GAYATRI VIDYA PARISHAD COLLEGE FOR DEGREE AND PG COURSES (A)

Rushikonda, Visakhapatnam-530 045 | website: www.gvpcdpgc.edu.in

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ENGINEERING AND TECHNOLOGY PROGRAM

DEPARTMENT OF CIVIL ENGINEERING

(Program Accredited by NBA)

Semester-V (Third year)

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits C
			L	T	P				
2065501	PCC	Hydrology and Water Resources Engineering	2	1	-	30	70	100	3
2065504	PCC	Applied Geotechnical Engineering	2	1	-	30	70	100	3
2065505	PCC	Reinforced Concrete Structures	2	1	-	30	70	100	3
	OEC	OPEN ELECTIVE 1	2	1	-	30	70	100	3
Professional Elective – I			3		-	30	70	100	3
2065506A	PEC	Remote Sensing and GIS							
2065506B		Traffic Engineering and Transportation Planning							
2065506C		Waste Water Engineering							
2065506D		Ground Improvement Techniques							
2065506E		Advanced Structural Analysis							
2065507P	PCC	Environmental Engineering Lab	-	-	3	50	50	100	1.5
2065508P	PCC	Geotechnical Engineering Lab	-	-	3	50	50	100	1.5
2065509	SC	Total station lab	1		2	50	50	100	2
		Summer internship evaluation(Community Service) (done after 4th sem)	0	0	0	-	100	100	**1.5**
Total credits									**21.5**

Title of the Program	L	T	P	C
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**1**	**0**	**4**

HYDROLOGY AND WATER RESOURCES ENGINEERING

Subject code: 2065501	**Credits : 3**
Instruction : 2 Lecture & 1 Tutorial /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Geotechnical Engineering-I, Environmental Engineering -I

Course Objectives:

The objective of this course is to:

1. Extend the concept of hydrology as a prerequisite for the irrigation engineering and for design of hydraulic structure.
2. Illustrate the distribution of water flow and planning of a reservoir.
3. Develop distribution systems for canal irrigation, design of unlined and lined irrigation canals design sediment problems associated with canal.

Course Outcomes

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

1. Explain various components of hydrologic cycle that affect the movement of Water in the earth.
2. Develop runoff and hydrograph estimation and apply into engineering practices
3. Illustrate the concepts of movement of ground water beneath the earth.
4. Interpret necessary investigations required for planning of a reservoir.
5. Categorize the basic requirements of irrigation and various irrigation techniques, requirements of the crops.

UNIT I

INTRODUCTION TO HYDROLOGICAL ASPECTS: Hydrology in water Resources Planning, Importance of Precipitation, Types, Measurement of rainfall. Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data Consistency of rainfall record, Double mass curve, Depth – Intensity, Depth-Area-Duration curves, frequency of point rainfall Intensity-Duration-Frequency (IDF) curves.

UNIT II

RUNOFF AND HYDROGRAPHS: Infiltration, Evaporation and Evapotranspiration Pan Evaporation; Runoff – Factors affecting Runoff, Methods of determination of Runoff, Hydrograph Analysis, Base flow separation, Unit Hydrographs, Hydrograph of different durations, Applications of Unit Hydrograph.

UNIT III

GROUND WATER FLOW: Definitions, subsurface distribution of water, ground water movement; Darcy's law; Permeability; Well hydraulics – Steady flow in different types of aquifers and wells; Determination of hydraulic properties of aquifer; Well losses; Specific capacity of well; well shrouding and well development.

UNIT IV

RESERVOIR PLANNING AND FLOOD ROUTING: Types of reservoir – Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir; Purpose of reservoir, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity; Reservoir Losses – Measures to reduce evaporation loss in reservoirs sedimentation, Control of reservoir sedimentation. Flood Routing – Hydraulic and Hydrologic routing, Channel and reservoir routing, Channel routing by Muskingum method (Concept only).

UNIT V

IRRIGATION: Definition of irrigation, Types of irrigation systems-methods of application of irrigation water –Irrigation efficiencies – Soil moisture – Irrigation relationship – Estimating depth and frequency of irrigation on the basis of soil moisture regime concept; Water requirements of crops, Duty, Delta and Base period – Their relationship, Factors affecting duty and methods of improving duty, Water logging, Assessment of irrigation water charges. Canals-Classification of irrigation canals

TEXT BOOKS

1. Punmia, B.C. and Lal Pande B.B. (1992), "Irrigation and Water Power Engineering",16th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 12th edition.
2. Garg, S.K. (1999), Irrigation Engineering and Hydrology Structures, Khanna Publishers, Delhi, 14th Edition.

REFERENCES

1. Modi, P.N. "Irrigation, Water Resources and Water Power Engineering", 6 th Edition.Standard Book House, Delhi, 2004.
2. Jayarami Reddy, P. "A Text book of Hydrology", 3 rd Edition Laxmi Publication, Delhi.1999.
3. Subramanya, KEngineering Hydrology, Tata-Mc Graw Hill Publishing, Delhi, 1 st Revised Edition,1994.

APPLIED GEOTECHNICAL ENGINEERING

Subject code: 2065504	**Credits : 3**
Instruction : 2 Lecture & 1 Tutorial /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Geotechnical Engineering-I

Course learning objectives:

The objective of this course is to:

1. Ability to analyze and interpret results for various Slope stability analysis.
2. Provide civil engineering students with a basic knowledge of Foundation engineering practice.
3. Ability to understand, formulate, and solve the problems related to Foundation engineering.

Course Outcomes

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

1. Analyze soil exploration.
2. Analyze finite and infinite slopes.
3. Analyze the Earth pressure theories.
4. Estimate the bearing capacity and settlement of shallow foundations.
5. Estimate load carrying capacity of piles and theory aspects of well foundations.

UNIT I

Subsoil Exploration: Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, bore logs, planning of exploration programs, report writing.

UNIT II

Stability Analysis of Slopes: Infinite and Finite Slopes, Stability Analysis of Infinite Slopes, different factors of safety, Types of Slope Failures. Stability Analysis of Finite slopes – Swedish Circle method, Friction Circle method, Taylor's stability number. Retaining walls: Types and Stability Analysis.

UNIT III

Earth Pressure: Types of Earth pressure, Rankine's Active and passive earth pressure, Smooth Vertical wall with horizontal and inclined backfills. Coulomb's wedge theory, Culmanns and Rebhanns graphical method for active earth pressure.

UNIT IV

Bearing Capacity: General and local shear failures, Terzaghi's bearing capacity equations, Factors affecting bearing capacity of Soil, IS Code method for Bearing capacity of footings, Bearing capacity from plate load tests. Shallow Foundations: Factors effecting locations of foundation, choice of type

of foundations, Settlement Analysis: Causes of settlement, Computation of settlement, allowable settlement. Measures to reduce settlement.

UNIT V

Pile Foundations: Types, Construction, load carrying capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction, under reamed pile.

Caissons: Types of caissons, pneumatic caissons, Different shapes of well foundations, Relative advantages and disadvantages, Different Components of well and their function, Grip length, problems in well sinking and remedial measures.

TEXT BOOKS:

1. Gopal Ranjan and A.S.R. Rao, "Basic and Applied Soil Mechanics", 3rd edition, New age international, 2016.
2. K.R. Arora, Soil Mechanics and Foundation Engineering 7th re print edition, Standard Publisher 2019.

REFERENCES:

1. Varghese. P.C., "Foundation Engineering", 1st Edition, Prentice Hall of India, 2005.
2. B.M. Das, Principles of Foundation Engineering, 7th Edition, Cengage Learning, 2011.
3. Bowles, "Foundation analysis and design" 5th edition, Mc Graw Hill,

REINFORCED CONCRETE STRUCTURES

Subject code: 2065505	**Credits : 3**
Instruction : 2 Lecture & 1 Tutorial / week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Course Objectives:

1. The objective of this course is:
2. Learn the recommendations of IS: 456-2000, loading standards as per IS 875
3. Understand the concepts of Working Stress Method, Ultimate Load Method and Limit State Method
4. Learn how to design various types of columns, beams, slabs and footings

Course Outcomes:

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

1. Design singly reinforced beams, doubly reinforced beams
2. Analysis of flanged beams and shear, torsion and bond reinforcement in beams.
3. Design of one way and two way slabs, Stair case.
4. Design of columns.
5. Design of footings.

UNIT – I

Loads on structure – Codes of practice, Grades of steel and cement, Stress-Strain characteristics of concrete and steel**.**

Introduction to Limit State Design: Concepts of limit state design- Characteristic loads- Characteristic strength -Partial loads and Material Safety factors- Representative stress- Strain curves- Assumptions in limit state design – Stress block parameters – Limiting moment of resistance. Reinforcements. Practical requirements of an RCC beam – size of the beam – concrete cover – effective depth – spacing of reinforcement.

Singly and Doubly Reinforced Beams:

Design for Flexure Introduction – Respective IS Code Provisions. Singly reinforced rectangular beams – Derivation of formulae – General values – Types of problems – Failure of RCC beams in flexure. Doubly reinforced Beams: Derivation of formulae – Types of problems –Use of design aids

Design of simply supported rectangular beam Design of cantilever beam

UNIT – II

Analysis of flanged beam sections: Position of neutral axis, moment of resistance of T and L beams.

Shear, Torsion and Bond: Design for Shear, Torsion and Bond Introduction – Respective IS Code Provisions. Design of rectangular and flanged beam sections for shear – Design examples on simply supported and cantilever beams. Limit state design of beams subjected to uniform Torsion on simply supported beams. Concept of bond, end anchorage and development length in beams with examples.

UNIT – III

Slabs: Introduction – Respective IS Code Provisions. Design of simply supported one way slabs with U.D.L. Design of cantilever slab with U.D.L. and end concentrated load. Design of simply supported two way slab using IS code method. Design of Restrained two-way slabs using IS code method.
Design of a dog-legged stair case – Flight slab supported on opposite beams / walls.

UNIT – IV

Columns: Introduction – Respective IS Code Provisions. Short and Long columns – Reinforcement requirements – Minimum eccentrically – Assumptions in design – Interaction charts. Design of short axially loaded tied columns. Design of short axially loaded spiral columns Design of short eccentrically loaded columns with Uniaxial Bending Design of short eccentrically loaded columns with biaxial bending.

UNIT – V

Footings:

Introduction – Types of footings, Respective IS Code Provisions. Design of axially loaded square type pad footings. Design of axially loaded Rectangular type pad footings.
Design of axially loaded square type sloped footings. Design of axially loaded Rectangular type sloped footings.

TEXT BOOKS :

1. Varghese, P.C., **"**Limit State Design of Reinforced Concrete", Prentice Hall of India Private Limited", 2nd Edition, New Delhi, 2009
2. Reinforced Concrete Limit state Design – A.K. Jain, 7th edition, Nem Chand and Brother Roorkee, 2012

REFERENCES

1. Pillai, S.U., & Devdas Menon, "Reinforced concrete design", Tata McGraw Hill. New Delhi, (3rd Edition, 2009)
2. Ramamrutham, S., "Design of Reinforced Concrete Structures", Dhanpat Rai Publishing Company (P) Ltd. New Dlehi(17th Edition, 2016)
3. R.C.C Design – Unnikrishna Pillai and Vasudeva Menon, 3rd edition, McGraw Hill.
4. B.I.S. 456-2000 "Code of practice for Plain and Reinforced Concrete"

PE I: REMOTE SENSING AND GIS

Subject code: 2065506A	**Credits : 3**
Instruction : 3 Lecture / week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Surveying

Course Objectives:

1. Learn about the principles of remote sensing and Electromagnetic radiations
2. Know about satellites, satellite parameters and satellite sensors.
3. Learn about the image interpretation and post processing techniques.
4. Study about GIS and various data models.
5. Applications of remote sensing and GIS in civil engineering projects

Course Outcomes

1. Recognize principles of remote sensing and GIS process.
2. Identify digital data in different formats.
3. Manipulate various image interpretation techniques and image classification techniques.
4. Categorize RS and GIS data integration and overlay functions.
5. Illustrate various applications of remote sensing and GIS in civil engineering projects.

Unit I

Remote Sensing: Principle - Electro-magnetic energy, spectrum - EMR interaction with atmosphere – Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials, Sensors- types and characteristics, passive sensor, active sensor, platforms-airborne remote sensing, space borne remote sensing, data pre-processing, Important Remote Sensing Programmes.

Unit II

Geographic Information System: Introduction, key components, spatial data, raster data models, vector data models, raster versus vector, data input methods and editing, non-spatial data, map projections.

Unit III

Image analysis: Elements of visual interpretations, digital image processing- digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, image Preprocessing, image rectification, image enhancement, image classification,

Unit IV

GIS analysis: Digital elevation models, RS and GIS data integration, overlay Function- vector Over lay operations, raster over lay operations, arithmetic operators, comparison and logical operators,

conditional expressions, overlay using a decision table, some neighborhood operations.

Unit V

RS and GIS applications in Civil Engineering: Land cover and land use, urban applications, Hydrological studies, flood zone delineation and mapping, groundwater prospects and recharge, reservoir storage estimation, water management, irrigation planning, drought monitoring, environmental impact assessment and other watershed studies.

TEXT BOOKS:

1. Thomas M. Lillesand and Ralph W. Kiefer, Remote sensing and image interpretation, John Wiley and Sons Inc, 5th edition,
2. Textbook of Remote sensing and GIS by M Anji Reddy, BS Publications/BSP Books, 4th Edition

REFERENCES:

1. Joseph, George, (2003), Fundamental of Remote Sensing, 2 nd Edition, University Press (India) Pvt. Ltd,Orient Longman Pvt. Ltd., Hyderabad, India .
2. C.P.Lo and Albert K.W.Yeung 2005 "Concepts and Techniques of Geographic Information Systems". Prentice Hall of India, New Delhi.
3. Burrough, Peter A. and Rachael McDonnell, 1998, 'Principles of Geographical Information Systems' Oxford University Press, New York.

PE-I: GROUND IMPROVEMENT TECHNIQUES

Subject code: 2065506D	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Geotechnical engineering, Foundation engineering

Course Objectives:

The objective of this course is to:

1. Classify the different in situ densification methods.
2. Design the Stone Columns.
3. Understand the grouting technology and principles of reinforced earth walls.
4. Identify the various types of Geo Synthetics.
5. Understand the various stabilization Techniques.

Course Outcomes:

At the end of the Course, the Student will be able to:

1. Identify dewatering techniques according to field conditions
2. Design Stone columns for improving soils.
3. Recommend grouting methods and design principles of reinforced earth walls.
4. Explain applications of Geo Synthetics.
5. Understand various soil stabilization techniques.

UNIT I

In-situ densification Methods

Granular Soils: Introduction of Vibration at the ground surface, Impact at the Ground surface, Vibration at depth, Impact at depth.

Cohesive soils: Introduction, preloading or dewatering, drain walls, sand drains, sand wicks, geo drains/band drains, stone and lime columns, and forced vacuum preconsolidation, thermal methods.

UNIT II

Stone columns**,** Introduction, construction practice, design principles (theory), Vibrofloatation techniques and dynamic replacement.

UNIT III

Grouting and Reinforced Soil

Grout injections, suspension and solution grouts, grouting equipment and methods, Applications. Reinforced Soil: Principles, components of reinforced soil, factors governing design of reinforced soil walls.

UNIT IV

Geo synthetics

Geotextiles-types of geotextiles; Functions and their application, tests for Geotextile materials, Geogrids and Geo membranes- functions and applications.

UNIT V

Stabilization

Mechanical stabilization: Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization: Types of admixtures, mechanism, factors affecting, design of mixtures, construction methods.

TEXT BOOKS:

1. Purushothama Raj. P, "Ground Improvement Techniques", 2nd ed., Laxmi Publications (p) Ltd., New Delhi, 2016.
2. Satyendra Mittal, "An Introduction to Ground Improvement Engineering", 1st edition, Medtech, 2013

REFERENCES:

1. Nihar Ranjan Patra, Ground Improvement Techniques, 1st edition, 2012, Vikas publishing house.
2. Vikas Chandra Chattopadhyay, Joyanta maity, Ground Improvement Techniques, 1st edition, PHI learning Publisher, 2017
3. Highway engineering, Khanna S.K. and Justo C.E., Nem chand Pulications.

PE-I: ADVANCED STRUCTURAL ANALYSIS

Subject code: 2065506 E	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Course Objectives:

1. Students understand the basics configuration and classification of structures.
2. Solve indeterminate structures.

Course Outcomes:

Students will be able to

1. Analyze indeterminate trusses
2. Analyze indeterminate frames
3. Analyze two and three hinged arches and its application.
4. Analyze suspension bridges with stiffening girders.
5. Analyze beams and trusses using matrix methods

UNIT-I

Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) external redundant supports (b) internal redundant members using (i) method of consistent deformation of unit load method (ii) Castigliano's theorm – II.

UNIT-II

Analysis of statically indeterminate frames (single storey, single bay portal frames only) using (i) slope-deflection method (ii) moment distribution method (iii) Kani's method,

UNIT-III

Arches: Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Effects of rib-shortening and temperature change.

UNIT-IV

Suspension bridges: Stresses in loaded cables with supports at the same and different levels. Length of cable; Two and Three hinged stiffening girders.

UNIT-V

Introduction to matrix methods of structural analysis (Very elementary treatment only) Static indeterminacy, Kinematic indeterminacy, Stiffness and flexibility method for two span continuous beams only – Truss with 3 supports and 7 members.

Text Books:

1. Statically indeterminate structures – C.K. Wang, Mc Graw Hill Education PVT.LTD
2. Mechanics of structures Vol. II- S.B.Junnarkar and Dr.H.J.shah, Charotar Publishing House.
3. Structural analysis – Devdas Menon, Narosa Publishing House PVT.LTD

Reference Books:

1. Basic structural Analysis- C S Reddy McGraw Hill Education PVT.LTD
2. Structural analysis – A matrix approach – G.S. Pandit and S.P. Gupta.
3. Indeterminate Structures by R. l. Jindal

PE-I: WASTE WATER ENGINEERING

Subject code: 2065506C	**Credits : 3**
Instruction : 3 Lecture/week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Water supply Engineering

Course Objectives:

The objective of this course is to:

1. Understand and explain the role of sanitation in the urban water cycle and its relation to public health and environment.
2. Develop rational approaches towards sustainable wastewater management via pollution prevention, appropriate treatment, and resource recovery and re-use at both centralized and decentralized levels.
3. Understand the relevant physical, chemical, and biological processes and their mutual relationships within various sanitation components;
4. Define and critically analyse, assess, and evaluate various urban drainage and sewerage
5. Contribute to the development of innovative approaches to the provision of adequate and sustainable sanitation services in developing countries and countries in transition.

Course Outcomes:

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

1. Understanding of various sewerage systems and their suitability
2. Understand pumping systems and various drainage systems for communities.
3. Determine waste water quality parameters and their characteristics.
4. Identify and design the aerobic treatment process of waste water.
5. Design an anaerobic treatment process of waste water and sewage disposal methods.

UNIT I

Introduction to sanitation: Systems of sanitation , relative merits & demerits , collection and conveyance of waste water, Sewerage-classification of sewerage systems, Estimation of sewage flow and storm water drainage, fluctuations ,types of sewers, Hydraulics of sewers and storm drains, materials for sewers- appurtenances in sewerage - cleaning and ventilation of sewers-safety of sewer workers.

UNIT II

Pumping of wastewater – Pumping stations, location, components parts, types of pumps and their suitability with regard to wastewaters. House Plumbing- plumbing systems of drainage, sanitary fittings and other accessories, single stack system, one pipe and two pipe systems.

UNIT III

Bacteriology of sewage: Sewage characteristics – Physical, Chemical and Biological Examination–

decomposition- cycles of decomposition-Sampling and analysis of wastewater-BOD-COD-Treatment of sewage-Primary treatment: Screens-grit chambers, grease traps, floatation, and sedimentation, design of primary and pretreatment units.

UNIT IV

Secondary treatment: Aerobic and anaerobic treatment process-comparison. Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Attached Growth Process: Trickling Filters – mechanism of impurities removal, classification, filter problems, design and operation-recirculation.

UNIT V

Anaerobic Processes: Septic Tanks and Imhoff Tanks-Principles and Design-Bio solids (Sludge): Characteristics- thickening, digestion, drying, sludge treatment and disposal. Miscellaneous methods-Oxidation ponds, Oxidation ditches, Aerated Lagoons, RBCs, Fundamentals of UASB.

TEXT BOOKS

1. S.K.Garg, Sewage disposal and Air Pollution Engineering, Khanna publications, revised 10 th edition.
2. Dr. P.N. Modi , Sewage treatment disposal and waste water engineering, 17th edition, Raj sons publication, 2020

REFERENCES

1. Metcalf & Eddy ,Wastewater Engineering Treatment and Reuse, 3rd edition Tata McGraw-Hill edition
2. Peavy, H.S., Rowe, D.R., and Tchobanoglous, H.S., Rowe, D.R., and Tchobanoglous, G. McGraw-Hill international edition, 1985.
3. B.C Punmia , Jain and Jain, Waste water Engineering, Lakshmi publications , 2nd edition re print, 2005.

PE-I: TRAFIC ENGINEERING AND TRANSPORTATION PLANNING

Subject code: 2065506B	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Traffic Engineering

Course Learning Objectives:

The objective of this course is to:

1.Necessity and importance of Transportation planning.

2. Understand types of traffic studies.

3. Choose traffic regulations

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

1. Estimate basic characteristics of traffic stream
2. Conduct traffic studies and analyze traffic data
3. Design traffic signal systems
4. Propose the traffic control devices
5. Transport Planning

UNIT-I

Introduction, Importance of Traffic Engineering under Indian conditions,
Traffic characteristics, The Road user and the vehicle. Traffic Surveys: Speed, Journey Time & Delay Surveys, methods of measuring Spot speeds, methods of measurement of Running Speed and Journey Speed, moving observer method, Traffic volume studies – Types of Counts, Automatic devices, Presentation of traffic volume study data.

UNIT-II

Origin & Destination Survey – Need for O – D surveys, Survey methods, Presentation of Results, Parking Surveys – Types of Parking surveys, Parking Space Inventory, Cordon Count, Questionnaire type parking usage Survey – Design of parking facility. Analysis and Interpretations of Traffic Studies.

UNIT-III

Statistical methods for Traffic engineering - Mean, Standard Deviation and Variance. Traffic flow characteristics, Traffic Capacity studies – factors affecting practical capacity, Design Capacity and Level of Service, Passenger Car Unit. Accident Studies – Accident studies and records, Accident investigations, Measures for reduction in accident rates, Traffic Safety.

UNIT-IV

Relationship between Speed, Travel time, Volume, Density and Capacity. Traffic Operations – Traffic regulation, Traffic Control Devices, Intersections – Intersection At Grade – Channelized and Unchannelized intersections, Rotary intersections, Grade – separated Intersections, Grade – separated structures.

UNIT-V

Transport Planning– Inter-relationship between Land Use and Traffic, Systems Approach to Transport Planning, Stages in the Transport Planning Process, Inventory, Survey and Analysis of existing Conditions, Trip Generation, Trip Distribution, Trip Assignment**.**

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Text books:

1.Highway Engineering By S.K. Khanna & C.E.G.Justo
2.Traffic Engineering and Transport Planning By L.R. Kadiyali

ENVIRONMENTAL ENGINEERING LABORATORY

Subject code: 2065309 P	**Credits : 1.5**
Instruction : 3 Practical / week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Pre-requisites: Chemistry, Environmental Engineering

Course Objectives:

The objective of this course is:

1. Tests to identify the physical properties of water.
2. Tests to identify the pH and conductivity of water.
3. Tests to identify concentration of acidity and alkalinity of water.
4. Tests to identify COD and BOD of water.

Course Outcomes:

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

1. Determine physical properties of water.
2. Determine the turbidity and hardness of water.
3. Determine COD and BOD of water.
4. Estimate concentration of acidity and alkalinity and chloride content of water

List of Experiments:

1. (a) Determination of pH value of a given sample .
   (b) Determination of Conductivity of a given sample.
2. (a) Determination of Turbidity of a given sample.
   (b) Determination of optimum dosage of coagulant by using Jar Test.
3. Determination of Hardness of a given sample.
4. Determination of Acidity of a given sample.
5. Determination of Alkalinity of a given sample.
6. Determination of Available Chlorine & Residual Chlorine of a given sample..
7. Determination of Total Solids : Settleable Solids : Suspended solids, dissolved solids of a given sample.
8. Determination of Dissolved Oxygen(D.O) of a given sample.
9. Determination of Biological Oxygen Demand(B. O. D.) of a given sample.
10. Determination of Chemical Oxygen Demand(C.O.D) of a given sample.
11. Determination of Chlorides of a given sample.

References:

1 Lab Manual, ISO 14001" *Environmental Management*," Regulatory Standards for Drinking Water and Sewage disposal

2 Clair Sawyer and Perry McCarty and Gene Parkin, "*Chemistry for Environmental Engineering and Science*" , McGraw-Hill Series in Civil and Environmental Engineering

GEOTECHNICAL ENGINEERING LAB

Subject code: 2009409P	**Credits : 1.5**
Instruction : 3 Practicals / week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Course Objectives:

The objectives of this course are to make the student aware of the tests to identify the:

1. Soil types by using index properties.
2. Characteristics of compaction.
3. Densities and permeability of soils.
4. Soil shear strength.
5. Characteristics of consolidation and compression of the soils.

Course Outcomes:

At the end of the Course, the Student will be able to:

CO1 Determine index properties of Soils and Classify Soils.

CO2 Determine the densities by using different methods.

CO3 Determine the shear strength parameters.

CO4 Compute the permeability, Swelling and compression characteristics of soils.

Experiments

1. Specific gravity by pycnometer/density bottle method.
2. Grain size analysis.
3. Atterberg limits.
4. Field density by Core Cutter and Sand replacement method.
5. Relative density.
6. Permeability of soil.
7. IS light compaction.
8. Unconfined compression test.
9. Direct shear test.
10. Vane shear test.
11. Triaxial compression test.
12. Consolidation test.
13. Differential free swell and swell pressure test.

References:

1. Braja M. Das "*Soil mechanics laboratory manual*"Oxford University Press, 2009, Seventh Edition.
2. IS 2720 all parts, IS 1498 (1970) and other relevant IS codes, special publications and handbook

TOTAL STATION LAB

Subject code: 2065308 P	**Credits : 1.5**
Instruction : 3 Practical / week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Pre requisite: Knowledge of Surveying Practice – I

Course Objectives:

1. Develop an ability to apply knowledge of mathematics, Engineering to understand the measurement techniques and modern equipment used in land surveying.
2. Develop skills in using modern surveying instruments.

Course Outcomes:

1. Develop skills in using Total Station instrument and analyse data.
2. Prepare plans using Total Station Instrument.

List of Experiments

1.Introduction and to set up the Total Station Instrument.
2. Use of Total station to measure Horizontal Distance.
3. Use of Total station to measure Horizontal Angle.
4. Use of Total station to measure Vertical Angle.
5.Determination of area using total station.
6.Traversing using total station.
7.Contouring using total station.
8.Determination of remote height using total station.
9.Stake out using total station.
10.Distance, gradient, difference in height between two inaccessible points using total station

REFERENCES:

1. K R Arora ,"*Surveying*" (Vol - 1,2&3), 9th Edition, Standard Book House, New Delhi,2008.
2. M James Anderson and Edward M.Mikhail,"*Surveying theory and practice"*, 7th Edition, McGraw Hill, 2001.

Semester VI (Third year)

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits C
			L	T	P				
2065601	PCC	Estimation and Quantity Surveying	3	-	-	30	70	100	3
2065602	PCC	Design of Steel Structures	2	1	-	30	70	100	3
2065603	PCC	Prestressed concrete structures	2	1	-	30	70	100	3
Professional Elective – II			3	-	-	30	70	100	3
2065604A	PEC	Advanced Concrete Structures							
2065604B		Watershed Management							
2065604C		Railway, Harbour and Tunnel Engineering							
2065604D		Solid Waste Management							
2065604E		Geoenvironmental engineering							
2065606	OEC	Open Elective-II: Introduction to civil engineering	2	1	-	30	70	100	3
2065607P	PCC	Transportation Engineering Lab	-	-	3	50	50	100	1.5
2065608P	PCC	Concrete Lab	-	-	3	50	50	100	1.5
2065609P	PCC	Computer Applications in Civil Engineering Lab	-	-	3	50	50	100	1.5
20656010	SC	Structural detailing Lab	0	0	4	50	50	100	2
Total Credits									**21.5**
Industrial Internship (2 months)									

Title of the Program	L	T	P	C
Honors/Minor Courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**3**	**1**	**0**	**4**

ESTIMATION AND QUANTITY SURVEYING

Subject code: 2065601	**Credits : 4**
Instruction : 3 Lecture/week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Building Materials and Building Construction, Building Planning and Drawing

Course Objectives:

The objective of this course is to:

1. Learn how to measure different items of work and specifications
2. Learn detail estimation of the building
3. Estimate the Earthwork, cost analysis and valuation of the building.

Course Outcomes:

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

1. Compare different types of estimates and units of measurements.
2. Analyse the specifications of items and rates of different items of work
3. Estimate the quantities and evaluate the cost for different types of buildings by long wall and short wall method and centre line method.
4. Estimate the quantities of earthwork for road works.
5. Analyse valuation and bar bending schedule for various buildings.

UNIT-I

Introduction: Standard units, Units of measurement of different items of work. Meaning of estimating. Errors in estimation, Different types of estimates. Contingencies and related terms in the estimate, different types of approvals. Plinth area and related terms used in the estimation of various structures, rules and methods of measurements of different works.

UNIT-II

Specializations: Meaning, purpose, types of specializations, Method of preparation of specification, general specification, detailed specifications of different items of buildings and other structures – Rate analysis – Data sheet for materials and various items of work in buildings and other structures, schedule of rates, abstract estimate of buildings.

UNIT-III

Detailed estimate of buildings: Different items of work in building; Principles of taking out quantities, detailed measurement form; long wall and short wall method of building estimate, Centre line method of building estimate. Estimate of RCC building, sloped roof buildings; G.I. and A.C. Sheet, Detailed estimate of different types of doors and windows, electricity and

water supply. Sanitation works etc.

UNIT-IV

Estimate of earth work; different formulae for calculations, estimate of metal road, Tar road, concrete road, Railway tract, Estimate of culverts and bridges etc.

UNIT-V

Valuation of buildings; purpose, different method of building valuation; different terms used in valuation and their meaning, bar bending schedule.

Text books:

1. B.N. Dutta, Estimating and Costing in Civil Engineering, 27th revised edition, UBS Publishers and distributers.
2. M. Chakraborti,Estimation, Costing, Specifications and Valuation in civil Engineering, M. Chakraborti. 29th revised edition, 2006

REFERENCES

1. G.S. Birdie, Textbook of estimating and costing, Danpath Rai Publications, 2014.
2. D.D. Kohli and R.C. Kohli, Textbook on Estimating, Costing and Accounts, S Chand, 2013.

DESIGN OF STEEL STRUCTURES

Subject code: 2065602	**Credits : 3**
Instruction : 2 Lecture & 1 Tutorial /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

COURSE OBJECTIVES:

The objective of this course is to:

1. Familiarize Students with different types of Connections and relevant IS codes.
2. Equip student with concepts of design of tension members.
3. Understand Design Concepts of compression members.
4. Appraise the design concepts of Beams.
5. Familiarize students different types of column bases and their design.

COURSE OUTCOME:

At the end of the course students will be able to

1. Design of connections
2. Design of tension members.
3. Design of compression members
4. Design of Beams
5. Design of column bases

UNIT I

CONNECTIONS:

Fundamental Concepts of limit state design of structures, Different types of rolled steel sections available to be used in steel structures. Stress – Strain relationship for mild steel. Behavior of bolted joints, Design strength of ordinary black bolts, high strength friction grip bolt, Types of welds and weld joints weld specifications Design of welded joints subjected to axial load, Eccentric welded connections.

UNIT II

TENSION MEMBERS:

Types of tension members, slenderness ratio, modes of failure, factors affecting strength of tension members, General design of members subjected to direct tension, design and strength of angle for tension with bolting and welding, Lug angles.

UNIT III

COMPRESSION MEMBERS:

Possible failure modes, classification of cross-section, behavior of compression members, Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members, Design of built up compression members made of channel, I sections and angle connecting system – Design of lacings and battens.

UNIT IV

BEAMS:

Beam types, section classifications, lateral stability of beams, Allowable stress in bending, Shear and Bearing stresses, Effective length of compression flange, Laterally supported and unsupported beams.

UNIT V

COLUMN BASES:

Design of slab base and gusset base. Column bases subjected to axial force and moment.

TEXT BOOKS

1. S.K. Duggal, Design of steel structures, 3rd edition, Tata Mcgraw Hill, New Delhi

REFERENCES

1. N.Subramanian, Steel Structures Design and Practice, 6th edition, Oxford University Press, 2013.
2. S.S. Bhavikatti, Design of steel structures by Limit State Method as per IS: 800-2007, 3rd edition, IK International Publishing House Pvt.Ltd

IS Codes:

1. Indian Standard code of Practice for general Construction Steel, IS:800 – 2007
2. Steel Tables.

PRESTRESSED CONCRETE STRUCTURES

Subject code: 2065705	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre- requisites:
Strength of materials, concrete technology, reinforced concrete structures

Course Learning Objectives:
The objective of this course is to:

1. Explain different types of pre stressing systems
2. Apply IS code provisions
3. Design of members for flexure
4. Design of end block using Guyon method

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

1. Explain the concept of tensioning system
2. Analyse pre-stress member
3. Analyse losses in pre-stressed member
4. Design the flexural members
5. Analyse end block

SYLLABUS:

UNIT-1
PRESTRESSING SYSTEMS:
Basic concepts of pre-stressing, need for high strength steel and concrete, advantages of pre-stressed concrete, Materials for pre-stressed concrete - high strength concrete and high strength steel.
Pre-stressing systems- Pre-tensioning and Post tensioning, Types of post tensioning system - (1) Fressinet System (2) Gifford Udall (3) Magnel Blatan System; Tensioning devices, anchoring devices

UNIT-2
ANALYSIS OF SECTION FOR FLEXURE:
Analysis of pre-stress members, assumptions, pressure, or thrust line concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

UNIT-3
LOSSES OF PRESTRESS:
Losses of pre-stress in pre tensioned and post tensioned member due to various causes like elastic shortening, shrinkage, creep, friction, relaxation of steel, slip in anchorage etc. I.S. Code provisions

UNIT-4

DESIGN OF SECTIONS FOR FLEXURE AND SHEAR:
Limit state design of flexural members, stress, I.S. code provisions, design of symmetrical beams, design of pre-stressed concrete poles, design for shear, I.S. code provisions.

UNIT-5
DESIGN OF END BLOCK:
Transfer of prestress in pre-tensioned members, Transmission length, bond stress, Transverse tensile stress, End Zone reinforcement, flexural bond stress, I.S. Code Provisions.
Anchorage zone in post tensioned members, stress distribution in end block, Guyon's method of approach of analysis of end block (Not more than 2 cables).

Text Book:

1) Prestressed Concrete by N.Krishna Raju, Mc. Graw Hill Publication, 4th Edition, 2007

References:
1) Prestressed Concrete by N.Rajagopalan, Narosa Publication, 2nd Edition, 2006
2) Design of reinforced concrete structutes by Ramamrutham, Dhanpatrai publications, 17th Edition, 2018.

IS Codes:
IS 1343-2012

PE2: ADVANCED CONCRETE STRUCTURES

Subject code: 1965604 A	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Course objectives:

1. Learn different types of retaining wall and design of retaining walls.
2. Determine the Stress in concrete and steel in water tanks and design of water tanks
3. Learn basic concept and design of bridges.
4. learn different types of piles and design of piles and pile caps
5. Brief explanation basic concepts of prestressed concrete.

Course Outcomes:

1. Design of cantilever & counterfort retaining walls.
2. Analyses and design of various parts of underground and overhead water tanks.
3. Analyses and design solid slab and T-beam bridges.
4. Design of piles and pile caps
5. Summarize the basic concepts of prestressed concrete.

Unit – I

Cantilever Retaining Walls: Introduction – Types of retaining walls – Active and passive earth pressure – Design principles of cantilever retaining walls with horizontal backfill – With horizontal backfill and traffic load – With sloping backfill.

Unit – II

Counterfort retaining walls: Design principles of Counterfort retaining walls with horizontal backfill – With horizontal back fill and traffic load – With sloping backfill- Reinforcement detailing and bar bending schedule.

Unit – III

Water Tanks: Stress in concrete and steel in water tanks, Modular ratio, Impermeability Requirements, Design of on ground and underground square, rectangular and circular tanks

Unit – IV

Piles and pile caps

Pile design - design of bored castin-situ and precast piles only; pile cap-design of 2 pile cap and 3 pile caps

Unit – V

Prestressed Concrete

Prestresed Concrete – Reinforced Concrete Versus Prestressed Concrete. – Prestressing Systems

(Fressinet, Gifford Udal, Magnel Blatten) – Prestressing Losses – Steel and Concrete for Prestressing – Homogeneous Beam Concept, limiting eccentricities, Pressure line, Elastic Stress distribution across the depth due to D.L. eccentric prestress and L.L.

Text Books:

1. S.Ramamrutham, Design of reinforced concrete structures, Dhanpath rai Publishing Company, 2016
2. N. Krishnam Raju, Advanced reinforced concrete structures, 3rd edition, CBS Publishers.

REFERENCES

1. Design of reinforced concrete structures by N. Subramanian, Oxford publisher
2. Reinforced concrete structures by Robert Park, Willey India

- I.S 456 – 2000 "Code of practice for Plain and Reinforced Concrete" 4th Revision, Bureau of Indian Standards, New Delhi, April 2007
- Relevant I.S. Codes.

PE2: WATERSHED MANAGEMENT

Subject code: 2065604 B	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Environmental Engineering, Water Resources Engineering-I & Engineering Geology.

COURSE OBJECTIVE:

1. Familiarize on the concept of watershed development.
2. Explain the principles and types of erosion
3. Infer on water harvesting and explain Watershed management
4. Review on land and Eco system management
5. Discuss watershed planning

COURSE OUTCOMES:

1. Understand the concept of watershed development
2. List the principles and types of erosion
3. Classify water harvesting and discuss Watershed management
4. Describe land and Eco system management
5. Summarize watershed planning

UNIT I

INTRODUCTION:

Concept of watershed development, need for watershed development in India, integrated and multidisciplinary approach for watershed management. Characteristics of Watershed: size, shape, physiography, slope, Climate drainage, land use, vegetation, geology and soils, hydrology, socio-economic characteristics, basic data on watersheds.

Unit II

EROSION

Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfall darns, brushwood darn, Gabion.

UNIT III

WATER HARVESTING

Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks

WATERSHEDMANAGEMENT

Participatory watershed Management – run off management – Factors affecting runoff – Temporary and Permanent gully control measures – Water conservation practices in irrigated lands – Soil and moisture conservation practices in dry lands

UNIT IV

LAND AND ECO SYSTEM MANAGEMENT

Land use and land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

Role of ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

UNIT V

WatershedPlanning

Planning principles – collection of data – present land use – Preparation of watershed development plan – Estimation of costs and benefits – Financial plan – selection of implementation agency - Monitoring and evaluation system

Text Books:

1. J. V. S. Murty, "Watershed Management", 2ndEdition, New Age International Publishers, 2013.
2. R.A. Wurbs and WP James, "Water Resource Engineering", 3rdEdition Prentice Hall of India, 2002

References:

1. V.V.N. Murthy and Madan K Jha. "Land and Water Management", 6thEdition, Kalyani Publishers, 2015.
2. D.K. Majumdar, "Irrigation Water Management", 3rdEdition, Prentice Hall of India, 2004.
3. Suresh, R. Soil and Water Conservation Engineering, 5^{TH} Edition, Standard Publishers and Distributors, New Delhi, 2005.

PE-I: RAILWAY, HARBOUR AND TUNNEL ENGINEERING

Subject code: 1965506D	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Pre-requisites: Transportation Engineering

Course Objectives:

The objective of this course is to:

1. Know the basics and design of various components of railway engineering.
2. Study about the types and functions of track, junctions and railway stations.
3. Study about the types and components of dock and harbour.
4. Learn about the Techniques in tunneling

Course Outcomes:

At the end of the Course, the Student will be able to:

1. Illustrate the importance of railway infrastructure planning and design
2. Design of track Geometrics
3. Design and analyze the railway track system
4. Design components of dock and harbour
5. Plan different cross sections of tunnel

UNIT-I

Introduction to Railway Engineering: Historical development of railways in India – Advantages of Railways – Classification of Indian Railways – Permanent way – Components and their Functions.

UNIT-II

Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings, Track Geometric design -Points & Crossings

UNIT-III

Track drainage –Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.

UNIT-IV

Dock & Harbour Engineering: Layout of Port components – Functions Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids.

UNIT-V

Tunnel Engineering: Alignment of tunnels – Cross-section of tunnels – Construction methods of Tunnels – Tunnel lining – Ventilation – Drainage – Muck disposal.

Text Books:

1. S.C. Saxena & S. Arora "Railway Engineering", 8th Edition, Dhanpat Rai Publications, 2014.
2. R.Srinivasan "Harbour, Dock and Tunnel Engineering", 37th Edition Charotar Publication, 2015.

References:

1. Rangwala "Railway Engineering", 26th Edition, Charotar Publication, 2016.
2. Dr. S.P.Bindra "Dock & Harbour", 5th Edition, Dhanpat Rai Publications, 2015.
3. Rangwala "Railway Bridge and Tunnelling", 2nd Edition, Charotar Publication, 2016.

SOLID WASTE MANAGEMENT

Subject code:	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

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

1. Explain Solid Waste, its types and characteristics, problems due to improper solid waste disposal.
2. Extend the definition of SWM, its generation, collection methods of waste, list guidelines for route layout.
3. Improve the transfer and transport of wastes
4. Define Composting and Incineration, its methods, advantages and disadvantages.
5. Illustrate disposal techniques of SW.

Unit –I

INTRODUCTION: Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

Unit –II

SOLID WASTE MANAGEMENT: Definition- Reduction, reuse, recycling and recovery principles of waste management- Functional elements of Solid Waste management- Waste generation and handling at source- Collection of solid wastes- Collection methods and services- guidelines for collection route layout.

Unit –III

TRANSFER AND TRANSPORT OF WASTES: Transfer station-Processing and segregation of the solid waste- various methods of material segregation.

Unit –IV

PROCESSING AND TRANSFORMATION OF SOLID WASTES: Composting: definition-methods of composting-advantages of composting- Incineration: definition- methods of incineration, advantages and disadvantages of incineration.

Unit –V

DISPOSAL OF SOLID WASTE: Volume reduction, Open dumping, land filling techniques. Landfills: classification-Design and Operation of landfills, Land Farming, Deep well injection.

TEXT BOOKS

1.George Tchobanoglous, Hilary Theisen , Samuel A Vigil, Integrated Solid Waste Management Engineering principles and management issues, M/c Graw hill Education . Indian edition

2.Howard S Peavy, Donald R Rowe and George Tchobanoglous, Environmental Engineering, Tata Mcgraw Hill Publishing Co ltd.,

PE2: GEOENVIRONMENTAL ENGINEERING

Subject code:	**Credits : 3**
Instruction : 3 Lecture /week	Sessional Marks : 30
End Exam : 3 Hours	End Exam Marks : 70

Course Objectives

1. The Course Objectives of this course are:
2. To create awareness about air pollution and its magnitude
3. To emphasize environmental implications of air pollution on all life forms
4. To enhance knowledge on air emission monitoring and control

Course Outcomes

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

1. Define Air Pollution, sources, effects and explain factors influencing air pollution
2. Explain wind effects and estimate pollutants and their behavior
3. Demonstrate knowledge on air pollution effects on life forms and implications of episodes.
4. Apply knowledge of air emissions on monitoring processes
5. Apply knowledge of monitoring equipment in control, reduce and remove air pollutants

UNIT I

Definition of Air Pollution

Air Pollution and its definition – Sources of pollution - Classification of pollutant particulates - Factors influencing air pollution – Location of Industries and Air pollution effects on all life forms.

UNIT II

Spread of Air Pollution

Meteorology – Wind roses – lapses rates – mixing depth atmospheric dispersion – plume behavior accumulation - estimation of pollutants – Effective stack height.

UNIT III

Effects of Air pollution on life forms

Air Pollution effects on human beings, animals, plants and materials – Air Pollution Episodes in India and abroad.

UNIT IV

Air Pollution Monitoring

Need for Air Monitoring - Air emissions and types, Air qualities standards, Ambient air quality monitoring and stack monitoring.

UNIT V

Control of air pollution

Removal of pollutants – particulate and gaseous – Air pollution control equipment such as setting chamber, cyclones, wet scrubbers/collectors, scrubbers, centrifugal scrubbers spray towers, packed beds, electrostatic precipitators, after burners- absorption – adsorption – Diffusion.

Text Books:

1. M N Rao and HVN Rao, Air Pollution McGraw Hill Education, First Edition 2018.
2. Santosh Kumar Garg, Sewage Disposal and Air Pollution Engineering, Revised 33rd Edition Khanna Publishers, 2015

Reference:

1. K.V.S.G. Murali Krishna, Air Pollution Control, Lakshmi Publications, First Edition
2. B.S.N. Raju, Fundamentals of Air Pollution, First Edition, Oxford & I.B.H.
3. T. Shivaji Rao, Elements of Air Pollution and its control., Visalandhra Publishers, Hyderabad.

OPEN ELECTIVE – II INTRODUCTION TO CIVIL ENGINEERING

Course Outcomes

1. Classify and explain the properties and uses of different building and construction materials.
2. Associate with the stress strain diagrams and the relationship between the elastic constants.
3. Define the types and characteristics of soil and rock formations.
4. Illustrate the knowledge on hydrological aspects and water supply systems.
5. Describe various modes of transport and develop an understanding of construction equipment.

SYLLABUS

UNIT-I

Various disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career, Development of various materials of construction and methods of construction, Contributions of eminent Civil Engineers.

Bricks:

Sources and qualities of Brick Earth, Classification of Bricks, general qualities of Bricks as per IS code, tests for good bricks as per IS code, special forms of Bricks and their uses.

Cements:

Natural and artificial cements, types of various artificial cements and their uses. Modern renovation materials- Cement bound, polymer cement bound and pure polymer bound materials, their properties &uses.

UNIT-II

Structural Engineering:

Types of buildings, bridges and Water retaining structures.

Simple stresses and strains:

Types of stresses and strains, Hooke's law, working stress, factor of safety, lateral and volumetric strain, Poisson's ratio, elastic constant and relationship between them, bars of varying cross sections, composite bars, temperature stresses.

UNIT-III

Geology

Formation of soil and rocks, types of soils, rocks and minerals.

Geotechnical Engineering:

Soil structure and clay mineralogy, Basics of Soil Mechanics, rock mechanics; types of foundations. Basics of Tunneling and the methods

UNIT-IV

Hydraulics, Hydrology &Water Resources Engineering:

Fundamentals of fluid flow, basics of water supply systems. Historical evolution of Irrigation in India, Importance of irrigation in agriculture. Classification of dams and Reservoirs.

Environmental Engineering:

Importance and necessity of protected water supply systems, Objectives of protected water supply system, Flow chart of public water supply system, Role of an Environmental Engineer. Components of sewage treatment plants and effluent treatment systems. solid waste management.

UNIT-V

Transportation:

Importance of transportation. Different modes of transportation, Historical development of road construction in India. Classification and layout of roads, Railway stations, ports, harbours and airports.

Equipment and Construction:
Classification of construction works, Construction stages, Construction Equipment: Scraper, Bulldozer, Mixer, Concrete Vibrator, Safety aspects of construction, Aesthetics and quality aspects of construction.

TEXT BOOKS:

1. Duggal K.N, Elements of Environmental Engineering, Revised Edition, S Chand Publication, 2014.
2. Arora K.R, Soil Mechanics and Foundation Engineering, Standard publisher dist., 2009
3. Rangwala, Engineering materials, 17th edition Charotar Publication, 2017
4. K P Subramanian, Highway railways airport and harbor Engineering. SCITECH publisher,2016.

REFERENCE BOOKS:

1. Timoshenko and Young, Elements of strength of materials, 5th Revised edition,Van Nostrand Reinhold Company publication, 2007.
2. Popov, Introduction to Mechanics of Solids by Popov, 1st edition, Prentice-Hall publication, 1968.

TRANSPORTATION ENGINEERING LABORATORY

Subject code:	**Credits : 1.5**
Instruction : 3 Practical /week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Pre-requisites: Transportation Engineering

Course Objectives:

The objective of this course is to:

1. Determine the aggregate properties.
2. Determine the bitumen properties.

Course Outcomes:

At the end of the Course, the Student will be able to:

1. Perform quality control tests on aggregates.
2. Perform quality control tests on Bitumen.
3. Perform bearing capacity test for subgrade.

List of Experments

1. Determine the specific gravity and water content of Aggregate
2. To determine the fineness modulus of the given aggregate sample
3. Find the flakiness index of the given sample of aggregate.
4. Find the elongation index of the given sample of aggregate
5. Determination of angularity number of coarse aggregates.
6. Determine the aggregate crushing value of coarse aggregate.
7. Determine the impact value of the road aggregates.
8. Determine the Los Angeles abrasion value.
9. Determine the soundness value of aggregate.
10. Determine the Specific gravity of given Bituminous material.
11. Determine the consistency and further grading of the given bituminous material.
12. Determine the penetration value of a given bituminous material as per IS: 1206.
13. Determine the softening point of the given sample of bitumen.
14. Measure the ductility of a given sample of bitumen.
15. Determine the flash point and the fire point of asphaltic bitumen
16. Determine the amount of bitumen by Bitumen Extraction test
17. Determine the Marshall stability value of bituminous mix
18. Determine the California bearing ratio of given soil sample.

References:

1. S.K. Khanna Highway material testing, C.E.G. Justo and A. Veeraragavan, Nem Chand & Brothers.

CONCRETE LABORATORY

Subject code:	**Credits : 1.5**
Instruction : 3 Practical / week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Course Objectives:

The objective of this course is to:

1. Tests to identify the physical properties of cement, sand and aggregate.
2. Tests to identify the initial and final setting of cement.
3. Tests to identify workability of concrete.
4. Tests to identify mechanical characteristics of concrete.

Course Outcomes:

At the end of the course Students will be able to

1. Determine physical properties of cement, sand and aggregate.
2. Classify fine aggregate and coarse aggregate as per IS 383
3. Determine workability of concrete.
4. Determine mechanical properties of concrete

List of Experiments

1. Specific gravity and unit weight of cement
2. Specific gravity and unit weight of coarse and fine aggregates.
3. Determination of normal consistency of cement
4. Determination of initial and final setting time
5. Fineness of cement.
6. Determination of compressive strength of cement (for different grades of cement).
7. Bulking characteristics of sand.
8. Sieve analysis of coarse and fine aggregates and classification as per IS 383.
9. Workability tests on green concrete by using: Slump cone, Compaction factor apparatus, Flow table, Vee-Bee Consistometer.
10. Tests on Hardened concrete.
11. Compressive Strength
12. Split tensile strength
13. Modulus of rupture
14. Design of concrete mix by using IS code method (for class work only)
15. Case studies on a) framed structures and b) plate girder bridge

TEXT BOOKS:

1. A.M. Neville, Properties of Concrete, Longman 1995.
2. P.K. Mehta, J.M. Monteiro, Concrete micro-structure, Properties and Materials, Printice Hall INC & McGraw hill, USA.
3. M.S. Shetty, Concrete Technology Theory and Practice, M.S. Shetty, S. Chand & Company Ltd.

COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

Subject code:	**Credits : 1.5**
Instruction : 3 practical /week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Pre-Requisites: Mechanics of Solids, Structural Analysis-I, Structural Analysis-II, Reinforced Concrete Structures

Course Objective:

1. Develop analytical and design skill by using Staad. Pro and ETABS software.

Course Outcomes:

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

1. Analyze and Design the elements of a structure (beams, portal frames) using Staad. Pro.
2. Analyze and Design the elements of a structure (beams, portal frames) using ETABS.

Determination of Shear Force, Bending Moment, Deflection for Different Loading Conditions for a Simply Supported Beam and Cantilever Beam. Analysis and Design of Singly and Doubly Reinforced Beams. Analysis and Design of columns, beams using STAAD. Pro

Determination of Shear Force, Bending Moment, Deflection for Different Loading Conditions for a Simply Supported Beam and Cantilever Beam. Analysis and Design of Singly and Doubly Reinforced Beams. Analysis and Design of columns, beams using ETABS

Application of STAAD Pro/ETABS for the Analysis and Design of various Structural Components of Civil Engineering and Building Frames.

Text Books

1. Computer aided design-Software and Analytical tools by C.S. Krishnamurthy and S. Rajesh, Alpha Science
2. Computer Aided Design in Reinforced Concrete, V.L.Shah, Standard publishers distributors

STRUCTURAL DETAILING LAB

Subject code:	**Credits : 1.5**
Instruction : 3 practical /week	Sessional Marks : 50
End Exam : 3 Hours	End Exam Marks : 50

Pre-requisites: Reinforced concrete structures, Steel structures.

Course Objectives:

The objective of this course is to:

Understand the Detailing and different Codes related.

Course Outcome:

At the end of the Course, the Student will be able to:

1.Illustrate the knowledge on Different Codes related to Detailing.

2.Study Structural Design, give Detailing for different components of Building.

SYLLABUS

1. Study of SP34/IS13920/IS456:2000 for detailing of structural elements.

2. Preparation of working hand sketches and soft drawings using BIM software (Open source/Commercial) for the following-

3.Detailing of

a) Simply supported, Continuous and Cantilever RCC Beams (T-beam and l-Beam)

b) RCC Slabs – (Simply supported, Continuous, One way and two way).

c) RCC Columns –(Tied columns and Spirally reinforced columns)

d) Isolated and combined footings for RC Columns.

4. Preparation of bar bending schedule.

5.Detailing of buildings with respect to Earthquake Resistant Design

6.Study of full set of structural drawing.