LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institute)

DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF INSTRUCTION & EXAMINATION [LR-21]

(W.e.f Academic Year 2022–23)

B.E. V-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U21CE501	PCC	Concrete Technology	2	0	0	2	40	60	3	2
2	U21CE502	PCC	Environmental Engineering	2	0	0	2	40	60	3	2
3	U21CE503	PCC	Structural Analysis-I	3	0	0	3	40	60	3	3
4	U21CE504	PCC	Hydrology and Water Management	3	0	0	3	40	60	3	3
5	------	PEC	Professional Elective-I	3	0	0	3	40	60	3	3
6	------	OEC	Open Elective-I	3	0	0	3	40	60	3	3
Practical/Laboratory Course											
7	U21CE5L1	PCC	Survey Camp	0	0	0	0	0	0	0	1.5
8	U21CE5L2	PCC	Concrete Technology Lab	0	0	3	3	25	50	3	1.5
9	U21CE5L3	PCC	Environmental Engineering Lab	0	0	3	3	25	50	3	1.5
Internship											
10	U21CE5P1	PROJ	Summer Internship (During Summer Vacations after IV Sem)	-	-	-	-	50	-	-	1
Total				16	0	9	25	365	510	--	**21.5**

L:Lecture(Hrs/Wk/Sem) **T**:Tutorial(Hrs/Wk/Sem) **P**:Practical **D**:Drawing(Hrs/Wk/Sem)

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination

PEC: Professional Elective **PCC**: Program Core **PROJ:** Project

CE: Civil Engineering

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment

Course Code	Course Title						Core/Elective
U21CE501	**CONCRETE TECHNOLOGY**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Building Materials	**2**	-	-	-	**40**	**60**	**2**

Course Objectives:

1. To understand the properties of ingredients of concrete
2. To understand the behavior of fresh and hardened concrete.
3. To understand the different types of admixtures and their uses.
4. To design the concrete mix.
5. To learn different special concretes and their uses.

Course Outcomes

After completing this course, the student will be able to:

1. Identify the properties of different ingredients of concrete.
2. Identify the properties of Hardened Concrete.
3. Distinguish different chemical and mineral admixtures as per their applications.
4. Identifying the strengths of Hardened Concrete.
5. Design the concrete mix as per the IS, ACI and British Standard codes.

UNIT–I

Cement: Portland cement- constituent of cement, types of cements and their compositions- different grades of cement- Manufacturing of OPC, Hydration of cement and hydration products-Structure of hydrate cement- Heat of Hydration and Rate of hydration- Test on physical properties

Fresh Concrete: Workability-Factorsaffectingworkability-workabilitytests-Settingtimesofconcrete- Effect of time and temperature on workability- Segregation & bleeding- Mixing and vibration of concrete-Steps in manufacture of concrete-revibration-curing–types of curing-water.

UNIT–II

Properties of Hardened Concrete: Water/Cement ratio- Abram's Law- Gel space ratio-effective water in the mix Short term and long term properties of hardened concrete and stress strain curves of concrete.

Testing of Hardened Concrete: Compression tests –Tension Tests- Flexure Tests-Non-destructive testing methods-Rebound hammer test- ultrasonic pulse velocity test

Elasticity Creep & Shrinkage- Modulus of elasticity- Dynamic modulus of elasticity- Poisson‘s ratio-Creep of concrete-Factors influencing creep-Relation between creep & time-Nature of creep-Effects of creep-Shrinkage-types of shrinkage

UNIT–III

Mix Design: Factors in the choice of mix proportions- Quality Control of concrete- Statistical Quality control- Acceptance criteria- Factors influencing the mix design - Proportioning of concrete mix – IS method of mix design–British and ACI method of mix design,

UNIT–IV

Admixtures: Types of admixtures- mineral and chemical admixtures- Influencing the properties of concrete used in SCC and FRC, Applications and Concept of RMC, Properties of Fly ash, Silica Fume, RHA.

UNIT–V

Special Concrete: High strength concrete, self-compacting concrete, fiber reinforced concrete , Ferro cement, mass concrete, light weight concrete, high density concrete, polymer concrete, , Recycled aggregate concrete, geo polymer concrete, nano concrete , shotcrete, reactive powder Concrete.

Text Books:

1. Concrete Technology, M.L. Gambir, Tata, Mc. Graw Hill Publishers, New Delhi, 5th Edition, 2017
2. Concrete Technology, M.S. Shetty, S.Chand & Co., Revised Edition, 2006

References

1. Properties of Concrete Pearson, A.M. Naville, Education India, 5th edition, 2012
2. Concrete Technology, A.R. Santha Kumar, Oxford university Press, New Delhi
3. Concrete: Micro structure, Properties and Materials, P.K. Metha and J.M. Monteiro, Tata Mc-Graw Hill Education
4. Concrete Admixtures Hand Book Properties, V S Rama Chandran, Noyes Publications, U.S.A
5. John Newman, Ban Seng Choo, ―Advanced Concrete Technology‖, Elsevier publisher, 2003.
6. Thomas Dyer, ― Concrete Durability‖, CRC Press, Taylor & Francis group,2014
7. N. Krishna Raju, ―Design of Concrete Mix‖, CBS Publications, New Delhi, 1985.

Course Code	Course Title						Core/Elective
U21CE502	**ENVIRONMENTAL ENGINEERING**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Engineering Chemistry	**2**	**-**	**-**	**-**	**40**	**60**	**2**

Course Objectives

1. Introduction to the basic concepts and requirements of environmental engineering.
2. Knowledge about different sequential unit operations of water and waste water treatment processes.
3. Inputs on engineering principles for analyzing various environmental issues.
4. Awareness towards the sustainability of standards for water resources.
5. Design of distribution system waste water treatment.

Course Outcomes

After completing this course, the student will be able to:

1. Aptitude to plan for protected water supply system needs and requirements.
2. Ability to design sequential unit operations in water treatment plants.
3. Design for the safe disposal of waste water and its reuse.
4. Analyze sustainable development of the society.
5. Execute and maintain standards for sustainable development of the society.

UNIT-I

Water Supply: Need for planned water supply schemes, water demand for industrial and agricultural water requirements, sources of water, water quality requirements for different beneficial uses, population forecast, water treatment through aeration, coagulation flocculation, and sedimentation.

UNIT-II

Water Treatment: Filtration, Disinfection, and Softening, methods of layout of distribution pipes, design of distribution by Hardy Cross method for simple networks, various types of pipes and valves used in water supply systems.

UNIT-III

Sewage: Domestic and storm water, Quantity of Sewage, Sewage flow variations.
Conveyance of Sewage: Sewers shapes, design of sewerage systems, operation and maintenance of sewers, sewage pumping, sewer appurtenances.

UNIT-IV

River Cleaning Plans: Self- purification of streams, BOD and COD concepts, waste water treatment, aerobic and anaerobic treatment system, suspended and attached growth systems, quality requirements of recycled water for various purposes. Principles of Septic Tank.

UNIT-V

Advanced Waste Water Treatment (WWT) Concepts: Theory and design concepts of Activated Sludge process, Mechanically Aerated Lagoons, Sequencing Batch Reactor (SBR), waste stabilization ponds, basic concepts of bio-remediation.

Text Books:

1. Water Supply and Sanitary Engineering,G.S.Birdie&J.S.Birdie,,Dhanpat Rai Publishing Company(P)Ltd.
2. Water Supply Engineering ,Dr. B.C .Punmia & AK Jain ,Laxmi Publications(P) Ltd.

Reference

1. Water Supply and Sanitary Engineering, G.S. Birdie & J.S. Birdie, Dhanpat Rai Publishing Company(P) Ltd.
2. Water and Wastewater Technology, Hammer, M.J. and Hammer, M.J. Jr., Prentice-Hall of India Pvt. Ltd., New Delhi, 1998.
3. Water Supply Engineering, Dr.P.N. Modi, Standard Book House, Rajsons Publications Pvt. Ltd.
4. Waste Water Treatment, M N Rao, A K Datta, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
5. Wastewater Engineering: Treatment, and Reuse by Metcalf and Eddy Inc, Tata McGraw Hill.

Course Code	Course Title						Core/Elective
U21CE503	**STRUCTURAL ANALYSIS - I**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Strength of Materials	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. Understand the advantage of statically indeterminate structure over the statically determinate structure
2. Understand basic methods for the analysis of statically indeterminate beams and frames and know the difference between different methods
3. Evaluate the displacements and redundant forces using energy principles
4. Identify the various straining action in arches
5. Analyze arches with varying degrees of indeterminacy

Course Outcomes

After completing this course, the student will be able to:

1. Solve statically indeterminate beams and portal frames using classical methods
2. Sketch the shear force and bending moment diagrams for different loading condition for in determinate structures.
3. Calculate the deflections in beams and pin jointed trusses.
4. Analyze the three hinged and two hinged arches.
5. To analyze multi storied frames using approximate methods

UNIT–I

Slope Deflection Method: Application of the method to continuous beams with and without sinking of supports, single bay - portal frames (Degree of freedom not exceeding three), loading on each span may be point load(s) or uniformly distributed load on whole span, shear force and bending moment diagrams.

UNIT-II

Moment Distribution Method: Application of the method to continuous beams with and without sinking of supports, portal frames (static indeterminacy not exceeding three), loading on each span may be point load(s) or uniformly distributed load on whole span, shear force and bending moment diagrams.

UNIT-III

Kani's Method: Application of the method to continuous beams with and without support sinking, portal frames (static indeterminacy not exceeding three), and loading on each span may be point load(s) or uniformly distributed load on whole span, shear force and bending moment diagrams.

UNIT–IV

Elastic Theory of Arches: Eddy's theorem, three hinged parabolic and segmental arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading, influence lines for horizontal thrust, bending moment, normal thrust and radial shear.

Two hinged arches: parabolic and segmental, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading.

UNIT–V

Cables and Suspension bridges: Stresses in suspended loaded cables, length of cable, simple suspension bridge with 3-hinged stiffening girders for static load.

Text Books

1. Structural Analysis- A Unified Approach, D.S. Prakash Rao, University Press, 1996
2. Theory of structures, B.C. Punmia and A.K. Jain, Laxmi Publications, New Delhi, 2004.

References

1. Basic Structural Analysis, C.S.Reddy,Tata McGraw-Hill Publishing Co.Ltd., 3rd Edition, New Delhi, 2010.
2. Finite Element Analysis C.S. Krishna Moorthy, Mc GrawHill,1991.
3. Theory of Structures, G.S,Pandit,S.P.GuptaandR.GuptaVol.I&II,TataMcGrawHill,NewDelhi,1999.
4. Theory of Structures, Pandit, G .S., S. P. Gupta and R. Gupta,Vol.l, Tata McGraw Hill, New Delhi, 1999
5. Mechanics of Structures (Vol. 1 &2), S.B. Junarkar, Charotar Publishing House Anand, 1992.
6. Basic Structural Analysis, C.S.Reddy, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

Course Code	Course Title						Core/Elective
U21CE504	**HYDROLOGY AND WATER MANAGEMENT**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	**T**	**D**	**P**			
Hydrology	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. Understanding the importance of Hydrology and its applications
2. Introduction to Hydrological processes and estimation of Design flood
3. Basic concepts and assessment of ground water flows
4. To study occurrence movement and distribution of water that is a prime resource for development of a civilization.
5. Introduction and assessment of soil-water-plant relationship

Course Outcomes

After completing this course, the student will be able to:

1. Understand the interaction among various processes in the hydrologic cycle.
2. Estimation of Design flood for Water Resources structures
3. Computation of draw down and yield in aquifers
4. Development of Rainfall–Run off relationship
5. Development of soil water plant relationship

UNIT–I

Introduction– Hydrologic cycle, Importance and scope of hydrology, Application in hydrology.

Precipitation- Forms of precipitation, types of rainfall, Characteristics of precipitation in India, measurement of rainfall, types of rain gauges, rain gauge network design, mean rainfall over an area, estimation of missing precipitation data, presentation of rainfall data, probable maximum precipitation (PMP), rainfall data in India.

UNIT–II

Abstractions from Precipitation- Evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction; Transpiration process; Evapo transpiration-measurement of evapo transpiration, evapo traspiration equations; Infiltration, infiltration capacity, measurement of infiltration, infiltration indices.

UNIT–III

Runoff- Definition, runoff process, factors affecting runoff, determination of runoff volume by- empirical formulae, rational method, SCS-CN method, Unit hydrograph method (def, limitation, application, derivation of unit hydrograph from direct runoff hydrograph and vice versa).

Floods: Definition causes and impact of floods, control measures of floods, estimation of floods, flood frequency studies- Weibul's and Gumble's method.

UNIT–IV

Ground Water- Forms of sub surface water, vertical distribution of sub surface water, geologic formations of aquifers, saturated formation, types of aquifers, aquifer properties, Darcy'slaw, types of wells, steady radial flow into wells in confined and unconfined aquifer, yield of open wells, safeyield, constant level pumping test and recuperation test.

Irrigation-Definition, necessity of irrigation, frequency of irrigation, types of irrigation methods, advantages and ill-effects of irrigation.

UNIT–V

Soil water-plant Relationship- Water requirement of crops, crops and crop seasons in India, cropping pattern. Vertical distribution of soil moisture, soil moisture tension, soil moisture stress, soil moisture constants, plant water relationship, moisture stress and plant response, consumptive use, crop factor, duty and delta, factors affecting duty.

Distribution systems - canal systems, alignment of canals, canal losses, estimation of design discharge, Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime cannels.

Text Books:

1. Engineering Hydrology, K.Subramanya, Tata McGraw Hill Publishing Co.Ltd. 1996 Water Supply Engineering, Dr.B.C.Punmia & AK Jain, Laxmi Publications (P)Ltd.
2. Hydrology– Principles, Analysis and Design, H.M. Raghunath, New Age International Publishers, 1996.

Reference

1. Irrigation Engineering and Hydraulic Structures, S K Garg, Khanna Publisher.
2. Irrigation and Water power Engineering, Dr B.C. Punmia, Laxmi Publications (P)LTD
3. Hydrology – Principles, Analysis and Design, H.M. Raghunath, New Age International Publishers,1996.
4. Irrigation Theory & Practice, Michael, A.M, Vikas Publishing House, New Delhi, 1978
5. Hydrology for Engineers, Ray K.Linsley, Jr, Max A.Kohler, Joseph L.H.Paulhus, McGraw-Hill Book Company, 1980
6. Hand book of Applied Hydrology, Ven Te Chow, McGraw- Hill Book Company, New York, 1964

Course Code	Course Title						Core/Elective
U21CE507	**ADVANCED SURVEYING**						**PEC-1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Surveying & Geomatics	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. To make students aware with different advance surveying methodologies
2. Application of different methods of Tacheometric Surveying
3. Understanding the Geometric Information System
4. Application of Remote sensing's in Advance Surveying
5. To prepare the students to handle the errors they are likely to come across any large-scale survey works.

Course Outcomes:

After completing this course, the student will be able to:

1. Application of different methods of Tacheometric Surveying
2. Identifying Prominent station in the fields by application of geodetic surveying
3. Preparation of plans by using Photogrammetric surveying.
4. Identifying the Difference between Mosaic & Map
5. Plotting the ground features by RS & GIS, Application of EDM.

Unit-1 Tacheometric Surveying:

Introduction, purpose, principle & use of tacheometry, Instrument used & stadia hairs & Fixed hair methods of tacheometry, Tacheometry constant & Problems Anallatic lens theory, sub tense bar, Fieldwork in tacheometry. Reduction of readings, errors and precisions. Difference between Theodolite & Tacheometer.

Unit-2 Geodetic Surveying:

Introduction & object of Geodetic Surveying, Principal & classification of triangulation system, Selection of base line and stations, Orders of triangulation- triangulation figures, Station marks and signals-marking signals, Examples on Phase error, Extension of base, reduction of centre, selection and marking of stations

Unit-3 Photogrammetric Surveying:

Introduction, principle, uses Aerial camera, aerial photographs Definitions, scale of vertical and tilted photograph Ground coordinates, ground control, examples on scale, Displacements and errors, Examples on Displacement and errors, Procedure of aerial survey, Examples on flight planning, Photomaps and mosaics. Difference between Mosaic & Map, Stereoscopes, Parallax bar, Examples on Parallax bar

Unit-4 Remote Sensing & Geographical Information System:

Introduction, principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global positioning system, Types, Applications of GPS, Method of operation, System Segmentation Integration of remote sensing and GIS, applications in civil engineering.

Unit-5 Special Survey Instruments:

Introduction, Electromagnetic Distance Measurement, Electronics Theodolite, Totalstation, Site square, Pantograph, Auto set Level, Transit level, Special Compasses, Brunton Universal Pocket Transit, Mountain Compass Transit.

Text Books:

1. Advanced Surveying, Agor, R Khanna, Publishers, New Delhi
2. Surveying Vol. I & II, Duggal, S.K.,Tata Mcgraw Hill, New Delhi

Reference

1. Fundamentals of Surveying, Roy, S.K., Prentice Hall India, New Delhi
2. Surveying & Levelling, Subramanian, R.,Oxford University Press, New Delhi
3. Surveying Vol. I, II & III, Punamia, B.C., Laxmi Publications
4. Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
5. Plane Surveying De, Alak S.Chand Publications, New Delhi ISBN:9788121917803

Course Code	Course Title						Core/Elective
U21CE508	**AIR AND NOISE POLLUTION**						**PEC-1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

1. Understand the Air pollution Concepts
2. Identify the source of air pollution
3. Know Air pollution Control devices
4. Distinguish the Air quality monitoring devices
5. Identify the Causes of indoor air pollution

Course Outcomes:

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

1. Identify sampling and analysis techniques for air quality assessment
2. Describe the plume behavior for atmospheric stability conditions
3. Apply plume dispersion modeling and assess the concentrations
4. Design air pollution controlling devices
5. Identifying the causes of indoor air pollution and changes in indoor air quality-control

UNIT-I

Air Pollution: Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution - Global effects – Ambient Air Quality and standards – Monitoring air pollution, Sampling and analysis of Pollutants in ambient air- Stack sampling, Air sampling and pollution measurement methods

UNIT-II

Meteorology and Air Pollution: Factors influencing air pollution, Wind rose, Mixing Depths, Lapserates and dispersion - Atmospheric stability, Plume behavoiur, Plume rise and dispersion, Prediction of air quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.

UNIT-III

Control of Particulate Pollutants: Properties of particulate pollution - Particle size distribution –Control mechanism-Dust removal equipment–Working principles and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP.

UNIT-IV

Concepts of Pollution Control: Particulate emission control - settling chambers, cyclone separation, Wet collectors, scrubbing, fabric filters, electrostatic precipitators, selection criteria for equipment, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods.

UNIT-V

Noise pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes.

Text Books:

1. Air Pollution, M.N.Rao and H V N Rao, Tata Mc Graw Hill Publishers
2. Air Pollution Control Engineering, Noel, D. N.,Tata McGraw Hill Publishers,1999.

References:

1. Air Pollution Control Engineering, Nevers, McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution, Dr.B.S.N.Raju, Oxford & I.B.H.
3. Air Pollution and Health, T. Holgate, HillelS. Koren, Jonathan M.Samet, Robert L.
4. Environmental Pollution Control Engineering, Rao, C.S., Wiley Eastern Ltd., New Delhi, 1996
5. Air Pollution and Control Technologies, Anjaneyulu, D.Allied Publishers, Mumbai, 2002.

Course Code	Course Title						Core/Elective
U21CE509	**URBAN TRANSPORTATION PLANNING**						**PEC-1**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Transportation Engineering	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

1. To discuss various urban transportation systems planning process and its components
2. To understand a variety of travel survey and data collection procedures
3. To review different travel demand forecasting models
4. To examine urban land use models and urban goods transportation models
5. Understand the challenging need for efficient planning of urban transport

Course Outcomes

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

1. Describe and evaluate various urban transportation issues and planning methodologies
2. Demonstrate effective way of understanding trip distribution and mode split models
3. Explain various issues related to trip assignment and land use transportation models
4. Transportation impacts various aspects such as mobility, health of residents, economic and energy aspects in an urban area.
5. Understand the challenging need for effective and efficient planning of urban transport addressing the growing travel demand in a sustainable and affordable way.

UNIT-I

Components of Urban Transportation System and Challenges- Transportation system definition, urban issues, evolution of planning process, demand and supply, challenges, limitation, measure of effectiveness, measure of collectiveness, traffic problem elements, planning and management, models, planning methodologies. Emerging future trends in Transportation Systems.

UNIT-II

Data Collection and Travel Surveys: Collection of data, design of survey format, organization of surveys and analysis, study area definition, zoning system, types and sources of data, road side interview method, home interview survey, in-vehicle surveys, sampling, types, various techniques, expansion factors, logical checks, use of secondary sources of data, planning variables, vehicles ownership, projection of data and statistical techniques.

UNIT-III

Travel Demand Forecasting: Various trends, overall planning process, short-and long-term planning, travel attributes, traffic analysis zones, trip generation, category analysis, concept of gravity model, trip distribution, model split and trip assignment and land use transportation interaction.

UNIT-IV

Trip Distribution and Model Split Analysis: Growth factor models, synthetic pattern models, gravity model, competing opportunity model, intervening opportunity model, linear programming model and abstract mode model, time series models, aggregate and disaggregate models, mode choice, competing modes, mode split models, trip interchange, Toronto transit model, service ratio model, probabilistic models, discriminate analysis, probit analysis and logit analysis, and probabilistic approaches.

UNIT-V

Traffic Assignment and Plan Preparation; Nodes, links, transport. Network, coding, rout characteristics, network skims, various methods, judgment tow path method, diversion curves, network, assignment, all or nothing assignment, capacity restraint techniques, multi-path assignment technique, graph theory, probabilistic assignment model, allocation of traffic, equilibrium assignment, dynamic assignment, land use transport @. models, Lowry models, Garin Lowry models, ISGLUTI models, mobility and accessibility, five stage models, choice models, urban goods transport, strategies for the evaluation of alternate transportation plans and plan implementation, framework and case studies, preparation of master plans.

Text Book:

1. Principles of Urban Transport Systems Planning, Hutchinson, E.G.,Mc Graw Hill, NewYork, 1974.
2. Modelling Transport, Ortuzar, J.and Williamson, E.G.,Wiley, Chinchestor, 1994.

References

1. Urban Travel Demand Modeling, Oppenheim,N., Wiley, NewYork, 1995.
2. Traffic Assignment Techniques, Thomas,R., Avebury Technical, Aldershot,1991.
3. Network Modelling and Intelligent Transport Systems, Taniguchi, E.,Thompson, R.G,Yamada, T. and Van Duin, R., City Logistics, Elsevier, Pergamon, Oxford, 2001.
4. Introduction to Transportation Planning, Bruton, M.I, Hutchinson, London, 1985.
5. IRC: 37 (2018), „Guidelines for the design of flexible pavements", Indian Roads Congress, New Delhi
6. IRC: 58 (2015), „Guidelines for the design of plain jointed rigid pavements", Indian Roads Congress, New Delhi

Course Code	Course Title						Core/Elective
U21CE5L2	**SURVEY CAMP**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	-	**25**	**50**	**1.5**

Course Objectives:

1. Field exercises with modern surveying equipment's like Total station.
2. All aspects of executing of field surveys
3. All aspects of plotting the field surveys
4. Work in team and make effective presentations

Course Outcomes:

After completing this course, the student will be able to

1. Develop knowledge of field exposure
2. Apply surveying knowledge and tools effectively for projects
3. Develop knowledge of practical application of different survey works
4. Develop knowledge of practical application of different surveying equipment's
5. Develop field constraints and also documentation of technical report.

Course Content:

Survey camp is introduced as part of the curricula to encourage students to be trained with latest equipments and surveying. It will be conducted during the summer vacation followed after the completion IV semester course.
After the completion of the Survey Camp, students need to submit a brief report to the Department.

Evaluation Process:

Evaluation of students are purely based on the performance of the student at the site place and will be judged by internal guides (25 Marks). The Below are the guidelines to be followed for awarding the marks to the candidate after submitting the detailed report of the Survey Camp in spiral bound in a précised format as suggested by the Department

Guide lines for Awarding Marks		
S .No	Description	Max marks
1	Day wise performance	10
2.	Question and Answers	5
3	Report in a Prescribed Format	10

Course Code	Course Title						Core/Elective
U21CE5L2	**CONCRETE TECHNOLOGY LABORATORY**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Material Testing	-	-	-	**3**	**25**	**50**	**1.5**

Course Objectives

1. Determine behavior of materials through physical tests
2. Infer suitability of materials in construction
3. Able to prepare concrete as per the standards

Course Outcomes

At the end of the semester student should be able to

1. Assess the suitability of differenting redients of concrete by conducting various test prescribed by relevant IS codes.
2. Assess the work ability of concrete and recommendits suitability for structural works
3. Determine the strengths of hardened concrete in compression, flexure and split tensile tests
4. Determine the fineness of fine aggregate
5. Assess the suitability of Bulk and compact densities of fine and coarse aggregates

I. **Test on Cement**

1. Fineness test
2. Specific gravity test
3. Normal Consistency test
4. Initial setting time and final setting time.
5. Soundness test.
6. Compressive strength of cement.

II. **Test on Aggregate (Fine and Coarse Aggregates)**

1. Specific gravity and Bulk Density
2. Surface moisture and water absoption test
3. Sieve Analysis.
4. Bulking of sand (Lab & Field method).

III. **Test on Fresh & Hardened Concrete**

1. Slump Cone Test
2. Compaction Factor Test
3. Compressive strength of concrete
4. Split tensile strength of concrete
5. Flexural strength of concrete

References

1. Concrete Technology, A.R.Shantha kumar, Oxford Publishers (Second edition)
2. Concrete Technology M.S.Shettyand A.K.Jain, S.Chand & Co, 2018.
3. Concrete Manual, M.L. Gambhir, Dhanpat Rai & Sons
4. IS10262:2019,Concrete Mix Proportioning Guidelines (Second Revision)
5. IS456(2000), Plain and Reinforced Concrete-Code of Practice

Course Code	Course Title						Core/Elective
U21CE5L3	**ENVIRONMENTAL ENGINEERING LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	**3**	**25**	**50**	**1.5**

Course Objectives

1. Characterization of water and waste water to ensure security and well-being of humanity.
2. Verify the efficiency of certain water treatment processes.
3. Understand the importance of coagulation.

Course Outcomes

After completing this course, the student will be able to:

1. Understand the compile and use of experimental information.
2. Ability to perform experiments on water sample for physical and chemical tests.
3. Understand the turbidity in water sample
4. Assess the suitability Total hardness and Alkalinity
5. Ability to critically analyze and interpret data and present results on water samples.

LIST OF EXPERIMENTS

1. a) Determination of total dissolved solids
   b) Determination of total suspended solids
   c) Determination of fluorides
2. Determination of pH and EC
3. Determination of total hardness
4. Determination of alkalinity
5. Determination of chlorides
6. Determination of residual chlorine
7. Determination of Dissolved oxygen (D.O)
8. Determination of residual chlorine
9. Determination of optimum alum dosage
10. Determination of BOD
11. Determination of COD
12. Determination of turbidity in water sample using nephelo turbidity meter.

References:

1. Hammer, M.J. and Hammer, M.J. Jr., Water and Wastewater Technology, Prentice-Hall of India Pvt.Ltd., NewDelhi, 1998.
2. G.S.Birdie & J.S.Birdie,Water Supply and Sanitary Engineering, Dhanpat Rai Publishing Company (P)Ltd.
3. Dr.P.N.Modi,“Water Supply Engineering“ ,Standard Book House, Rajsons Publications Pvt.Ltd.
4. Dr. B.C. Punmia & AK Jain”Water Supply Engineering”, Laxmi Publications (P)Ltd.

Course Code	Course Title						Core/Elective
U21ME5P1	INTERNSHIP						Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
-	L	T	D	P			
	-	-	-	2	50	-	1

Course Objectives:

1. Produce an accurate record of work performed during the Internship/Co-op
2. Apply engineering knowledge to a problem in industry
3. Produce a technical report
4. Discuss work in a team environment, if relevant to the project
5. Conduct herself/himself responsibly, safely, and ethically in a professional environment

Course Outcomes:

After completing the course, the student will be able to:

1. Design a small and simple production hardware
2. Develop a small and simple product in software
3. Complete the task or realize a pre specified target, with limited scope, rather than taking up a complex task and leave it.
4. Learn to find alternate viable solutions for a given problem and evaluate the seal ternatives with reference to pre specified criteria.
5. Implement the selected solution and document the same.

Guidelines:

Internship is introduced as part of the curricula of encouraging students to work on problems of interest to industries. A batch of three students will be attached to a person from the Government or Private Organisations /Computer Industry/Software Companies/R&D Organization for a period of 4 weeks. This will be during the summer vacation following the completion of the III-year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry co- ordinate (person from industry). The course schedule will depend on the specific internship/ training experience.

The typical time per topic will vary depending on the internship

1. Overview of company/project
2. Safety training
3. Discussions with project teams
4. Background research, review of documents, whitepapers, and scientific papers
5. Planning, designing, and reviewing the planned work
6. Executing the plans
7. Documenting progress, experiments, and other technical documentation
8. Further team discussions to discuss results
9. Final report writing and presentation

After the completion of the project, each student will be required to:

1. Submit a brief technical report on the project executed and
2. Present the work through a seminar talk (to be organized by the Department)

Note: Students have to undergo summer internship of 4weeks at the end of semester IV and credits will be awarded after evaluation in V semester.

Guide lines for Awarding Marks		
Sl.No	Description	Max marks
1	Day wise performance	
2.	Presentation Skills	
3.	Presentation of PPT Slides	
4.	Question and Answers	
5.	Report in a Prescribed Format	