,4		3.2	3.2.1	3	2	Apply principles of vector calculus to the analysis of engineering problems.
1,2,3,4.12		2.1	2.1.2	3,4	3	Translate business problem to mathematical form & can find optimal solution by graphical or simplex method & dual simplex method
1,2,12		2.1	2.1.2	3,4	4	Ability to use probability distribution to analyze & solve real time problem
1,2,3,12		2.4	2.4.1	2	5	Explain the test of hypothesis for small & large samples by using various test like t- test, z- test & chi- square test.
1,2,3,4		3.3	3.3.1	3	6	Develop the concept of ANOVA to measure the effect of extraneous variables.

Course Objectives

Sr. No.	Description
1	To inculcate an ability to relate engineering problems to mathematical context.
2	To provide a solid foundation in mathematical fundamentals required to solve engineering problem.
3	To study the basic principles of Vector analyses, complex integration, probability, test of hypothesis and correlation between data.
4	Apply test of hypothesis & Analysis of Variances for solving engineering problems.
5	To study linear programming problem and probability distribution.
6	To identify significance of sampling theory.

Department- Civil Engineering

Semester- IV

Scheme - R-16

Subject- SURVEYING II   Subject Code- CE C402

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO 1 PO 3	2	1.3 3.3.1	1.3.1 3.1.3	Level-2	CO-1	Understand to set out different types of horizontal curves with linear and angular methods
PO-3	2	3.3	3.3.1	Level-2	CO-2	Illustrate tangent correction and chord gradient methods for setting out vertical curves.

PO-4	2	4.1	4.1.2	Level-2	CO-3	Preparation and & setting out of foundation plan for different types of construction.
PO-5	2	5.1	5.1.1	Level-2	CO-4	Discuss about special survey instruments like electronic theodolite total station for desired accuracy in surveying.
PO-1	2	1.4	1.4.1	Level-3	CO-5	Explain the application of GPS, remote sensing, GIS, field astronomy, aerial photography then hydrographic survey.
PO-1	2	1.4	1.4.1	Level-3	CO-6	Explain the role of different government authority maintaining cadastral surveying.

Course Objectives

Sr. No.	Description
1	To Setout different types of horizontal curves with linear and angular methods
2	To Setout vertical curves by tangent correction and chord gradient method
3	To Understand the setting out of foundation plan for buildings, sewer line, culvert and tunnels
4	To Study about special survey instruments like electronic theodolite and total station for desired accuracy in surveying.
5	To develop concept of GPS, remote sensing, GIS, field astronomy, aerial photography then hydrographic survey.
6	To Study about the role of different government authority maintaining cadastral surveying.

Department-Civil Engineering

Semester-IV

Scheme (R-16/R-19)-R-16

Subject-BDD   **Subject Code-CEC404**

Course Outcomes

PO	PSO	Compet ancy	PI	Bloom's Level	CO	Description
PO 1, PO 4, PO 9	PSO 2	4.2	4.2.1	BT1,BT 2,BT3		Define and apply the principles and code of practices for planning and designing of residential buildings and interpret the various building components and building services.
PO 1, PO 4,PO 7	PSO 2	4.3	4.3.1	BT3		Plan and develop dog legged as well as open newel staircase.
PO 4, PO 5	PSO 2	4.2	4.2.1	BT1		Define and draw one point and two-point perspective.
PO 6, PO 7, PO 8, PO 9, PO	PSO 2	8.2	8.2.2	BT3		Make use of the concept of town planning, architectural planning and built environment.
PO 6, PO 7, PO 8, PO 9, PO	PSO 2	8.2	8.2.1	BT3		Utilize the concept of Green buildings.
PO 1, PO 4, PO 5, PO 9	PSO 2	5.2	5.2.1	BT1,BT 2, BT3		Define and apply the principles and code of practices for planning and designing of various public buildings and study the various components and building services as well as apply the knowledge of overall planning and

Course Objectives

Sr. No.	Description
1	Define, evaluate and apply the principles and code of practices for planning and designing of residential buildings and study the various building components and building services.
2	Study the designing of dog legged as well as open newel staircase.
3	Define and draw one point and two-point perspective.

4	Study the concept of town planning, architectural planning and built environment.
5	Understand the concept of Green buildings.
6	Define, evaluate and apply the principles and code of practices for planning and designing of various public buildings and study the various components and building services as well as apply the knowledge of overall planning and

Department- Civil Engineering

Semester- IV

Scheme (R-16)

Subject- Fluid Mechanics II   **Subject Code- CEC406**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	2	1	Interpret different pipe fittings and evaluate the fluid velocity considering major and minor losses.
3	2	3.3	3.3.1	3	2	Determine the power transmitted through nozzle
2	1	2.1	2.1.2	4	3	Distinguish the types of compressible flow and compute the stagnation properties.
2	1	2.1	2.1.2	5	4	Compute drag and lift coefficients and terminal velocity of the body.
2	1	2.4	2.4.1	5	5	Evaluate pressure drop for laminar flow in a pipe.
2	1	2.4	2.4.1	3	6	Establish Prandtl's mixing theory and solve turbulent flow problems

Course Objectives

Sr. No.	Description
1	To understand the Pipe flow problems, losses incurred during transmission of power through pipe and nozzle.
2	To study hardy cross method and water hammer phenomenon
3	To study and analyze the pipe network which will help to design water supply schemes.
4	To study laminar its significance.
5	To study turbulent flows and its significance.
6	To study compressible flow and understand boundary layer theory.

Department- Civil Engineering

Semester- IV

Scheme- R-16

Subject- Building Materials & Concrete Technology   **Subject Code- CEL405**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
2	2	2.2	2.2.2	3	1	Develop & implement the conceptual knowledge of building materials in the construction industry.
2	2	2.2	2.2.3	2	2	Classify the type & manufacturing process of different types of building materials.

4	2	4.3	4.3.1, 4.3.4	5	3	Assess the various quality control aspects of civil engineering materials by performing different lab tests on materials.
7	2	7.2	7.2.2	3	4	Identify the ingredients & properties of fresh and hardened concrete.
5	2	5.3	5.3.2	5,6	5	Design and interpret concrete mix for various grades for various exposure conditions.
5	2	5.2	5.2.2	2	6	Explain the new technology for manufacturing, testing & quality of concrete.

Course Objectives

Sr. No.	Description
1	List and classify the building materials to be used for the construction work and their associated quality, durability, economy, and their role in the construction.
2	Explain the manufacturing process, properties and usage of different types of building materials to achieve good knowledge about the building materials.
3	Assess the constituents of Concrete, explain their properties, classification and compatibility with concrete as per relevant IS codes.
4	State and explain the properties,tests , factors affecting durability and make use of it for the manufacturing of concrete.
5	Design and interpret concrete mix for various grades for various exposure conditions.
6	To enable the students to understand and enlist various components of the Ready Mix Concrete Plant and explain the basic non-destructive test on concrete.

SE

Saraswati College of Engineering

Department- Civil Engneering

Semester- V

Scheme (R-16)

Subject-ADVANCED CONCRETE TECHNOLOGY   **Subject Code-CEC-302**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	1	1	To recall the various materials used for concrete making and also learn different properties in Concrete
2	1	2.2	2.2.2	4	2	To categorize the various properties of concrete and identify,assemble,evaluate information and resource
4	1	3.1,3.2	3.1.4,3.2.3	4	3	To analyse the different methods of mix design and select optimal mix design as per requirement of a structure
2	1	2.4	2.4.4	3	4	To evaluate knowledge of Fibre Reinforced Concrete and extract desired understanding and conclusion
2	1	2.3	2.3.1	3	5	To apply the different procedures to demonstrate the tests on concrete for determining conclusions by combining scientific
3	1	3.2	3.2.1	5	6	To summarize the concept of durability of concrete to develop multiple civil engineering design solutions.

Course Objectives

Sr. No.	Description
1	Know the various materials and properties in concrete
2	Understand the various properties of special concrete
3	Understand the Mix design by different methods.
4	Get a thorough knowledge of Fibre Reinforced Concrete.
5	Know the different procedures for testing concrete
6	Understand the concept of durability and cracking in concrete

Department- CIVIL ENGINEERING

Semester- V

Scheme (R-16)

Subject- STRUCTURAL ANALYSIS - II   **Subject Code- CEC501**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	2	1.3	1.3.1	3	1	Apply the civil engineering concepts to solve problems related to stability of civil engineering structures.
1	1	1.3	1.3.1	3	2	Compute the deflection of statically determinate structures due to loading/temperature variations/support settlements.

2	1	2.2	2.2.3	4	3	Identify existing solution methods for solving the problems related to flexibility of indeterminate structures with justified
2	1	2.2	2.2.3	4	4	Identify existing solution methods for solving the problems related to stiffness of indeterminate structures with justified
2	2	2.3	2.3.1	4	5	Combine the basic principles and engineering concepts related to plastic analysis of structures for accurately ascertaining
2	1	2.3	2.2.3	4	6	Identify the analytical methods for solving the problems on multi-storeyed building frames using justified approximations

Course Objectives

Sr. No.	Description
1	To understand static and kinematic indeterminacy of structure.
2	To find deflection of statically indeterminte structure due to temperature variation.
3	To analyze indeterminate structures by flexibility method and clapeyron's theorem
4	To analyze indeterminate structures by stiffness method.
5	To analyze indeterminate structures using plastic analysis of structures.
6	To understand Approximate methods for analysis of frame structure.

Department- Civil Engineering Department

Semester- V

Scheme R-19

Subject-Geotechnical Engineering-1   **Subject Code- CEC503**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO-2			2.1.3			Explain the basic concepts of the physical and engineering
PO-4	PSO-1	2.1	4.1.4	BT-2	CO1	properties of soil and use the relationship among various unit
		4.3	4.3.1	BT-1		
PO-4	PSO-1	4.1	4.1.4	BT-3	CO2	Evaluate the index properties of soil and describe clay mineralogy.
				BT-1		
PO-2	PSO-1	2.2	2.2.4	BT-4	CO3	Classify the soil as per IS code.
PO-2		2.2	2.2.3			Calculate the coefficient of permeability of different types of soils
PO-4	PSO-1	4.1	4.1.4	BT-3	CO4	and summarize flow net.
						Determine the total stress, neutral stress and effective stress in a
PO-2	PSO-1	2.1	2.1.3	BT-2	CO5	soil mass subjected to different geotechnical condition.
			2.2.3	BT-1		Calculate the optimum moisture content of a soil and explain the
PO-2	PSO-1	2.2	2.2.4	BT-3	CO6	necessity and methods of soil exploration.

Course Objectives

Sr. No.	Description
1	To study the origin and mode of formation of soil as well as functional relationships among different unit weights, volumetric ratios, and water content to solve the problems.
2	To study clay mineralogy and plasticity characteristics of soils.
3	To comprehend particle size distribution and classification of soils as per IS code.
4	To study permeability and seepage flow of water through the soil.
5	To understand the concept of total stress, neutral stress and effective stress in soil.

	To understand compaction characteristics of soils as well as the techniques of soil as well as the techniques of soil exploration,
6	assessing the subsoil conditions and engineering properties of various soil strata.

Department- Civil Engineering

Semester- V

Scheme (R-16)

Subject- Applied Hydraulics   Subject Code- CEC503

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
2	1	2.1	2.1.3	3	1	Apply the concepts of fluid dynamics to solve pipe bend and sprinkler problems.
2	1	2.3	2.3.1	3	2	Determine the flow phenomenon using the dimensional analysis or model analysis.
2	1	2.1	2.1.3	3	3	To apply the concept of fluid dynamics to determine the impact of jet on various bodies.
3	2	3.1	3.1.6 5.2.1	3	4	Demonstrate the working and Determine the design parameters for different types of turbines.
3	2	3.1	3.1.6	3	5	Examining the working of centrifugal pump along with the governing properties of pump
3	2	3.2	3.2.6	3	6	Calculate the flow parameters for uniform and non uniform flow in open channel.

Course Objectives

Sr. No.	Description

1	To introduce the concept of dynamics of fluid flow and dimensional analysis
2	To study hydraulic machines like centrifugal pumps, reciprocating pumps and turbines
3	To study the mathematical techniques used in research work for design conducting model tests.
4	To impart the dynamic behavior of the fluid flow analyzed by the Newton's second law of motion.
5	To understand the uniform and non-uniform flow through open channels
6	To study design of open channel and understand concept of surface profile with hydraulic jump

Department- Civil Engineering

Semester- V

Scheme (R-16)

Subject- Applied Hydraulics   **Subject Code- CEC503**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
2	1	2.1	2.1.3	3	1	Apply the concepts of fluid dynamics to solve pipe bend and sprinkler problems.
2	1	2.3	2.3.1	3	2	Determine the flow phenomenon using the dimensional analysis or model analysis.
2	1	2.1	2.1.3	3	3	To apply the concept of fluid dynamics to determine the impact of jet on various bodies.
3	2	3.1	3.1.6 5.2.1	3	4	Demonstrate the working and Determine the design parameters for different types of turbines.

| 3 | 2 | 3.1 | 3.1.6 | 3 | 5 | Examining the working of centrifugal pump along with the governing properties of pump |
| 3 | 2 | 3.2 | 3.2.6 | 3 | 6 | Explain the basic concepts of open channel hydraulics. Calculate the flow parameters for uniform and non uniform flow in |

Course Objectives

Sr. No.	Description
1	To introduce the concept of dynamics of fluid flow and dimensional analysis
2	To study hydraulic machines like centrifugal pumps, reciprocating pumps and turbines
3	To study the mathematical techniques used in research work for design conducting model tests.
4	To impart the dynamic behavior of the fluid flow analyzed by the Newton's second law of motion.
5	To understand the uniform and non-uniform flow through open channels
6	To study design of open channel and understand concept of surface profile with hydraulic jump

Department- Civil Engineering Department

Semester- V

Scheme (R-16/R-19)- R-16

Subject-Transportation Engineering-1   **Subject Code- CEC505**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO 12	PSO-1	12.2	12.2.21	BT-2	CO1	Classify the roads based on the different criteria and explain alignments and different types of surveys for highway.
PO-1	PSO-1	1.3	1.3.1	BT-2 BT-3	CO2	Explain the various types of geometric elements of highway and calculate sight distance, horizontal curves and gradients.
PO-4	PSO-1	4.1 4.3	4.1.2 4.3.3	BT-5	CO3	Assess different traffic studies, control devices, different types of intersections and evaluate the traffic capacity and traffic volume.
PO-4	PSO-1	4.3	4.3.1	BT-5	CO4	Evaluate the properties of materials used in highway construction by
PO-3	PSO-1	3.1	3.1.4 3.1.6	BT-6	CO5	Design flexible and rigid pavement as per IRC-37 & IRC-58
PO-3 PO-5	PSO-1	3.1 5.3	3.1.4 5.3.1	BT-2 BT-6	CO6	Descirbe the various types of highway construction, drainage and maintenance and design the overlay thickness in flexible pavement

Course Objectives

Sr. No.	Description
1	To understand the classification ot roads and different types of surveys required for highway
2	To carry out Planning and design of geometric elements of Highways.
3	To study various traffic studies and to understand elements of Traffic Engineering for efficient planning and control.
4	To study Requirements of Highway materials and study methods of construction of Rigid and Flexible pavements, use of soil,stabilization and drainage to highways
5	To design Rigid and flexible pavements using IRC codes.
6	To design the overlay on basis of pavement evaluation and failure identification on rigid and flexible pavements.

Saraswati College of Engineering

Department-Civil Engineering

Semester-VI

Scheme (R-16/R-19)- R-16

Subject-Transportation Engineering-II   **Subject Code- CE603**

Course Outcomes

PO	PSO	Compe tancy	PI	Bloom's Level	CO	Description
6	1	7.1 7.2	7.1.2 7.2.2	1, 2	CO-1	Identify and explain the various elements pretending to air transportation, water transportation, and railway transportation.
3 2	1	1.3 2.2	1.3.1 2.2.3	1, 2, 4	CO-2	Analyze the geometric features along with functions of points and crossings.
3	1	3.1 3.2	3.1.6 3.2.1	1, 5, 6	CO-3	Define and explain the various geometric features of airport runway, airport layout, marking- lighting and design the exit taxiway along
5	1	4.2 5.1	4.2.2 5.1.1	2	CO-4	Illustrate the air traffic control aids, airport drainage and explain runway gate capacity and taxiway capacity.
6	1	7.2	7.2.2	2	CO-5	Illustrate the various modes of water transportation like harbours and port facilities , jetties , wharves , piers, dolphins etc.
1 2	1	1.3 2.1	1.3.1 2.1.2	2, 5	CO-6	Classify the different components of bridge, and determine the concept of economic span and scour depth in bridge engineering

Course Objectives

Sr. No.	Description
1	To enable the students to study the various elements pertaining to air transportation, water transportation, railway transportation. To study the various components of railway track, materials used functions of component parts.
2	To study the various imaginary surfaces of an airport, geometric standards, runway taxiway lighting
3	To study the various parking system, holding apron, hangars drainage system.
4	To study the various modes of water transportation, types of breakwater, harbours and port facilities equipment.
5	To study the various aspects of jetties, wharves, piers, dolphins, fenders buoyancy etc
6	To study the fundamental concepts of bridge engineering

Department-CIVIL Engineering

Semester-VI

Scheme (R-16)

Subject- Software Applications in Civil Engineering

Subject Code- CE-C607

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO-5	PSO-2	5.2 5.3	5.2.1 5.3.2	BT-2	CO1	Explain the importance, needs, advantages and limitations of software.
PO-5	PSO-2	5.1	5.1.1	BT-2	CO2	Classify different types of software available in Civil Engineering.

PO-5	PSO-2	5.1	5.1.2	BT-3	CO3	Identify the applications of different types of software.
PO-5	PSO-2	5.2	5.2.1 5.2.2	BT-3	CO4	Make use of software results and validate them by analysing results obtained from conventional methods.
PO-11	PSO-2	11.3	11.3.1 11.3.2	BT-3	CO5	Organize an executive summary of the report based on whole work.
PO-9	PSO-2	9.2 9.3	9.2.1 9.2.2	BT-3	CO6	Build their communication skill as well as teamwork qualities.

Course Objectives

Sr. No.	Description
1	All kinds of software packages available in various fields of civil engineering.
2	Proficiency in applications of these software packages
3	Practical use of software results and their validation by relating them with analytical results by conventional methods.
4	To make the use of software output results and validate them by analysing output results values obtained from conventional methods.
5	To organize an executive synopsis of the report based on whole work.
6	To build their communication skill as well as teamwork qualities.

Department- Civil Engineering Department

Semester- V

Scheme (R-16/R-19)- R-16

SUBJECT- ADVANCED
CONSTRUCTION   **Subject Code- CEDLO6061**

PO	PSO	Compe tancy	Bloom's Level	CO	Description
			Course Outcomes		
3,6,9	1	3.2, 6.2, 9.3	1	1	Recall the use and application of various conventional construction equipment's in different construction projects.
5,7	1	5.1,5.2, 7.2	2	2	Understand advance methods and special equipment used for under-ground as well as under water tunnelling.
10,12	1	10.2, 12.2	6	3	Compare the conventional and modern methods of form work on the basis of productivity, reuse value, ease of erection and dismantling, flexibility offered and overall cost
11,12	1	11.3, 12.2	4	4	Identify different methods/equipment of construction for road/flyovers/bridge projects and systems for locating under-ground utilities
1,3	1	1.3,3.3	5	5	Perceive knowledge about the setting up of different kinds of the power generating structures.
5,11	1	5.1, 5.2, 11.3	6	6	Understand the techniques involved and the equipment required thereof for construction of various transporting facilities. Choose proper equipment for construction of transporting facilities based on function.

			Course Objectives				
Sr. No.			Description				
1		To illustrate the characteristics and complexities involved in large civil engineering projects.					

2	To classify various construction equipment	
3	To elaborate the various advanced equipment used on, below or above ground/water.	
4	To discuss about the various non-conventional construction techniques which make use of these advanced equipment.	
5	To discuss the utility of modern formworks systems over conventional systems.	
6	To select appropriate equipment and techniques in construction for large and heavy engineering projects on the basis of suitability, availability, productivity, output, initial and operation cost, savings in time and other	

Department- Civil Engineering

Semester- VI

Scheme - R-16

**Subject- WATER RESOURCES
ENGINEERING-I**   **Subject Code- CEC – 605**

Course Outcomes

POs	PSO	Competency	BL	CO	Description
PO 2 PO 3	PO 2 PO 3	2.1 3.1	BL-2	CO 1	Able to understand the basics of Irrigation engineering and types of irrigation projects along with National Water policy
PO 3 PO5	1	3.1 5.1	BL 3 BL 4	CO 2	Able to choose and compare different techniques and methods of irrigation for a particular crop grown over an area in view of pros and cons of each technique.

PO 2 PO 7	1	2.3 7.1	BL 4 BL 6	CO 3	Able to understand the relation between duty & delta, calculation of water requirement of the crop, design discharge of canal, the storage requirements for optimum irrigation.
PO 2 PO7	2	2.4 7.1	BL 4 BL 5	CO 4	Analyze and interpret runoff resulting from a rainfall over a catchment area with the knowledge of various type of hydrograph
PO 1 PO2	1	1.1 2.2	BL 5 BL 6	CO 5	Identify the existing methods to design a well for required discharge and Estimate yield from a well.
PO 3 PO 7	1	3.2 7.1	BL 3 BL 5	CO 6	Identify suitable nonfunctional requirement for evaluation of alternate techniques to know the investigations for reservoir planning and

Course Objectives

Sr. No.	Description
1	To understand basics of irrigation engineering and classify irrigation projects.
2	To classify and select techniques and methods of irrigation suitable for cultivation of crop.

3	To analyze the water requirements of crops which will help to estimate the capacity of canal and reservoir
4	To explain the components of hydrological cycle and to determine the runoff from a catchment area
5	To summarize well hydraulics and evaluate yield from a well.
6	To classify the investigations for reservoir planning and estimate safe yield from a reservoir

Department- Civil Engineering

Semester- VI

Scheme - R-16

Subject- WATER RESOURCES ENGINEERING-I   **Subject Code- CEC – 605**

Course Outcomes

POs	Com pete	Perfor mance	CO	Description
PO 2 PO 3	2.1 3.1	2.1.1 3.1.1	CO 1	Able to understand the basics of Irrigation engineering and types of irrigation projects along with National Water policy
PO 3 PO5	3.1 5.1	3.1.4 5.2.1	CO 2	Able to choose and compare different techniques and methods of irrigation for a particular crop grown over an area in view of pros and cons of each technique.
PO 2	2.3	2.3.1	CO 3	Able to understand the relation between duty & delta, calculation of water requirement of the crop, design discharge of canal, the storage requirements for optimum irrigation.

PO 7	7.1	7.1.2	CO 3	
PO 2 PO7	2.4 7.1	2.4.2 7.1.2	CO 4	Analyze and interpret runoff resulting from a rainfall over a catchment area with the knowledge of various type of hydrograph
PO 1 PO2	1.1 2.2	1.1.1 2.2.3	CO 5	Identify the existing methods to design a well for required discharge and Estimate yield from a well.
PO 3 PO 7	3.2 7.1	3.2.3 7.1.1	CO 6	Identify suitable nonfunctional requirement for evaluation of alternate techniques to know the investigations for reservoir planning and

Course Objectives

Sr. No.	Description
	Description
1	To develop the clear understanding of design philosophy amongst the students for the design of reinforced concrete structures using Working Stress Method (WSM)
2	To introduce the concepts of Limit State Method and its significance in Reinforced Concrete design
3	To apply the concepts of Limit state of collapse- flexure, shear and torsion in the design of beams
4	To study and apply the concept of Limit state of Serviceability in the design of Slabs
5	To develop the concept of design using ready charts and curves for column subjected to axial load and moments

6	To study the concept of reinforced concrete footing design subjected to axial load and moment

Department- Civil Engineering

Semester- VI

Scheme (R-16)

Subject- Geotechnical Engineering-II   Subject Code-CEC601

Course Outcomes

PO	PSO	Compe tancy	PI	Bloom's Level	CO	Description
4	1	4.1	4.1.4	5	1	Appraise the consolidation parameters for the soil
4	1	4.3	4.3.3	5	2	Interpret the shear strength parameters for the soil
4	1	4.3	4.3.3	6, 2	3	Estimate the factors of safety of different types of slopes under various soil conditions and infer the stability of slopes, retaining walls & lateral earth
2	1	2.2	2.2.3	3, 5	4	Calculate the lateral earth pressure using Rankine , coulombs and graphical method also evaluate the stability analysis of gravity and
5 3	2	5.3 3.1	5.3.1 3.1.4	2	5	Evaluate the bearing capacity of shallow foundation using theoretical, field methods, Vesic methods and IS code method.
3	1	3.1	3.1.6	5	6	Determine the load bearing capacity of individual as well as group of pile foundations and their settlement using theoretical and field Method.

Course Objectives

Sr. No.	Description
1	Describe the knowledge of consolidation theory.
2	Evaluate the shear strength characteristics of the soil. Moreover, they would apply the knowledge for solving the related problems.
3	Analyze stability of slopes.
4	Recommend lateral earth pressure theories and apply them in stability analysis of retaining walls.
5	Illustrate the design of shallow foundations.
6	Formulate the capacity of pile foundation by different methods.

Saraswati College of Engineering

Department- Civil Engineering

Semester- VII

Scheme - R-16

Subject- THEORY OF REINFORCED CONCRETE STRUCTURES   **Subject Code- CEC702**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO-1	1	1.3	1.3.1	Level-3	CO-1	Apply fundamental concepts/method in Civil Engineering to solve engineering problems
PO-1	1	1.4	1.4.1	Level-2	CO-2	Use of LSM concepts to solve Civil Engineering problems.
PO-2	1	2.2	2.2.3	Level-3	CO-3	Identify existing solution method for solving the problem, including forming justified approximations and assumptions
PO-3	2	3.1	3.1.4	Level-4	CO-4	Extract engineering requirements from IS-456:2000 for analyzing and design Slabs.
PO-2	2	2.1	2.1.3	Level-3	CO-5	Identify the mathematical, engineering and other relevant knowledge that applies to a given problem
PO-3	2	3.1	3.1.6	Level-4	CO-6	Determine design objectives, functional requirements and arrive at design specifications

Course Objectives

Sr. No.	Description
1	To develop the clear understanding of design philosophy amongst the students for the design of reinforced concrete structures using Working Stress Method (WSM)
2	To introduce the concepts of Limit State Method and its significance in Reinforced Concrete design
3	To apply the concepts of Limit state of collapse- flexure, shear and torsion in the design of beams
4	To study and apply the concept of Limit state of Serviceability in the design of Slabs
5	To develop the concept of design using ready charts and curves for column subjected to axial load and moments
6	To study the concept of reinforced concrete footing design subjected to axial load and moment

Department- Civil Engineering

Semester- VII

Scheme - R-16

Subject- WATER RESOURSES ENGINEERING II   Subject Code- CEC703

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO-3	2	3.3	3.3.1	Level-4	CO-1	Able to analyze dam sections and check the modes of failure of gravity dam
PO-3	2	3.1	3.1.1	Level-4	CO-2	Able to identify seepage line in earth dam in different condition.

PO-4	1	4.3	4.3.4	Level-3	CO-3	Able to choose different types of spillways and design energy dissipaters.
PO-3	2	3.3	3.3.1	Level-3	CO-4	Able to calculate channel dimensions using Kennedy's & Lacey's theory of channel design.
PO-2	1	2.2	2.2.3	Level-2	CO-5	Able to understand canal classification, canal losses and canal lining.
PO-1	1	2.2	2.2.4	Level-3	CO-6	Able to suggest the canal structures on field.

Course Objectives

Sr. No.	Description
1	Able to design dam sections and check the modes of failure of gravity dam
2	Able to determine seepage line in earth dam in different condition.
3	Able to compare various types of spillways and design energy dissipaters.
4	Able to design and compare channels using Kennedy's & Lacey's theory of channel design
5	Able To understand canal classification, canal losses and canal lining.
6	Able to suggest the canal structures as per field condition

Department- Civil Engineering

Semester- VII

Scheme (R-16/R-19)- R-16

Subject- SOLID WASTE MANAGEMENT   **Subject Code- CE-DLO7042**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO2	1	2.2	2.2.2	Level-2	CO-1	Identify and evaluate information and resources related to solid waste management.
PO2	1	2.2	2.2.3	Level-2 & 3	CO-2	To understand the characteristics of different types of solid waste and solving problem related to waste characteristics
PO2	1	2.3	2.3.1	Level-2	CO-3	Identify method of waste collection, storage, transport and optimization of transportation routes.
PO2	1	2.2	2.2.4	Level-2	CO-4	Study methods or techniques for waste processing.
PO2	1	2.1	2.1.2	Level-2 & 3	CO-5	Identify engineering systems for disposal of solid waste and plan waste minimization.
PO2	1	2.2	2.2.2	Level-2	CO-6	Discuss treatment, disposal and management of industrial, hazardous, biomedical and E- waste.

Course Objectives

Sr. No.	Description
1	To explain generation, storage, collection, transfer and transport, processing, recovery and disposal in the management of solid waste.
2	To understand the characteristics of different types of solid waste and the factors affecting variation.
3	To identify the methods of collection, storage and transportation of solid waste.
4	To suggest suitable technical solutions for processing of wastes.
5	To plan waste minimization and disposal of municipal solid waste.

| 6 | To discuss safe handling and treatment of industrial, Hazardous, Electronic and Biomedical waste. |

Saraswati College of Engineering

Department- CIVIL ENGINEERING

Semester- VIII

Scheme- R16

Subject- DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

Cource Code : CEC801

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO -3	2	3.1 3.4	3.1.4 3.4.1	3	CO -1	Refine a conceptual design into a detailed design by applying the provisions of relevant engineering codes and standards
PO -3	2	3.1	3.1.6	3	CO -2	Determine design objectives, functional requirements and arrive at design specifications for staircases
PO -2	2	2.1	2.1.3	3	CO -3	Identify the mathematical, engineering, and other relevant knowledge that applies to the design of retaining walls.
PO -2	2	2.2	2.2.3	2	CO -4	Discuss the structural behaviour and apply the concepts of WSM in the design of RCC water tanks
PO -7	1	7.2	7.2.2	3	CO -5	Demonstrate the response of a structure during earthquake and determine design seismic forces
PO -3	1	3.2	3.2.3	3	CO -6	Explain principles of prestressing and analyse the stresses in prestressed beams

Course Objectives

Sr. No.	Description
1	To explain the LSM design procedure of G+ 3 structures by proper application of IS code clauses including loading calculation, analysis and design of individual elements
2	To determine design objectives, functional requirements and arrive at design specifications for staircases
3	To explain the structural behaviour that applies to the design of retaining walls and arrive at reinforcement detailing.
4	To apply the concepts of WSM in the design of RCC water tanks
5	To introduce earthquake resistant design method using relevant IS codes
6	To explain concept of Pre-stressed Concrete members

Department- CIVIL ENGINEERING

Semester- VIII

Scheme (R-16/R-19)- R 16

Subject-CONSTRUCTION MANAGEMENT   **Subject Code- C802**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
9,11	2	9.2,11.3	9.2.1; 11.3.1	2,3	CO1	Understand & apply the knowledge of management functions like planning, scheduling, executing &
3	2	3.4	3.4.1	4,5	CO2	Discover the importance of construction Industry. Classify the construction Projects.

5	2	5.1	5.1.2	3,6	CO3	Construct feasible project schedule by using scheduling techniques like CPM and PERT and
5	2	5.3	5.3.1	5	CO4	Evaluate the daily resource requirement and interpret the best possible schedule from different
11	2	11.2	11.2.1	4	CO5	Analyze the given network and determine an optimum time cost optimization curve
7	2	7.1	7.1.1	4	CO6	Inspect the quality & safety measures on construction sites during execution of civil

Course Objectives

Sr. No.	Description
1	To understand the basic functions and construction management.
2	To study the different types of construction projects and understand the feasibility of projects
3	To apply scheduling techniques such as CPM & PERT.
4	To understand allocating the resources and project monitoring
5	To gain knowledge of time-cost optimization & effective utilization of resources on consrtruction sites
6	To know about safety and quality aspect of construction works

Department- Civil Engineering

Semester- VIII

Scheme (R-16/R-19)- R-16

Subject- INDUSTRIAL WASTE TREATMENT   **Subject Code- CE-DLO8032**

Course Outcomes

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO2 PO6	1	2.2 6.2	2.2.2 6.2.2	Level-2	CO-1	• Understand different types and characteristics of industrial wastes.
PO2	1	2.2	2.2.3	Level-2 & 3	CO-2	• Identify sampling methods and analyze industrial wastewater.
PO2	1	2.2	2.2.2	Level-2 & 3	CO-3	• Determine the effects of industrial wastewater on self-purification of streams, reclamation of industrial
PO2	1	2.2	2.2.3	Level-2	CO-4	• Explain general treatment of industrial wastes, dewatering and disposal of sludge and advanced
PO2	1	2.2	2.2.3	Level-2	CO-5	• Describe manufacturing processes and treatment of wastewater.
PO6 PO7	1	6.2 7.2	6.2.1 7.2.2	Level-2	CO-6	• Study of location, design, need of CETP. • Discuss about provision of various acts pertaining to

Course Objectives

Sr. No.	Description
1	To understand characteristics of industrial wastewater, effluent standard and stream standards.
2	To identify sampling methods and analyze industrial wastewater.
3	To determine the effects of industrial wastewater on self-purification of streams, Streeter and Phelp's equation and solve numerical based on Oxygen sag.
4	To explain general treatment of industrial wastes, dewatering and disposal of sludge and advanced treatment methods.

5	To describe manufacturing processes and treatments of industrial waste.
6	To discuss about provision of various acts pertaining to industrial wastes, EIA, Environmental Audit, CETPs.