CE401U ENVIRONMENTAL ENGINEERING

Teaching Scheme :03L+00T, Total: 03 **Credit:** 03

Evaluation Scheme:30 MSE + 10 ISA + 60 ESE **Total Marks:** 100

Duration of ESE :03Hrs

COURSE DESCRIPTION:-This course offers the wide knowledge of sewage ranges from its composition to its degradation &. steps involved in it. Also it discuss about pollution of water, air & noise with it's measurements & remedies.

COURSE OBJECTIVE:-To enable the students understand the concepts from basic theory to design of various treatment units of sewage treatment plant & also introduce with pollution of water, air & land.

COURSE OUTCOME:-

Upon successful completion of this course students will be able to,

1. identify the various types of characteristics of wastewater
2. calculate the quantity of sewage
3. study the ways of testing of sewage
4. conveyance of sewage from its source to treatment plant
5. classify various sources of solid waste, it's disposal methods

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2				2	2	1			1	1	2	1	1
2	1	1	1			1	2	1				1	2		1
3	1	1	1			1	2	1				1	1	1	1
4	1	2	1			2	2	1			2	1	1		1
5	2	1	2			1	2	1				1			1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT:-

Quantity of wastewater: Components of sewage, dry weather flow, peak factor, quantity of storm water, rational formula, ground water infiltration, variation in flow rates, population equivalence, types of reactors.

Quality of wastewater: Parameters of characterization, dissolved oxygen and its significance, biochemical oxygen demand, first stage BOD satisfaction and nitrification process chemical oxygen demand, total solids, different types of solids in water, Sampling of sewage. Pollution effects due to disposal of sewage on land, river, lake and sea, river re-aeration.

Wastewater Pumping: Difficulties in pumping, types of pumps used, their maintenance. Conveyance of sewage ,Quantity of domestic and storm sewage-assessment, sewer-terminologies, non-silting non-scouring velocity, coefficient of roughness, Manning's formulation, Chezy's formulation, shapes of sewer, sewer appurtenances, forces acting on sewers, laying of sewer, maintenance of sewer.

Wastewater Treatment: Primary treatment, types and functions of screen chamber , design of grit chamber, function, velocity control, design of oil and grease tank, primary settling tank,surface over flow rate, secondary treatment, trickling filters, standard rate, high rate, recirculation, efficiency, design of trickling filters, sludge disposal, activated sludge process.

Low Cost Waste: Treatments, unit operations and processes, problems on design of oxidation pond, oxidation ditch and septic tank. .

Sources of Solid Waste: Municipal solid waste - bad effect, generation rates, effect of socioeconomic on rate of generation, global and Indian scenario, storage,collection, removal methods, transportation, methods of disposal- land filling, composting, incineration, vermin composting, sea disposal, application to public places like colleges, parks, cinema halls, auditoriums, hospitals, offices etc.

Air and Noise Pollution: Sources of air pollution, primary, secondary and tertiary, stationary and mobile sources, effect of air pollution on man, material, and plants,

Text Book:

1.Garg S.K,Environmental Engineering vol.2, Khanna Publisher, Latest edition
2. G.S.Birdie and J. S. Birdi, Water Supply and Sanitation Engineering Dhanpat Rai Publication Company,New Delhi, Latest edition
3.B C Punmia, Ashok Jain and Arun Kr Jain,Wastewater Engineering ,Firewall Medium Publication, Latest edition

Reference Book :-

1.Water Supply and Sewerage,E W Steel and Terence J McGhee,McGraw-Hill, Latest edition
2. Air pollution, M.N Rao and S K S Rao, TMH publication, Latest edition
3.Wastewater Engineering: Treatment and Resource Recovery,Metcalf& Eddy, Inc., George Tchobanoglous , Latest edition
4. Solid Waste Management in Developing Countries, Bhide A. D. and Sundaresan B. B., INSDOC, New Delhi,1985(Journal)

CE402U FOUNDATION ENGINEERING

Teaching Scheme :03L+00T, Total: 03 **Credit:** 03

Evaluation Scheme:30 MSE + 10 ISA + 60 ESE **Total Marks:** 100

Duration of ESE :03Hrs

COURSE DESCRIPTION

Foundation Engineering is very fundamental subject consisting of selection of proper type of foundation as per sub-soil profile and type of structure. The course on Foundation Engineering provides the students basic knowledge on foundation selection, foundation forces, foundation design and its stability under seismic forces. Various types of foundation and their analytical solution helps the student to design suitable foundation with respect to soil and site condition.

COURSE OBJECTIVES:

To enable the students to apply the knowledge of basics of soil mechanics for safe design of civil engineering structures such as shallow foundation, deep foundation and machine foundation.

COURSE OUTCOMES

Upon successful completion of this course the students will able to

1. evaluate a detailed site investigation to select geotechnical design parameters and type of foundation
2. calculate bearing capacity of soil to design a shallow foundation
3. design combined footings and raft foundations, its component or process as per the needs andspecifications
4. design deep foundations, its component or process as per the needs and specifications.
5. design machine foundations, its component or process as per the needs and specifications.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	1				2						2		1
2	2	1	2				1						2		1
3	2	2	1				1						1		1
4	1	2	1			2	2	1			2	1	1		1
5	2	1	2			1	2	1				1			1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Soil Exploration, Sampling and Testing: Subsurface exploration, trial pits, shafts and boring, geophysical tests, wash boring, representative and undisturbed samples, bore hole sampling, laboratory evaluation of foundation parameters, field testing, penetration tests, plate load test

Bearing Capacity: Definitions of ultimate bearing capacity, gross, net and safe pressures, allowable bearing pressure, load settlement curve, Terzaghi's bearing capacity analysis, bearing capacity equations for square and circular footings, factors influencing bearing capacity, performance of footings in different soils, local and general shear, effects of water table, bearing capacity of layered soils.

Elastic settlement: Elastic settlement, elastic stresses and strains, contact pressure, empirical relation for settlement of bases, total and differential settlement, tolerable settlement.

Shallow Foundations: Spread footings, minimum depth, plain and rcc footings, allowable soil pressure, use of SPT blow count, wall footings, column footings, combined footings, raft foundations, floating foundations, grillage foundations.

Deep Foundation : Introduction to pile foundation, necessity of pile foundation, classification of piles, construction methods of bored piles, concrete bored piles, driven cast in-situ piles, pile capacity based on static analysis, dynamic methods and their limitations, in-situ penetration tests and pile load test as per IS:2911 specifications, negative skin friction, pile groups, ultimate load capacity of groups, under-reamed piles, introduction to piers , caissons and well

Machine Foundation: Mechanical vibrations, single degree freedom systems, free and forced vibrations, damped systems, natural frequency, resonance magnification, vibration parameters , vibration test, block foundation design Balkan method, isolation and control of vibration screen barriers.

Text Books

1) Soil Mechanics and Foundation Engineering, Dr.B.C.Punmia, Laxmi Publications, Latest edition
2) Soil Mechanics and Foundation Engineering ,K. R. Arora, Standard Publishers and Distributors, New Delhi, Latest edition.
3) Soil Mechanics and Foundation Engineering,V. N. S. Murthy, Saitech Publications, Latest edition

Reference Books

1) GeoTechnical Engineering, Gulhati and Datta ,Tata McGraw Hill, Latest edition.
2) Soil Engineering in Theory and Practice (Vol.II), Dr.Alam Singh, CBS Publication Delhi, Latest edition
3) Modern Geotechnical Engineering and Foundation, Dr.Alam Singh, CBS Publication, Delhi. Latest edition
4) GeoTechnical Engineering ,Ramamurthy T.N. and Sitharam T.G., S.CHAND publication, Latest edition

CE403U: ENGINEERING ECONOMICS, ESTIMATION ANDCOSTING

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This is a basic course which makes a student familiar methods of estimating, bar bending schedule, rate analysis, tendering and valuation.The course also contains introduction to basic principles of economics applicable to civil engineering projects

COURSE OBJECTIVES

1. The students will acquire knowledge in estimation, tender practices, contract procedures, and valuation and will be able to prepare estimates, call for tenders and execute works
2. Student will also be able to work out the rate analysis
3. Student will also be able to work out the valuation of properties.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. estimate the quantities for buildings.
2. Estimate rate analysis for all Building works, canals, and Roads and Cost Estimate.
3. explain and prepare types of specifications,
4. explain and Interpret principles for report preparation,

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2				2	2	1			1	1	2	1	1
2	1	1	1			1	2	1				1	2		1
3	1	1	1			1	2	1				1	1	1	1
4	1	2	1			2	2	1			2	1	1		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Basic principles and methodology of economics: Demand and supply, Government policies and application.Theory of the firm and market structure, Basic Macro-economic concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies.Price indices (WPI/CPI), Interest rates, Direct and indirect taxes. Public Sector Economics –Welfare, Externalities, Labour Market, Commercial Banks & their functions.
Elements of Business/Managerial Economics and forms of organizations. Cost & Cost Control – techniques, Types of costs, Lifecycle costs, Budgets

Indian economy - Brief overview of post-independence period – plans. Post reform Growth, Employment–Informal, Organized, Unorganized, Public, Private.

Approximate Estimate: Definition and necessity, general principles, methods of preparing approximate estimates for buildings, roads, bridges.

Detailed Estimate: Types of detailed estimate, purpose, data required for preparing detailed estimate, factors to be considered during preparing detailed estimate, methods of taking out quantities, abstracting, units of measurement

Building Cost: Building cost, provisional sum, centage charges, work charged establishment, administrative approval, budget provision, technical sanction, different methods of execution of minor works in PWD, like piece work, check list, day work, daily labour, introduction to registration as contractor in the PWD

Building Estimate: PWD method and centre line method of taking out quantities, using IS 1200 rules, estimate of frames residential building (1 BHK Only with estimating earthwork, concrete stair case, RCC elements like slab, beam, column, footing & masonry, finishes, interiors etc.), Bar bending schedule.

Estimating earthwork for road work, irrigation works.

Specification: Definition & purpose, types of standard specification, legal aspect, drafting detailed specification for buildings, roads, minor bridges.**Rate analysis:** Purpose and principles, importance of schedule of rates in cost estimates, Rate analysis, factors affecting rate analysis, task work, fixed, variable, prime and supplementary cost, overhead cost, daily output from different equipment/ productivity.

Tender: Preparation of tender documents, importance of inviting tenders, types of contracts, relative merits, prequalification, General & special Conditions : termination of contracts, extra works & changes, penalty and liquidated charges, settlements of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc.

Valuation: Purpose of valuation, value and cost, types of value, factors affecting value of property, net andgross return, free hold and lease hold property, sinking fund, depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation of old building.

Text books:

1. Estimating and Costing in Civil Engineering, Theory and Practice, Datta B.N., UBS Publisher, New Delhi, Latest edition

2. Estimating, Costing Specifications & Valuation in Civil Engineering, Chakraborti M., UBS Publisher, New Delhi, Latest edition
3. Estimating, Costing and Valuation, Rangwala S. C., Charotar Publishing House, Anand, Latest edition
4. A Text Book of Estimating and Costing, Birdie G. S., Dhanpatrai publishing company, Latest edition
5. Indian Economy, Puri V. K. and S. K. Misra, Himalaya Publishing House, Latest edition
6. Text book of business Economics, PareekSaroj, Sunrise Publishers, Latest edition
7. Managerial economics, Mote V., Paul Samuel and Gupta G., McGraw Hill Education, Latest edition

Reference books:

1. Civil Engineering Contracts & Estimates, Patil B. S., Orient Longman Ltd, Mumbai, Latestedition
2. National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New, Delhi
3. Principles of Economics, Gregory Mankiw N., Thomson Southwestern, Latestedition
4. Typical PWD Rate Analysis documents.
5. Current District Schedule Rate (DSR)

CE404U (A) PAVEMENT DESIGN

Teaching Scheme : 03 L + 00 T Total = 03 Credits: 03
Evaluation Scheme : 30 MSE + 10 TA + 60 ESE Total Marks: 100
Duration of ESE : 3 hrs.

COURSE DESCRIPTION

Thismakes a student familiar with material and their characteristics which are used for construction of pavement, design parameters, analysis of flexible and rigid pavement, various pavement evaluation techniques.

COURSE OBJECTIVE:

Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and evaluate the serviceability conditions of pavements.

COURSE OUTCOMES:

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

1. explain pavement components in flexible and rigid pavement.
2. illustrate stresses and strains in flexible pavements & rigid pavements.
3. design the flexible pavement.
4. describe stresses and strains in rigid pavements.
5. design the cement concrete pavements with different joints.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	1				2						2		1
2	2	1	2				1						2		1
3	2	2	1				1						1		1
4	3	2			2									1	
5	2	1		2		1								2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

General: Structural action of flexible and rigid pavements. Characteristics of highway pavements.

Material Characteristics: AASHO sub grade soil classification. Group index, CBR, North Dakota cone bearing value, plate load test for "K", Marshal's method of bituminous mix design. Modulus of rupture and elasticity, poison's ratio and coefficient of thermal expansion of concrete, layer equivalency concepts.

Design Parameters: Standard Axle load and wheel assemblies for road vehicles, tire and contact pressure, contact area imprints, computations of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway.

Analysis of Flexible and Rigid Pavements: Stress, strain deformation analysis for single, two three and multilayered flexible pavement systems. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis, joints in C.C. pavements.

Flexible Pavement Design: North Dakota Cone, Group index, CBR, IRC-37, Brumister, Triaxial (Kansas), AASHO method of design.

Rigid Pavement Design: IRC-58, PA. C.A., AASHO method of design, design of joints and reinforcement.

Pavement Testing and Evaluation: Pavement evaluation techniques including bump integrators, Benkelman Beam, falling weight deflectometer methods. strengthening of pavement: Design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements.

Text Books:

1 Traffic Engineering and Transportation Planning, Kadiyali L.R , Khanna Publication New Delhi, Latest edition.
2 Highway Engineering, Nem Chand Bros., Khanna S.K., and Justo C.E.G., Roorkee, Latest edition.

Reference Books:

1. Design and Performance of Road Pavement, Croney&Croney;McGHraw Hill, Latest edition
2. Principles of Pavement Design, Yoder &Witzace, Prentice Hall, Latest edition Pavement Analysis and Design, Y. H. Huang, Pearson Prentice Hall, Latest edition.
3. Pavement Engineering - Principles and Practice, Mallick, R.B. and T. El-Korchi,CRC Press, Taylor and Francis Group, Florida, USA, Latest edition.
4. Pavement Design and Materials, Papagiannakis, A.T. and E.A. Masad,John Wiley and Sons, New Jersey, USA, Latest edition.

CE404U(B): ADVANCED REINFORCED CEMENT CONCRETE

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3Hrs

COURSE DESCRIPTION

The primary aim of this course is to provide an introduction to the analysis and design of reinforced concrete advanced structures, The course covers design of various structures with elements viz. Combined footing. Retaining wall, Flat slab and water retaining structures It equips the students with the tools necessary for designing RCC structures and to familiarize them with the relevant national design code.

COURSE OBJECTIVES

1.To understand behavior of structural members under various loadings.
2.To understand concept of RCC structural design
3.To conceive elementary design of different structural elements.

COURSE OUTCOMES

After successful completion of this course; student shall be able to
1. apply concept of ductile detailing and earthquake resistance design method.
2. design the advance structures like combined footing, retaining wall .
3. designof flat slabs
4. designof water retaining structures.
5. design of prestressed concrete structures.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	2	1					1		1		1		
2	1	2	2	3							2	1			2
3	2	2	1	3					2				2	2	
4	2	2	2						2		2	1	3		2
5	1	2	1	2					1		2				

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

R.C. Structures: Introduction to earthquake resistant design , ductile detailing of reinforced concrete members as per IS13920-2016.
Introduction and design of combined footing. Design of flat slabs.
Liquid retaining structures

Introduction, types, function, code provisions, methods of analysis and design of circular, Elevated Storage Reservoir with staging.

Prestressed concrete - Analysis

Introduction, Basic concepts, materials-various Pretensioning and post tensioning systems, concept of losses, Stress calculations, and concept of cable profile.

Losses in pre-stresses :- Nature of losses, loss due to elastic shortening of concrete, shrinkage, creep, anchorage slip, successive pre-stressing of straight cables, relaxation ofstress in steel friction in a curved cable anchorage.Transfer of pre-stress in pre-tensioned members, transmission length, end zone reinforcements. Anchorage Zone stresses in post –tensioned members – Guyan's method.

Prestressed concrete - Design

Introduction to Pretension and post tensioned prestressed concrete designs

Text books:

1. Limit state design of Reinforced Concrete Structures, Ramchandra. Standard Book House , Latest edition.
2. Limit State Theory and Design of Reinforced Concrete Structures,Karve S.R. and Shah V.L, Structured Publications Pune, Latest editionn.
3.Rinforced Concrete Structures, Dr. B.C.Punmia and A.K.Jain , Laxmi publication New Delhi Latest edition.

Referrence:

1. Limit state design of Reinforced Concrete Structures,Varghese P.C. Prentice Hall of India, Latest edition.
2.Limit State Analysis and Design ,P. Dayaratnram, Wheeler Publishing company Delhi, Latest edition
3.Reinforced Concrete Design ,Pillai Menon , Tata Mc Graw Hill, New Delhi., Latest edition
4. Bureau of Indian Standards, I.S.456-2000: Plain and reinforced concrete, Code of Practice, Bureau of Indian Standards 2000.
5. I.S.3370-2009: Part I, II and Part IV, Code of Practice for Concrete structures for storage of liquids. Bureau of Indian Standards 2009.
6. S.P. (16): Design Aids for Reinforced Concrete. (Interaction Charts Only) Bureau of Indian Standards 1980.

CE404UC: AIR AND NOISE POLLUTION

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This is a basic course which makes a student familiar with the air and noise pollution. Students will learn types of air and noise pollution and control measures of air and noise pollution.

COURSE OBJECTIVES

The main objective of this course is to impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. identify the major sources of air pollution
2. find effects of air pollution on health and environment.
3. evaluate sampling techniques for atmospheric and stack pollutants
4. identify the major sources of noise pollution effects and control measures of noise pollution
5. design control techniques for particulate and gaseous emissions..

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1			3		3		1	1				1	1	1	1
2			3		3									1	1
3	1		2		1		1	1						1	1
4			2		2								1	1	
5	2	1	1		2		2	1						2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Air pollution: composition and structure of atmosphere, definition of air pollution, Air pollutants, Sources, classification, Combustion, Processes and pollutant emission, Effects on health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects-Smoke, smog and ozone layer disturbance, Greenhouse effect, Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.

Meteorology: Wind profiles, topographic effects, separated flows, temperature profiles in atmosphere, stability, inversions, and plume behavior.

Air sampling and pollution measurement methods: principles and instruments, Ambient air quality and emission standards, Air pollution indices, Air Act, legislation and regulations.

Control of air pollution: Control principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods. Particulate emission control, settling chambers, cyclone separation, Wet collectors, fabric filters, electrostatic precipitators and other removal methods like absorption, adsorption, precipitation etc., Introduction to National Clean Air program (NCAP).

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; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices, Noise control methods.

Text books:

1. Environmental Pollution Control and Engineering, Rao C.S., New Age International (P) Limited, Latest edition
2. Air Pollution, Rao M and Rao HVN, McGraw Hill Education, Latest edition
3. Noise Pollution and Control, S. P.Singhal , Narosa Pub House, Latest edition
4. Textbook of Noise Pollution and Its Control by S. C. Bhatia, Atlantic, Latest edition

Reference books:

1. Air Pollution: its origin and control, Kenneth Wark and Cecil F Warner, Harper and Row Publishers, New York.
2. Air Pollution Control Engineering, Noel De Nevers, Waveland Pr Inc., Latest edition

CE404U(D): BUILDING SYSTEMS AND SERVICES

TeachingScheme:3LTotal:3Hr **Credit: 3**

EvaluationScheme:30MSE +10ISA +60 ESE **Total Marks: 100**

Duration of ESE: 3 Hrs

COURSEDESCRIPTION

Thiscourseintroducesthestudentsaboutthe systems and services required invarious buildings such as: Lighting and ventilation, Water supply and drainage system to be provided for proposed building, Study of various components of these systems, Electrical and Mechanical services and their layout, Importance of fire protection, acoustics and sound insulation for various buildings.

COURSE OBJECTIVES

1. To impart knowledge required for understanding the basic principles, installation and maintenance of building services.
2. To know the concept of acoustics and sound insulation required for building, and their application.
3. To understand preparing layout of house wiring, water supply and drainage systems.

COURSE OUTCOMES

Upon successful completion of this course the students will able to:

1. plan various types of services required for different types of buildings.
2. supervise installation and testing of services such as lift, fire protection, lightings, air conditioning, acoustic and sound insulation.
3. Apply the basic aesthetic principles involved in architectural design for building projects.
4. manage building services provisions in big construction sites.
5. prepare layout of various systems for proposed building.

RelevanceofProgramOutcomes(POs)andstrengthof co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2		1		1								2		
2	2		3		1								2		
3	3		1	3										1	
4		2		2	1										1
5		2	1										2		2

1-Weaklycorrelated 2– Moderatelycorrelated 3– Stronglycorrelated

COURSECONTENT

Introduction to building services : Definitions, Objective and uses of services, Applications of services for different types building considering, Classification of building services, Types of services and selection of services,

Lighting and ventilation : Natural and artificial lighting, principles and factors, Arrangement of luminaries, Distribution of illumination, Utilization factors, Necessity of Ventilation, Types – Natural and Mechanical, Systems of air-conditioning.

Water supply and drainage : Surface and underground sources of water supply, rate of demand, water requirement for various buildings, methods of distribution systems of supply of water, storage tanks, water services to multistory buildings,

Building drains, sewers, gully traps, inspection chambers, manholes, connection to public sewer. Waste-water disposal systems, septic tank, soak pits and anaerobic filters.
Basic requirements of Drainage and Sanitation, Installation of Sanitary Appliances, Drainage system for multi storied buildings.
Refuse disposal:-Refuse bins, Refuse chutes etc. Rain water harvesting:- Rainwater harvesting techniques, methods of recharging ground water.

Electrical services and layout : Electrical services in the building, Technical terms and symbols for electrical installations and Accessories of wiring, Elements of building wiring system – feeders, panel board, circuit breakers' fuses, switches etc.; electrical layout for residence.

Mechanical services in buildings: Introduction of mechanical services like Lift -Definition, Types of Lifts, Design Considerations, Location, Sizes, Elevators & Escalators - Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators,

Fire protection, acoustic and sound insulations : Causes of fire and Effects of fire General Requirements of Fire Resisting building as per IS and NBC 2005, Characteristics of Fire resisting materials, Maximum Travel Distance. Fire Fighting Installations.

Acoustic and sound insulations: Requirement of good Acoustic, Various sound absolvent Factors to be followed for noise control in residential building.

Text Books -

1. National Building code, Bureau of Indian standard.
2.Design and Installation of Services in Building complexes & HighRise Buildings,Jain. V.K., Khanna Tech. Publishers, New Delhi, Latest edition.
3. Water Supply and Sanitary Engineering, Chatterjee, A.K., Khanna Publishers,New

Delhi, Latest edition.
4. Water Supply and Sanitary Engineering,Birdie, G. S., and Birdie, J. S., Dhanpat Rai and Sons, New Delhi, Latest edition.
5. Environmental Engineering, Vol. II,Garg, S. K., Khanna Publications, New Delhi, Latest edition.

Reference Books -

1. Energy Conservation Act 2001, Electricity Act 2003
2. Acoustic designing & practice, R. L. Suri, Asia Publishing House, Volume I, 1967.

CE405UX: INTERIOR DESIGN

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

Any building whether it is residential or commercial requires interior. Interior design is the art and science of enhancing the interior of a building to achieve a healthier and more aesthetically pleasing environment for the people using the space. This course enables a student to plan design and execute an interior design project.

COURSE OBJECTIVES

1. The basic objective of this course is enabling a student to plan, design and execute interior design project.
2. The student must be able to understand various materials used and different planning concept of interior design.
3. The student must also be able to design and construct necessary structures for enhancing esthetics of the structure.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. apply the functional planning of interior spaces.
2. explain various elements principle of interior design.
3. demonstrate ability to design interior of building.
4. choose the physical dimension of various furniture
5. construct partition walls and false ceiling.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1				2	2				1		1	1
2	2	1	1				1	1				1			1
3	2	2	1		2		1	1				1	1	1	
4		1					1					1		1	
5	1		1				1					1	1		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Interior Designs: Character of good design - Values of design, Influence of environment on design in tune with community & site location, Eco friendly designing,

Functional Planning of Interior Spaces - Planning for specific functions, Planning for coordination & circulation, Psychological space planning

Elements of Interior Design: Form, texture, hard, medium, soft & importance of texture in design, Light- Importance of light as an art element & effect of light color & texture. Space - Organization of space in design. Color- Importance of color as an art element, Color theory- Lightness & Darkness, intensity, Brightness &, dullness warm & cool color, paint & their properties- how to apply, textures & patterns

Principles of Design: Balance its definition, types, formal & informal balance. Harmony definition, aspect of harmony, line, shape size, texture, color, idea, Rhythm - definition, methods of obtaining rhythm repetition of shapes, progression of size, continuous line movements

Interior Materials:
Floor covering carpets, types & fixing of carpets, Finishes- Walls & Furniture finishing likes paint, wallpaper paneling & cladding, Furnishing materials - cloth, Rexene, leather, etc. curtains, Plastics - Study of types of plastics, casting, molding process, use in interiors

Furniture - Movable furniture like chairs, tables, fixed furniture like wall units, wardrobe, kitchen platform, partitions, Upholstered furniture like sofa sets, chairs etc., Lighting, study of types of lighting, Direct & Indirect lighting,

Construction:
Partition – wooden partition, aluminum partitions, sound proofing partitions False ceiling, different types of false ceiling systems in different materials

Text books:

1. Interior Design Principles and Practice, Pratap Rao M., Standard Publishers, Latest edition
2. Interior Design, Chaudhari S. N., Aviskar Publisher, Latest edition
3. Building Material, P. C. Vargeesh, PHI Learning, Latest edition

Reference books:

1. Time Saver Standards for Interior Design and Space Planning, Joseph De Chiara, McGraw-Hill Education, Latest edition
2. The Interior Design Reference & Specification Book updated & revised: Everything Interior Designers Need to Know Every Day by Chris Grimley and Mirni Love, Rockport publishers, Latest edition

CE405U (Y) METRO SYSTEM AND ENGINEERING

TeachingScheme: 3LTotal :3Hr **Credit:3**

EvaluationScheme:30MSE +10ISA +60 ESE **Total Marks: 100**

Duration ofESE: 3 Hrs

COURSE DESCRIPTION

This course focuses on complete understanding of urban transport system. It provides the fundamental knowledge of various aspects of metro system such metro planning and selection, metro construction, metro track metro electrification systems, metro signalling, metro operations, metro depots, metro maintenance and metro station management

COURSE OBJECTIVES

1. To introduce necessity of metro system for urban transport.
2. To understand integrated operation of metro system.
3. To understand working of different metro system components.
4. To understand interdependency of various sub systems of metro working.

COURSE OUTCOMES

After successful completion of this course; student shall be able to:

1. Explain the various facets of the metro systems.
2. articulate the various operational management aspects of the metro system.
3. elaborate metro activities involved in the daily line-of-road operations, terminal operations, and local operations.
4. predict the various demands and measurements of acceptance for the metro systems
5. assess the changing objectives and requirements necessary for the expansion of the metro industry.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1		1		2	3	1	1		1		1	1		2
2	2	1			1			2		1	1		2	1	
3	2	2	1	2								2	2		
4	1	3	2	2			1	2			2	2	3	2	2
5	1	1		1	1	1		1		1		2	1	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

General: Origin of Metro Rail System, Overview of World & Indian Metro Systems, Need for Metros; Routing studies; Basic Planning and Financials, Initial Surveys & Investigations;

Metro Construction : Basics of Construction Planning & Management, Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges, Underground tunnels, Depots, Commercial and Service buildings, Construction Quality & Safety Systems.

Metro Rolling stock : Metro operations - terminal operation, local operations, Track systems-permanent way, Rolling stocks, vehicle dynamics and structure.

Metro Traffic Management : Metro Electrification systems, Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguard.

Metro system : Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators.

Metro Act : Introduction of metro act, Report of Ministry of Urban Development on standardization of metro system.

Textbooks :

1. A Text Book of Railway Engineering, Saxena S. C. & Arora S. P.,7th edition, Dhanpat Rai Publications(P) Ltd., New Delhi, Latest edition
2. Railway Engineering, Satish Chandra & Agrawal M. M., 2nd edition, Oxford University press India, Latest edition.
3. Principles of Transportation Engineering, Chakroborty P. and Das A., 1st edition, Prentice Hall of India, Latest edition.

Reference Books :

1. Transportation Engineering Vol. I & II, V.N. Vazirani& S.P. Chandola, 7thedition , Khanna Publishers, New Delhi, Latest edition.
2. Metro Act _ Government of India – 2002
3. Rolling Stock – Report of Ministry of Urban Development – GOI -2013
4. Radio communication for Communications-Based Train Control (CBTC): A tutorial and survey – 2017
5. Technical Details of Metro Rolling Stock _ Ansaldo Manual – 2016
6. Technical Details of Metro Rolling Stock – Bombardier – 2015
7. Technical Standards of Track Structure for Metro Railways/MRTS – RDSO
8. Detailed Project Reports of Various Metro Projects in India – By Delhi Metro Rail Corporation
9. Manual Of Specifications And Standards – Hyderabad Metro Government of Andhra Pradesh - 2008

CE406UENVIRONMENT ENGINEERING LAB

Teaching Scheme : 02P **Credit**: 01
Evaluation Scheme:25ICA+25ESE**Total Marks**: 50

COURSE DESCRIPTION:- This course provides practical knowledge of various experiments performed on sewage sample & also students have to do design of at least two treatment units which are covered in theory classes & students will visit Sewage treatment plant to gain live knowledge of wastewater treatment.

COURSE OBJECTIVE:-To determine various contents of sewage viz. Chloride content, oil & grease content, TDS & also to determine Biological oxygen demand , dissolved oxygen etc by performing experiments.

COURSE OUTCOME :-Upon successful completion of this course students will be able to

1. calculate impurities present in wastewater
2. determine BOD & DO of wastewater
3. determine various types of solids present in Wastewater

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1					1				1	1		2
2	2	1	1			1	1	1				1		1	2
3	1		1			1		1				1		1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum Seven experiments shall be performed to cover entire curriculum of course CE401U, four from Group A, two from Group B and Group C is compulsory,

Group A:

1. Determination of Chloride content of wastewater sample.
2. Determination of DO content of water and wastewater sample.
3. Determination of BOD of wastewater sample.
4. Determination of COD of wastewater
5. Determination of total dissolved solids and suspended solids content of wastewater sample.
6. Determination of oil and grease content of waste water sample.
7. Determination of Sludge Volume Index of wastewater sample from aeration tank.

Group B:

1. Design of screen chamber
2. Design of grit chamber

3. Design of conventional Activated Sludge Process.
4. Design of trickling filters

Group C:

Visit to Sewage Treatment Plant/Waste Water Treatment Plant: Visit report shall be in brief consisting of layout of plant, necessity of units, design details such as: flow, size etc. along with cross-section of each unit.

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge acquired and record submitted by student based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10.
- **ESE** – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE407U FOUNDATION ENGINEERING LAB

Teaching Scheme : 02P **Credit**: 01
Evaluation Scheme:25ICA +25ESE **Total Marks**: 50

COURSE DESCRIPTION:-This course provides practical knowledge of various experiments performed on soil to check the bearing capacity and design of pile foundation according to available soil at site.

COURSE OBJECTIVE:- To impart knowledge of methods of analysis capacity of soil and design of pile foundations.

COURSE OUTCOME :-Upon successful completion of this course students will be able to

1. prepare soil investigation report
2. evaluate bearing capacity of soil from different tests
3. design the pile foundation according to site condition

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1			2		1				1	1		2
2	2	1	1				1	1				1		1	2
3	1	2	1			1		1				1		1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

A) Minimum Four assignments shall be performed to cover entire curriculum of course CE402U.

1. Preparation of Soil investigation report based on given data.
2. Problems on Plate Load Test, Standard Penetration Test and corrections.
3. Bearing capacity calculations for different foundation.
4. Settlement analysis.
5. Design of pile foundations.
6. Design of under reamed pile.

B) Demonstration of any one of following tests;

1. Plate load test.
2. Standard penetration test.
3. Swelling pressure test.

- ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge acquired and record submitted by student based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10.
- ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE408U: ENGINEERING ECONOMICS, ESTIMATE ANDCOSTING LAB

Teaching Scheme: 02P Total: 2 Hr **Credit: 1**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

COURSE DESCRIPTION

Engineering economics estimating and costing is a core syllabus of civil engineering which needs practical treatment. Here, a student has to findestimated cost of variety of contemplated structures using standard procedures and DSR. Somepart of the syllabus is dedicated to economics,

COURSE OBJECTIVES

1. To enable student to working out quantities of various items involved in construction. of structures based upon detailed drawings.
2. To enable student to prepare the rate analysis.
3. To enable student to carry out valuation of existing property considering depreciation.
4. To enable students to draft the specifications for new civil works.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. attain the level of proficiency to prepare approximate as well as detailed estimate of civil engineering project.
2. competent enough to calculate the amount of material, labor & machinery required to execute any civil construction projects.
3. perform and evaluate present worth of a property and Assess the future worth & annual worth analyses on one of moreeconomic alternatives

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1			2	2	1				1	1		2
2	2	1	1			1	1	1				1		1	2
3	2	2	1			1	2	1				1		1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum five assignments shall be performed to cover entire curriculum of course CE403U. The list given below is just a guideline.

1. Units of measurements of various Items of Civil Engineering Works / study of DSR, study and use of check list of PWD for estimating of various building works
2. Approximate estimate of residential building, public building, elevated storage reservoir, road and bridge
3. Prepare detailed estimate for

i. Single story load bearing structure upto 2 flats (use current DSR)
ii. Ground plus three storied RCC framed building with block work walls also prepare bar bending schedule for the same.
iii. Road Work/canal
iv. Single Toilet Block with Septic tank

4. Prepare detailed estimate for (any one)
   i. Cross Drainage Works/bridge/Box Culvert
   ii. Minor irrigation tank (dam line and spillway)
   iii. compound wall
5. Rate analysis and Specifications for any eight items
6. Site visit (attached estimate and photographs) / study standard estimate of PWD or any civil organization

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE409 U(A)PAVEMENT DESIGN LAB

Teaching Scheme : 02 P Total = 02 **Credits: 01**
Evaluation Scheme : 25 ISA + 25 ESE **Total Marks: 50**

COURSE DESCRIPTION:-

This course provides practical knowledge of design and evaluation of rigid and flexible pavement by various methods.

COURSE OBJECTIVE:-

1. Test the quality of materials used in flexible pavement
2. Design the flexible pavement
3. Design the Rigid pavement

COURSE OUTCOME :- Upon successful completion of this course students will be able to

1. select suitable material for pavement construction
2. design the suitable pavement according to site condition
3. evaluate the pavement by various methods

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	2	2							1	1	3		
2	1	1	2	2			1				2				2
3	2	2	1	3			1		2				2	2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlate

COURSE CONTENT

Minimum six experiments shall be performed to cover entire curriculum of course CE404U(A).

1. Determining CBR value for sub grade, sub-base and base material and designing the flexible pavement
2. Determining North Dakota cone bearing value and designing the flexible pavement
3. Determining modulus of sub grade by conducting plate load test
4. Bituminous mix design by Marshal method
5. Designing flexible pavement by IRC - 37.
6. Designing rigid pavement along with joints by IRC -58
7. Pavement evaluation by Bump integrators,
8. Pavement evaluation by Benkelman Beam,
9. Pavement evaluation by Falling weight deflectometer methods

- ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge acquired and record submitted by student based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10.
- ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE409U(B): ADVANCED REINFORCED CEMENT CONCRETE LAB

Teaching Scheme: Total: 2Hr **Credit: 1**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

COURSE DESCRIPTION

The primary aim of this course is to analysis and design of reinforced concrete advanced structures, by limit state/ working stress method conforming to IS 456:2000 . The course covers design of various elements and advanced structures viz. Retaining wall, flat slab, water retaining structures combined footing in RCC. It equips the students with the software tools necessary for designing RCC structures also .

COURSE OBJECTIVES

1.To prepare detailing of reinforcement of members under various loading conditions
2.To prepare schedule of the reinforcement
3.To practice the elementary design of different structural elements

COURSE OUTCOMES: Upon successful completion of this course students will be able to:

1.apply the concepts of structural design procedure
2.design the individual members and hence structure as a whole
3.apply the concept of detailing of reinforcement

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	1	2	2							1	1	3		
2	1	1	2	2			1				2				2
3	2	2	1	3			1		2				2	2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Following assignments shall be performed to cover entire curriculum of course **CE404 U B**

List given below is just a guideline.

1) Assignment on Loss calculation

2) Assignment on stress calculation

3) Design and detailing of prestressed concrete girder

4) Assignment on Earthquake force calculation

5) Design and detailing of frame(beam only)

6) Design and detailing of retaining wall for any type of loading

7) Design and detailing combined footing

8) Design and detailing of ESR

9) Minimum five sheets based on four projects of RCC and one project of pre-stressed concrete.

10) Report on analysis of assignment of retaining wall by software or computer program

11) Two site visit reports one each of R.C.C. and another P.S.C.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format..
- **ESE –** The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be outside the institute.

CE409UC: AIR AND NOISE POLLUTION LAB

Teaching Scheme: 02P Total: 2 Hr **Credit: 1**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

COURSE DESCRIPTION

To expose the students to the methods for monitoring of ambient air qualilty, ambient noise monitoring. Students will understand air and noise pollution in a better way.

COURSE OBJECTIVES

1. To check ambient air quality.
2. To understand effect of noise and air pollution on human health.
3. To measure noise pollution.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. measure and interpretambient air quality
2. measure and interpret noise pollution.
3. explain effect of noise and air pollution on human health.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		1	2		3		1					1	2	1	1
2		1	2		3		1					1	1	1	
3			3		2		1							1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum six experiments shall be performed to cover entire curriculum of course CE404UC. The list given below is just a guideline.

1. Sampling of PM 2.5 in ambient air.
2. Sampling of respirable Suspended Particulate Matter PM10 in ambient air.
3. Sampling and analysis of SO2.
4. Sampling and analysis of NOx.
5. Studies on index of air pollution
6. Demonstration / Exercises on Air Pollution Control Devices – Bag Filter, Scrubber, Cyclone and ESP
7. Field visit to assess air and noise pollution
8. Study of effect of noise pollution on health of humans.
9. Measurement of noise level in different environments by sound level meter (SLM)

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE409U(D): BUILDING SYSTEMS AND SERVICES

TeachingScheme: 2P, Total: 02 Credit: 01EvaluationScheme:25 ICA + 25 ESE Total Marks: 50

COURSEDESCRIPTION:-

Thiscourseintroducesthestudentsabout the building systems and services. It will helpful to student to prepare layout of house wiring, rain water harvesting, water supply and drainage system.

COURSEOBJECTIVES:-

1. To study installation and maintenance of building services.
2. To study rain water harvesting system and preparing its layout.
3. To understand preparing layout of house wiring, water supply and drainage systems.
4. To give suggestions of noise control methods for various buildings.

COURSEOUTCOMES:-

Uponsuccessfulcompletionofthiscoursethe studentswillable to:

1. plan various types of services for different types of buildings.
2. prepare a plan for fire safety measures in multistoried buildings.
3. identify the location of mechanical services.
4. manage building services provisions in big construction sites.

RelevanceofProgramOutcomes(POs) andstrengthof co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2												2		1
2	2		1			2							2		1
3	1	2				2									1
4	1	2	2			2							2		1

2-Weaklycorrelated 2– Moderatelycorrelated 3– Stronglycorrelated

COURSE CONTENT

Minimum five assignments shall be performed to cover entire curriculum of course CE404UD

1.Prepare installation layout of house wiring in small building as well as in high rise building.

2.Prepare rain water harvesting layout plan for a given building.

3.Prepare layout of water supply and drainage system for residential building.

4. Suggest noise control methods for a given Commercial Complex building.

5.Prepare a plan for fire safety measures for a given multi story building.

6.Identify proper locations for Lift/ Escalator/ Elevator in a given commercial complex. (Case Study)

7. Visit a residential building & commercial building under construction and prepare layout for electrical, water supply, sanitary and related allied services of civil engineering and prepare site visit detailed report. (Site visit is Mandatory)

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute

CE410U: Industrial Lectures

Teaching Scheme: 01P Total: 1 Hr **Credit: 1**

Evaluation Scheme: 50 ICA **Total Marks: 50**

COURSE DESCRIPTION

The course helps students to interact with experts from different fields which will help students to get informed with latest processes, technology etc used in field, to get practical knowledge, etc.

COURSE OBJECTIVES

1. To provide platform for students to have interaction with experts from different fields.
2. To get idea about latest processes and technology used in field.
3. To provide a bridge between education and industry.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. match the industry atmosphere.
2. know latest processes and technology used in field.
3. learn from experiences of experts.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		1	2	1			1		2	2	2	1		1	1
2		1	2	1			1		2	2	2	1	1	1	1
3		1	2	1			1		2	2	2	1		1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

There shall be minimum 4 lectures of 60-90 minutes duration.The lecture shall include presentation, informal discussions with students and faculty, andlaboratory tours (ifrequired).

Topics of Industrial Lectures shall be technical in nature and should not be the specific or extended part of thecurriculum.

Typically speakers should talk about:

i. Their own career following (and sometimes including) university.
ii. Interesting jobs/projects they have had worked on.
iii. The areas of work they are currently involved in.
iv. The type of work engineering graduates can expect.
v. Current job opportunities that may be available for engineering graduates in general and Civil engineering graduates in particular.

vi. Any suggestions for students with regard to job hunting / CV writing / interviews etc.

vii. Latest technology used in the industry which is not the part of curriculum or routine training programs.

viii. Any other suitable topic/information which provides industrial exposure and improves entrepreneurshipquality/ employability of the students.

ix.

Course coordinator shall discuss with students on the content of lecture and may conduct oral or give writtenassignments to judge the depth of understanding of students. Students shall submit the report based on minimum six lectures giving summary of the lecture delivered.

Industrial Lecture deliverables: An industrial lecture report as per the specified format (available on thedepartment and institute's website) and assignments given by course coordinator (if any)

(**Note:** List of renowned experts/Officials/Entrepreneurs from Industries/Government Organizations/PrivateSectors/Public Sectors / R&D Labs etc shall be prepared by the committee appointed by HoD and shall be approved by principal. After approval from the principal, minimum six Industrial Lectures shall be arranged,which shall be delivered by experts to cover the various aspects of course content)

Evaluation system:

It includes Internal Continuous Assessment (ICA). Guidelines for ICA are given bellow.

Internal Continuous Assessment (ICA) : The ICA shall be evaluated by course coordinator. Course coordinator shall judge the students on the principle of continuous evaluation andcontribution ofindividual student.It shall be evaluated on the basis of deliverables of industrial lecture and depth of understanding (oral conductedby course coordinator).

S.No.	Name of Student	Attendance (2 Marks per Lecture)	Depth of Understanding (04 Marks per Lecture)	Report Writing	Total
		12	24	14	50

CE411U: PROJECT PHASE- I

Teaching Scheme: Total: 2Hr **Credit: 3**

Evaluation Scheme: 25 ICA + 75 ESE **Total Marks: 100**

COURSE DESCRIPTION

The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

GUIDELINES:

Students should fallow the following guidelines and submit the progress of the work regularly:

1. It is expected that the broad area of Project phase I shall be finalized by the student in the beginning of the VII semester. Extension of Minor project undertaken may be Project.
2. In general a group of Maximum 5 students shall be allotted for Project and same project group for Project phase II.
3. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The Synopsis/Abstract on the selected topic, after detail literature survey should be submitted to the Project guide appointed by Head of the department.
4. Project phase I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data , conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
5. Within three week a sort of session, a review of all Project work area will be taken by a committee comprise of guide, expert and HOD
6. Another presentation will made to finalize the title of project within a month from first presentation.
7. Approximately more than 50% work should be completed by the end of VII semester.

8. Each student group is required to maintain log book for documenting various activities of Project phase I and submit group project report in the form of thermal bound at the end of semester–VII. Submit the progress report.
9. Evaluation Committee comprising of the Guide, Expert and HOD appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in Table-A.

Assessment of Project-I Name of the Project:_____ Name of the Guide:_____

Table- A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	A Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Presentation
		20	20	30	10	20
		5	5	5	5	5

SH496U ORGANIZATIONALBEHAVIOUR

Teaching Scheme: 03 L **Total : 3 Hr** **Credit: 03**
Evaluation Scheme: 30 MSE +10 ISA + 60 ESE **Total marks: 100**

COURSE DESCRIPTION:

The course is intended to provide basic understanding of organizational behaviorto engineering students with the basic concept of attitude & job satisfaction. This course introduces the student to the fundamental concepts of organizational behavior(OB); personality, perception and decision making, motivation and leadership etc. Students will study the interpersonal behavior.Students will learn organizational change and conflict management.

COURSE OBJECTIVES:

1. To understand fundamentals of behavior in an organization.
2. To increase understanding of the concept of attitude & job satisfaction in an organization.
3. To acquaint the students with the appropriate concepts, theories to make better understanding of behavioral dynamics.
4. To understand the latest developments and cultivate an understanding of organizational culture and structure.
5. To understand applications of organizational change, power and conflict.

COURSE OUTCOMES:

Upon successful completion of this course the students will able to:

1. know the basic concept of organizational behavior
2. demonstrate the ability to personality, perception and decision making
3. apply the fundamental concepts motivation and leadership
4. know the interpersonal behavior
5. deal with organizational change and conflict management

Relevance of Program Outcomes (POs)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1					1										2
2						3		1						1	2
3							2	1							2
4								2	2		2				2
5											3			1	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Organisation Behaviour: Field of organization behaviour: past and present, importance, emerging issues, organization behaviour: a frame workand interdisciplinary influences on organization behaviour, challenges and opportunities for organization behavior.

Attitude & Job Satisfaction:main components of attitudes, types of attitude, attitude and consistency, cognitive dissonance theory, relationshipbetween attitudes andbehavior, major job attitudes, job satisfaction, measuring job satisfaction, factors determining job satisfaction, the impact of satisfiedand dissatisfied employees on the workplace.

Personality, Perception and Decision Making: Personality: Definitions, Myers-Briggs Type Indicator (MBTI), The Big Five Personality Model, Personality Traits, Perception: factors affecting perception, Attribution theory, Improving perception, Perception and its application in organization, Decision Making: Meaning, Types of decisions, DecisionMaking Process, Individual Vs Group Decision Making, Decision Making Conditions, Creativity.

Motivation and Leadership:motivation: definitions, meaning, types, Maslow's theory of hierarchy of needs, Alderfer's ERG theory, McCellands Learned Needs Theory, Theory X and Theory Y, Motivation-Hygiene Two Factor theory, Goal Setting Theory. Leadership: definitions, types, traits of leadership, transactions vs transformational leadership, VUCA leaders, leadership grid & leadership formulation.

Interpersonal Behaviour: Introduction - Johari window, Ego state Analysis of transactions, Life script-Life positions-Stroking, Psychological games, Benefits of transactional analysis.

Organization Culture and Structure: Concept of organizational culture, functions of organizational culture, organization structure: definition, form of organisational structure – formal and informal organisation, span of management, types of organizational structure

Organizational change and Conflict: Introduction-understanding change-organisational growth as a kind of change, forces of change, forces for change, factors in organizational change, planned change, human response to change, resistance to change, managing resistance to change**Conflict**: Definition, transition of conflict, types of conflict, conflict process, causes of conflict, conflict resolution model.

Power & Politics: Definition & meaning, difference between power & authority, bases of power, power tactics, politics: power in action, factors contributing to political behavior: individual &organizational, impression managementpolitics - techniques of political plays-Machiavellianism-strategies used by executives

Text Books:

1. Organizational Behavior, Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, 18th edition, Pearson publications, 2018
2. Organizational Behaviour, Shuchi Sharma, 1st edition, Tata McGraw Hill, 2012
3. Organizational Behaviour, Ray French, Charlotte Rayner, Gary Rees and Sally Rumbles, 3rd edition, Wiley Publications, 2015
4. OrganisationalBehaviour, K. Aswathappa, 12th edition, Himalaya Publishing House, 2016

Reference Books:

1. Business Psychology and Organisational Behaviour: A Student's Handbook, McKenna, E. F., Psychology Press, 2000
2. A Organisational behaviour on the Pacific Rim,Tony Travaglione, Steven McShane, and Mara Olekalns, 3rd edition, McGraw-Hill Higher Education, 2010
3. Leadership: A New Synthesis, Hunt, J. G., 4th edition, Sage Publications, Inc, 1996

CE451U(A):RAILWAY, TUNNEL AND AIRPORTENGINEERING

Teaching Scheme: 3L Total: 3Hr **Credit: 3**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**

Duration of ESE: 3 Hrs

COURSE DESCRIPTION

To provide the basic knowledge of types of rails and its components, Design of Rail Geometrics, to understand the Layout of an airport and its classification, Design of Runway and Taxiways and Introduction to tunnel engineering.

COURSE OBJECTIVES

1.Design the geometrics of a Railway Track.
2. To learn the modernizations in railways.
3.To study types of tunnels and methods of tunneling.
4. To study the corrected runway length and taxiway geometrics.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. calculate stresses in railway track
2. design the railwaytrack
3. identify the suitable method of tunneling
4. calculate the corrected runway length and taxiway geometrics

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2		2										2		
2		3	3										3		
3	2													2	
4		3	2										2		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Railway: Characteristics of railway transport, classification of railway, track standard terminology, track sections in embankment and cutting, engineering survey.

Railway Track Gauge: Different gauges on indian railways, loading gauge, construction gauge, unigauge, problems caused by change of gauge.

Track and Track stresses: Requirements, forces acting on track, coning of wheels, tilting of rails, rails: functions, types of rails, rail joints, rail failure, function suitability and drainage, treatment, defects, standard rail sections.

Sleeper: Functions, requirements, types of sleepers; concrete sleepers, pre stressed, sleeper density, manufacturing and spacing of sleepers, ballast: function, specifications of track ballast, track fittings: fittings and fastening.

Alignment of Railway lines: Importance, basic requirements of an idealalignment, selection of a good alignment, geometric design of track: necessity for geometric design, gradients, grade compensation on curves, super elevation, equilibrium cant, cant deficiency, maximum permissible Speed, negative super elevation.

Resistance to Traction: Resistance to-friction, wave action, causes of creep, effects of creep, measures to reduce creep. speed, track irregularity, wind, gradient, curvature. stress in rails, sleepers, ballast and formation.

Construction and Track maintenance: Plate laying method, operations involved Tools & common items of track maintenance.

Points and crossings: Important terms, types of track layouts and sketchesof turn out, diamond crossing, triangle, double junction, scissors cross over, single slip, double slip, gathering line, signaling and interlocking: objectives of signaling, classification of signals, CTC and ATC system, interlocking & it's principles.

Railway Stations and yards: Classification of railway stations, Purpose, facilities required at railway stations, requirements of station yard, types of yards,

Modernization in railways: Types of railways, high speeds, improvementsin track structure: components, automation, safety aspects, introduction to skybus, monorail & metro rails.

Tunnels: Necessity, types, advantages and disadvantages of tunnels compared to open cuts, tunnel alignment, size and shape of tunnels, tunnel lining,drainage, ventilation & lighting of tunnels, tunneling methods for soft ground and hard ground, method of mucking, drilling, and blasting.

Airport: Agencies controlling national and international aviation, various surveys to be conducted, airport, classifications (ICAO), selection of site for airportAirport obstructions: Zoning laws, imaginary surfaces, approach and turning zone.

Runway and Taxiway Design: Orientation of runway, wind rose diagram, basic runway length and corrections, runway geometric design standards, drainage, introduction to pavement design airport layout, terminal area, unit terminal concept, apron, apron layout, aircraft parking, hangers, environmental guidelines for airport projects, heliports, main characteristics of helicopters, nature of helicopters transport, site selection for helicopters

Text Books:

1. A Text Book of Railway Engineering, Saxena S. C. & Arora S. P.,7th edition, Dhanpat Rai Publications(P) Ltd., New Delhi, 2015.

2. Airport Planning & Design, Khanna S. K., Arora M. G. , Jain S. S. , 6thedition, Nemchand&Bros., Roorkee,2012.
3. A Text Book of Transportation Engineering, S. P. Chandola, S. Chand &Co.New Delhi, reprint 2008.
4. Tunnel Engineering, S. C. Saxena, Dhanpat Rai Publications(P) Ltd., New Delhi.
5.

Reference Books:

1. Principles of Transportation Engineering, Chakroborty P. and Das A., 1st edition, Prentice Hall of India, 2009.
2. Transportation Engineering Vol. I & II, V.N. Vazirani& S.P. Chandola, 7thedition , Khanna Publishers, New Delhi, 2003.
3. Railway Engineering, Satish Chandra & Agrawal M. M., 2nd edition, Oxford University PressIndia, 2013.
4. Harbour, Dock & Tunnel Engineering, Shrinivasan R., 27th revised edition, Charotar publishing House Pvt. Ltd., 2009.

CE451U (B): GEO-SYNTHETIC ENGINEERING

Teaching Scheme: 3L **Total: 3Hr** **Credit: 3**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**

Duration of ESE: 3 Hrs

COURSE DESCRIPTION

The Civil Engineering Students will introduce and expose to design and analysis of geosynthetic materials used in geotechnical applications. Geosynthetics provide a design alternative that has the potential of overcoming a wide variety of difficult site conditions. It also deals with the manufacturing techniques, and design and construction aspects of geosynthetics in geotechnical engineering applications. The application of geotextiles, geogrids, geomembranes geofoam, geotextile tube, in civil engineering are elaborated.

COURSE OBJECTIVES

1. To understand the emerging trends of Geosynthetic in Geotechnical Engineering
2. To evaluate the different properties of geosynthetics by different tests
3. To analyze the functions of geosynthetic and its suitability
4. To design different structures using geosynthetics according to various applications

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. identify the type of geosynthetics and their relevance in geotechnical field
2. find the mechanism of formation of different geosynthetics
3. analyze and compute different properties of geosynthetics
4. apply the knowledge for designing the structures using Geosynthetic materials

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2												3		
2		3											2		
3			3											2	
4		3											2		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Geosynthetics classifications, functions, applications, raw materials used. Different types of Geosynthetics, manufacturing, system, Design and sustainability.

Various properties of Geosynthetics, physical properties, mechanical properties, hydraulic properties & endurance properties,

Mechanism of filtration and drainage functions & their applications,

Erosion control – Wind erosion, Rain water erosion, Use of geotextile, Geotextile beneath rock rip-rap, Geotextile filters – Design criteria, Construction criteria, Erosion control measures using Geogrids, Erosion control mattresses, Geotextile silt fences for erosion control

Pavement construction using Geotextile – Mode of action, design methods, Construction methods.

Bearing capacity improvement – Soil mass reinforcement geometry, Mechanism, Modes of failure (Binquet and Lee theory), Foundation on soil with geotextile reinforcement, Design procedure

Reinforced retaining walls – Geotextile reinforced walls – Construction procedure, Analysis, Design, Design of gabion walls using Geotextile, Geogrid soil walls – Construction, Design, Different types of facing elements, construction procedure, cost.

Model for single and multi-layer reinforced slopes, guidelines for design of reinforced slopes,

Design of basal reinforced embankment, placement of Geosynthetics, construction procedure, widening of existing road embankments.

Consolidation techniques, Development of design chart for prefabricated vertical drains, ground instrumentation and monitoring, Design of encased stone columns, geocell/geofoam systems.

Geotextile tubes, geotextile containers, geotextile bags, dewatering waste and contaminated sediments, installation and design of geotextile tube.

Design of landfill liner, veneer slope stability without and with seismic analysis, run out length, settlement of landfill, advantage of LSS model.

Applications, advantage, function of geofoam, physical, mechanical and thermal properties of geofoam, design of embankment using geofoam, geofoam reinforced soil walls, New light weight fill material.

Text Book:

1. Engineering with Geosynthetics, G.V.Rao and G.V.S.S Raju, Tata-McGraw Hill Publication, New Delhi, Latest edition.
2. Reinforced Soil and its Engineering Applications, Swami Saran, I. K. Internationals, Latest edition.
3. Designing with Geosynthetics, R.M. Koerner, Xlibris Corporation, Latest edition.

4. Geosynthetics World, Mandal J. N., New Age International, Latest edition

Reference Books:

1. Construction and Geotechnical Engineering using Synthetic Fabrics, R.M. Koerner and J.P. Welsh, John Willey and Sons, Latest edition
2. Construction and Geotechnical Methods in Foundation Engineering, R. M .Koerner, McGraw Hill Publication, Latest edition.
3. Fundamentals of Geosynthetic Engineering , Sanjay Kumar Shukla and Jian-Hua Yin, Taylor and Francis Group UK, Latest edition
4. Geosynthetics in Civil Engineering, R W Sarsby, Elsevier Science, Latest edition
5. An Introduction to Geosynthetic Engineering, Sanjay Kumar Shukla, CRC Press, Taylor & Francis Group, Latest edition.
6. A Guide to Geotextiles Testing, Mandal J. N. and Devshikar D. G., New Age International, 1st edition, Latest edition
7. https://nptel.ac.in/courses/105101143/

CE451U(C)ENVIRONMENTAL GEOTECHNOLOGY

Teaching Scheme: 03L **Total: 3Hr** **Credit: 03**
Evaluation Scheme:30 MSE + 10 ISA + 60 ESE **Total Marks:100**
Duration of ESE: 03Hrs

COURSE DESCRIPTION

The course describes various causes of soil pollution, behavior of the pollutants and its detection and testing methods. It also outlines the application of geo synthetics in solid waste management along with current practice for waste disposal.

COURSE OBJECTIVES:

1. Understand the causes of soil pollutants and factors affecting soil pollutant interaction
2. Selection and characterization of land fill site
3. Understand the ground water pollution due to transport of contaminant.
4. To study the remediation of contaminated Soils

COURSE OUTCOMES:

Upon successful completion of this course the students will:

1. identify the causes for soil pollution and behavior of the pollutants.
2. characterization of disposal site and waste.
3. evaluate and remediate contaminated sites and monitor to bring natural attenuation

Relevance of Program Outcomes (POs)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		3												2	
2		2												3	
3			2												2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Soil- Pollutant Interaction: Introduction to geo environmental engineering, environmental cycle, sources, production and classification of waste, causes of soil pollution, factors governing soil-pollutant interaction, Physicochemical behavior and modelling, failures of foundations due to pollutants.

Characterization, Stabilization and Disposal Safe disposal of waste, site selection for landfills, characterization of land fill sites, waste characterization, stability of landfills, current practice of waste disposal, passive contaminant system,hazardous waste control and storage

system,mechanism of stabilization, solidification of wastes, micro and macro encapsulation, absorption, adsorption, precipitation- detoxification, organic and inorganic stabilization.

Transport of Contaminants: Contaminant transport in sub surface, advection, diffusion, dispersion, governing equations, contaminant transformation,absorption, biodegradation, ion exchange, precipitation, hydrological consideration in land fill design, ground water pollution, pollution of aquifers by mixing of liquid waste, protecting aquifers.

Detection and Testing Methods:Review of current soil testing concepts, Proposed approach for characterization and identification of contaminated ground soil for engineering purposes.

Remediation of Contaminated Soils: Rational approach to evaluate and remediate contaminated sites, monitored natural attenuation, exsitu and insitu remediation, solidification, bio – remediation, incineration, soil washing, electro kinetics, soil heating, verification, bio venting. Ground water remediation, pump and treat, air sparging, reactive well, application of geo synthetics in solid waste management, rigid or flexible liners.

Text Books:

1. Introduction to Environmental Geotechnology, Hsai Yang Fang and John Daniel, CRC press, Taylor and Francis, Latest edition
2. Geotechnical Practice for Waste Disposal, Daniel, B.E., Chapman and Hall, London, Latest edition
3. Geoenvironmental Engineering – Site Remediation, Waste Containment, Emerging waste management technologies, Hari D. Sharma and Krishna R. Reddy, John Wiley and Sons, Latest edition

Reference Books:

1. Environmental Geotechnics, Robert Sarsby, Thomas Telford, Latest edition
2. Hazardous Waste Management, Lagrega, M.d., Bukingham, P.L., and Evans, J.C., McGraw Hill, Inc. Singapore, Latest edition
3. Basics of Solid and Hazardous Waste Management Technology, Kanti L. Shah, Prentice Hall; Latest edition
4. Advances in Solid and Hazardous Waste Management, Sudha Goel, Springer, Cham, Latest edition
5. Solid and Hazardous Waste Management: Science and Engineering, M.N. Rao, Razia Sultana, Sri Harsha Kota, Anil Shah, Naresh Davergave, B S publication, Elsevier, Latest edition
6. Hazardous Waste Management, Wentz, C.A., McGraw Hill, Singapore, Latest edition.

CE451U(D)CONSTRUCTION EQUIPMENT AND AUTOMATION

Teaching Scheme: 03L **Total: 3Hr** **Credit: 03**
Evaluation Scheme:30 MSE + 10 ISA + 60 ESE **Total Marks:100**
Duration of ESE: 03Hrs

COURSE DESCRIPTION

In this course students are introduced to modern construction equipment's, their applications and the concept of advanced techniques adopted in construction.

COURSE OBJECTIVES

1. To understand different excavating, compaction, earthmoving, pile driving and pumping equipment's.
2. To know about the concrete mixing, transporting and placing equipment.
3. To provide knowledge on automation in construction industry.

COURSE OUTCOMES

Upon successful completion of this course the students willable to:

1. identify types and capacity of equipment used for excavation
2. select proper compacting and earthmoving equipment
3. identify proper equipment for concrete work, pile driving or pumping
4. apply automation in construction

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	3											3		
2		3												3	
3		3												3	
4				3										3	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Excavating Equipment: Different types of Excavator such as Front shovel, hoes. Their selection, calculation of shovel production, height & cut of shovel, angle of swing effect on shovel production, calculation of hoe production, Type of loaders their bucket attachments, loader production rates, calculation of wheel loader production, equipment for underground open excavation - Trenchless Technology

Compacting Equipment: Compaction of soil and rock, types of compacting equipment, roller production estimating, Dynamic compaction

Earthmoving Equipment: Tractors and attachments, dozers and rippers, scrapers , shovels, draglines, trenching machines, clamshell, hoes, trucks and wagons, dumpers, rollers and compactors

Pile driving equipment: Types, pile driving hammers, single acting and double acting, differential acting hammers, hydraulic and diesel hammers, vibratory drivers

Pumping equipment: Reciprocating, diaphragm & centrifugal pumps, well point system.

Concrete mixing, transporting & placing: Concrete compacting equipment, mixers, central batching and mixing plants, pavers, transit mixers, concrete pumps, shotcrete, Air Compressor equipment for moving materials, Prestressing jacks and grouting equipment

Material Handling Equipment: Builder's hoists, Forklifts, cranes, booms, belt-conveyors, cableways, ropeways.

Automation in construction industry: Advantages of automation in construction industry, Use of Drones for spread out sites;Use of robots for repetitive activities, Use of 3D printers, Hundegger, Trimble

Text Books:

1. Construction Planning, Equipment's and Methods, R. L. Peurify, McGraw Hill Publication, Latest edition
2. Construction Equipment and its Planning and Applications, Mahesh Varma, Metropolitan Book Co. (P) Ltd., New Delhi, India, Latest edition
3. Construction Equipment & Management, S.C. Khanna, Khanna Publishers, Latest edition

Reference Books:

1. Construction Equipment and Methods: Planning, Innovation, Safety, Leonhard E. Bernold, Wiley Global Education, Latest edition
2. Construction Equipment and Job Planning,S.V.Deodhar,Khanna Publishers, New Delhi, Latest edition

CE452U(A) BRIDGE ENGINEERING

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30 ESE + 10 ISA+ 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course deals with basic components of bridge superstructure and substructure: its analysis and design for various loads coming during their service life.

COURSE OBJECTIVES

To give an overview of loadings coming on bridge components for the analysis purpose.

COURSE OUTCOMES

Upon successful completion of this course the students will:

1. classify loadings on bridge superstructure.
2. analyse various bridge components.
3. design various bridge components.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2											1			
2				2		2									
3				1	2	2									

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction: Evolution of Bridges, Reinforced Concrete Bridges, Pre-stressed Concrete Bridges, Cable-stayed Bridges, Standard Specifications

Bridge Loading Standards :IRC Bridge Loading Standards, Impact Factors, Indian Railway Bridge Loading Standards

Reinforced Concrete Slab Bridge Decks : Flexural and Shear Strength of Reinforced Concrete Bridge Decks, Analysis of Slab Decks, Design of Slab Culvert for IRC Class AA & A Loads

Tee Beam and Slab Bridge Deck: Tee Beam Slab Decks, Design Principles, Load Distribution on Slab Decks, Design Example.

Pre-stressed Concrete Bridges: General Features, Pre-tensioned and Post-tensioned Pre-stressed Concrete Bridges, Design of Post-Tensioned Tee Beam and Slab Bridge Deck system.

Piers and Abutments: Bed Block, Piers and Abutments, Forces acting on Piers, Design of Piers, Forces acting on Abutments, Design of Abutments.

Text books:

1. Design of Bridges , N. Krishna Raju, Oxford and IBH , Latest edition.
2. Essentials of Bridge Engineering, D. Johnson Victor, Oxford and IBH , Latest edition.
3. Bridge Engineering, S. C. Rangawala, Charotar Publishing, Latest edition.

Reference books:

1. Design of Bridge Structures, T. R. Jagdeesh and M. A. Jayaram, Prentice Hall of India, Latest edition.
2. IRC 6 (2014), Section II: Loads and Stresses.
3. IRC 112 (2012), Design Criteria for RCC and PSC Bridges

CE452U(B) Advanced Foundation Engineering

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30 ESE + 10 ISA+ 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

Understand the need for having foundation and their types to suit the practical requirements. Develop an understanding about the requirements of foundations for their satisfactory performance.

COURSE OBJECTIVES :

1. Classify and suggest foundation type for various field and loading conditions, understand the basic requirements of a satisfactory foundation and the determinants of foundation location and depth, and proportion shallow foundations.
2. Estimate individual vertical and lateral pile load capacity, pile group capacity, and pile group efficiency.
3. Explain the causes of expansive nature of clays, simple methods to assess the swelling potential and methods to prevent and overcome swelling of expansive clays

COURSE OUTCOMES

After completion of this course students shall be able to

1. evaluate shear strength behavior of soil under different drainage conditions and compressibility potential under complex pore pressure conditions.
2. determine stresses due to applied loads for the analysis of settlement.
3. explain the advanced methods of computation of bearing capacity for homogenous, layered and sloping soil deposit under the axial or eccentric/inclined loads and settlement for different types of soil.
4. illustrate the methods of ground improvement technique for improvement of weak soil.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2											1	2		1
2				2		2									
3	2			1	2	2							2		1
4	2	1			1								2		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Consolidation: Terzaghi's theory of One Dimensional Consolidation – derivation of equation (solution in detail need not be covered), Field consolidation curves, Consolidation settlement of NC and OC clays, practical applications

Stress and strain behavior of soil Failure criteria in soils – only Mohr – Coulomb's criteria, Ideal, plastic and real soil behavior, Shear strength of sand and clays. Skemton's pore pressure parameters. Soil elastic modulus

Estimation of stresses Boussinesq's theory, Westergard's theory, Newmarks charts.

Bearing capacity and settlement analysis of shallow foundations: Bearing Capacity theories – Terzaghi solution (detailed approach), Vesic's theory. IS 6403 (1981) method and Skempton's method. Assumptions in estimates of ultimate loads, Effect of shape, embedment of footing, eccentricity and inclination in loading. Effect of compressibility (including critical rigidity index), Bearing capacity of non-uniform soils (Meyerhof &Hamnna).Foundation on Sloping Ground. Elastic settlement use of Steinbrenner and Fox Theory, Schmertmman's method. Bearing capacity of foundation on compact and weathered rock. Raft foundation. Foundations on collapsing and swelling soils, compressible soils and on rock, R.C.C. design of isolated and combined footings

Pile foundations: Use of load tests, Estimation of single pile capacity by static formulae using β methods and dynamic methods, Group capacity, Separation of skin friction and end bearing capacity, Settlement of single and group of piles. Capacity from in-situ tests (SPT and SCPT). Piles in weathered rock. Piles subjected lateral load. Elastic –p-y curve analyses. pile subjected to uplift loads

Ground improvement: Ground improvement of soft soil: Sand Drains/Band Drains, Stone columns and Dynamic consolidation. Geological properties of reinforced soils, Design of Reinforced Earth wall using Geogrid using BS 8006 or other relevant codes and use of Geocell. Instrumentation – mainly pore pressure gauges and settlement gauges and their applications. Introduction to Grouting techniques.

Introduction to Soil Structures Interaction Introduction to soil - Foundation interaction problems, Soil behaviour, Foundation behaviour, Interface, behaviour, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behavior.

Text Books

1. Shallow Foundation- Bearing Capacity & Settlement, B.M. Das, Taylor & Francis.
2. Principles of Foundation engineering, B.M. Das, PWS Publishing Company, Latest edition.
3. Basic and applied soil mechanics, Ranjan, Gopal andA.S.R. Rao, New Age International Pvt. Ltd., Latest edition
4. Advanced Foundation Engineering, V.N.S. Murthy, CBD Publishers and Distributors, New Delhi, Latest edition.

5. Pile foundation analysis and design,H.G. Poulos and E.H. Davis, John Wiley and Sons, New York, Latest edition.
6. Elastic Analysis of Soil Foundation Interaction, A.P.S. Selvadurai, Elsevier, Latest edition.
7. Designing with Geosynthetics, R.M. Koerner, (Third Edition), Prentice Hell, Latest edition.

References:

1.Soil Mechanics in Engineering Practice,K. Terzaghi and R.B. Peck Wiley and Sons, Latest edition.
2. Soil Mechanics and Foundation Engineering, Alamsingh,Vol I & Vol II, Standard book House, Latest edition.
3.An introduction to geotechnical engineering, R.D. Holtz andW.D. Kovacs Prentice Hall, Latest edition.
4.Foundation Engineering Handbook, H. Winterkorn and F.Y. Fang CBS Publishers & Distributors, New Delhi, Latest edition.
5.Foundation Analysis and Design, J.E. Bowles ,McGraw-Hill Book Co, Latest edition.
6. Pile Foundations in Engineering Practice, P. Shamsher and H. Sharma,Wiley and Sons, 1990.
7. Ground Improvement Techniques (HB), R. Purushothama, Laxmi Publication Pvt Ltd., New Delhi, Latest edition.
8. Engineering Principles of Ground Modification,M.R. Hausmann, McGraw-Hill Inc., US, Latest edition.
9. IS1892 (1979), Subsurface Investigation for Foundation.
10. IS6403 (1981), Determination of Bearing Capacity of Shallow Foundation.
11. IS8009 Part I (1978), Calculation of Settlement of Foundation and Shallow Foundation Subjected to Symmetrical Static Vertical Loads.
12. IS2911 Part I (2010), Design and Construction of Pile Foundations, Part I Concrete Piles.
13. IS1888 (1982), Method of Load Test on Soil.
14. IS1904 (1986), Design and Construction of Foundation in Soil – General Requirements.
15. IS15284 Part I (2003), Design and Construction for Ground Improvement – Guidelines, Part I – Stone Columns.

CE452U(C): ADVANCED DESIGN OF STEEL STRUCTURES

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 4Hrs

COURSE DESCRIPTION

The primary aim of this course is to provide an introduction to the analysis and design of advanced steel structures, The course covers design of various structures with elements viz. Towers, Tubular structures, chimneys etc It equips the students with the tools necessary for designing steel structures and to familiarize them with the relevant design code

COURSE OBJECTIVES

1.To understand behavior of structural members under various loadings.
2.To understand concept of advanced steel structural design
3.To conceive elementary design of different structural steel elements.

COURSE OUTCOMES: After successful completion of this course; student shall be able to

1. understand details of steel structural drawing and design .
2. design the advance structures like towers , tubular structures and PEB as per I.S.800-2007.
3. design and calculate design load for various advanced structures
4. design of Gantry girder.
5. design of plate girder.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	2	1					1		1		1		
2	1	2	2	3							2	1			2
3	2	2	1	3					2				2	2	
4	2	2	2						2		2	1	3		2
5	1	2	1	2					1		2				

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Structures : Analysis and design of hoarding structures under dead, live and wind load conditions as per code provisions by limit state method, introduction to fatigue failure. Introduction to gantry girder.Plate Girder

Microwave Towers: Introduction, structural configuration, function, analysis and design.

Transmission Towers: Introduction, structural configuration, bracing systems, analysis and design as per code provisions.

Tubular Structures: Design of tubular Trusses and scaffoldings using circular hollow, rectangular hollow sections as per codal provisions, detailing of joints.

PEB structures: (Pre engineered buildings,) Introduction , types , methods, advantages and disadvantages.

Text Books:

1. Design of steel Structures, Volume II,Ram Chandra, Standard Book House, Delhi, Latest edition
2. Comprehensive Design of steel structure,Punmia and Jain, Laxmi Publications, Delhi, Latest edition
3. Design of steel structures, M Raghupathi, Tata McGraw Hill, New Delhi, Latest edition.
4. Limit state design of steel structures, S K Duggal, Tata McGraw Hill New Delhi, Latest edition
5. Design of steel structures, N Subramanian, Oxford University Press, Latest edition

References Books:

1. Structural Design in Steel ,SarwarAlamRaz, New Age International Publishers, Latest edition

2. IS: 800 - 2007, Code of Practice for General Construction in Steel, BIS, New Delhi.

3.IS: 801 - 1975, Code of Practice for use of cold formed light gauge steel structural members in general building construction, BIS, New Delhi.

CE452U (D) SOLID AND HAZARDOUS WASTE MANAGEMENT

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3Hrs

COURSE DESCRIPTION

This course focuses on complete understanding of solid waste management. This course provides an in-depth understanding of solid and hazardous waste characteristics and management. Some basics of radioactive waste characterization and handling are also provided**.**

COURSE OBJECTIVES

1. To provide comprehensive overview of solid, biomedical and hazardous waste management.
2. To provide knowledge on solid waste management design aspects.
3. To learn about the different methods of solid waste management..

COURSE OUTCOMES :

Upon successful completion of this course, students will be able to

1. know solid waste remedial measures and their importance.
2. articulate Various aspects of solid waste management system.
3. design solid waste management system
4. do projects related to solid waste management.
5. analysis requirements and objectives of municipal solid waste management.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3					1	3	1		2		1	3		
2	3					1	2	1		1			3		
3	3	1	3	1			2			1		1	3	2	
4	3	3		1			1				2			2	1
5	2	1	1	2			2			1			3	2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Relevant Regulations : Municipal solid waste (management and handling) rules; hazardous waste(management and handling) rules; biomedical waste handling rules; fly ash rules; recycled plastics usage rules; batteries (management and handling) rules

Municipal Solid Waste Management : Fundamentals Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options

Hazardous Waste Management : Fundamentals Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects

Radioactive Waste Management : Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal Options

Environmental Risk Assessment: Defining risk and environmental risk; methods of risk assessment; case studies

Physicochemical Treatment of Solid and Hazardous Waste : Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation); ground water contamination and remediation's

Biological Treatment of Solid and Hazardous Waste : Composting; bio-reactors; anaerobic decomposition of solid waste; principles of bio-degradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bio-reactor; in-situ remediation
Landfill design : Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration

Textbooks

1. Hazardous Waste Management, La Grega, M.D. Buckingham,P.L. and Evans, J. C. McGraw Hill International Editions, New York, Latest edition.
2. Sources, Pathways, Richard J. Watts, Hazardous Wastes Receptors John Wiley and Sons, New York, Latest edition
3. Waste Management – Collection, Processing and disposal. D.Bhide and B.B.Sundaresan, Mudrashilpa Offset Printers, Nagpur, Latest edition.

Reference Books

1. Ecology Science and Practice; Claude Fourie, Christian Ferra, Paul Medori, TeanDevaux, Oxford and IBH Publishing Co (Pvt) LTD, special Indian edition. Engineering", Pretice Hall of India, Latest edition.
2. Solid Waste Management – Collection, Processing and disposal, D.Bhide and B.B.Sundaresan, Mudrashilpa Offset Printers, Nagpur, Latest edition.

3. Solid Waste Engineering Principles and Management, TechobanoglousThiesenEllasen; McGraw - Hill Latest edition.
4. Manual on Municipal 1 Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, Latest edition.
5. Solid Waste Management in Developing Countries, Blide A.D.&Sundaresan, B.B, INSDOC, Latest edition

CE453U(A): STRUCTURAL HEALTH MONITORING AND AUDITING

Teaching Scheme: 3L Total: 3Hr **Credit: 03**
Evaluation Scheme: 30 ESE + 10 ISA+ 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course deals with basic concepts of structural health monitoring using various sensors and its applications for service life predictions.

COURSE OBJECTIVES

1.To give an overview of the methods used for structural health monitoring and auditing.

COURSE OUTCOMES

Upon successful completion of this course the students will able to :

1. knowmethods used for structural health monitoring.
2. analyse the data acquired through various sensors.
3. choose method for structural performance audit.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2											1			
2				2		2									
3			2	1	2	2									

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction: NeedforStructural and Performance Health Monitoring, Performance, Assessment, Data Collection, Storage, and Transmission, Data Processing, Decision making, and Prognosis

Sensors : Accelerometers, Dial Indicators, Strain Gages, Crack and Joint Width Measurement Systems, Schmidt Hammer , Concrete Pull-off Testers, Permeability Testers, Pressure Gages, Electrical Sensors, Load Cells, Fibre Optic Sensors, Chemical and Corrosion Sensors

Data Acquisition : Amplitude Range and Quantization, Digitization in Time and Space, Data Transmission, Sensor Networks

Health Monitoring and Prognosis: Concept of Health Monitoring, Visual Inspections, Condition Assessment, Damage Indices, Load Testing, Load Rating of Structures, Load, Fatigue

and real-Time Monitoring, Root Cause Analysis, Failure Prognosis, Corrosion and Chemical Damage, Long-Term Monitoring, Post-event Assessment, service life prediction of the structure

Structural Performance Audit: Geometric Configuration, Construction Sensing Systems, Operational Load Performance Assessment, corrosion, Chemical Attack, Moisture, Floor Vibrations, Bridges and Roadways, Railroads, Fatigue performance, Special and Monumental Structures.

Text books:

1. Structural Health Monitoring, D. Balageas, C. P. Fritzen and A. Guemes, John Wiley , Latest edition.
2. Structural Sensing, Health Monitoring, and Performance Evaluation, D. Huston, CRC Press , Latest edition.

Reference book:

1. Health Monitoring of Structural Materials and Components, D.E. Adams, John Wiley, Latest edition.

CE453U (B) Ground Improvement Techniques

Teaching Scheme: 3L Total: 3Hr **Credit: 3**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**

Duration of ESE: 3Hrs

COURSE DESCRIPTION

This course deals with basic concepts of ground improvement techniques using various techniques and its applications for practical purpose.

COURSE OBJECTIVES

Students will be exposed to various problems associated with soil deposits and methods to evaluate them. The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

COURSE OUTCOMES

Upon successful completion of this course the students will able to:

1. analyze the field data and assess the requirement for improving the locally available soils.
2. describe various available techniques of ground improvement and their suitability for various soil conditions and requirement for the proposed structure.
3. analyze and suggest / propose suitable ground improvement technique for a given site with the knowledge of basic concepts
4. evaluate the stability and safety of the structures on improved ground.
5. demonstrate an ability to design retaining walls, its component or process as per the needs and specifications.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3										1	2		
2	2			2		2							3		
3	3	2	2	1	2	2								2	
4	3													2	
5	2			2											1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Problematic soil and improvement techniques

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

Dewatering:Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysis for two dimensional flow for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

Insitu treatment of cohesionless and cohesive soils

Insitu densification of cohesionless soils - Dynamic compaction - Vibroflotation, Sand compaction piles and deep compaction. Consolidation of cohesionless soils - Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles-Installation techniques – Simple design - Relative merits of above methods and their limitations. separation, road works and containment applications

Earth reinforcement

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design - Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

Grouting techniques

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring Stabilization with cement, lime and chemicals – Stabilization of expansive soil

Text books:

1.Ground Improvement Techniques , Purushothama Raj. P, Firewall Media, Latest edition.
2.Ground Improvement Techniques,Bikash Chandra chattopadhyay and JoyantaMaity, PHI Learning Pvt. Ltd., Latest edition

Reference book:

1.Construction and Geotechnical Methods in Foundation Engineering, Koerner, R.MMcGraw Hill, Latest edition.
2. Ground Improvement Blockie Academic and Professional, Moseley, M.P., Chapman and Hall, Glasgow, Latest edition.
3.Foundation Engineering Hand Book.Winterkorn, H.F. and Fang, H.Y Van NostrandReinhold, Latest edition.
4. Designing with Geosynthetics, Koerner, R.M., (Fourth Edition), Prentice Hall, Jersey, Latest edition.

CE453U(C): FINITE ELEMENT ANALYSIS

Teaching Scheme: 3L Total: 3Hr **Credit: 03**
Evaluation Scheme: 30 MSE+10 ISA+ 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course deals with the Finite Element Method used for stress analysis of the continuum structural elements.

COURSE OBJECTIVES

To give an overview of Finite element method and its applications in Civil Engineering

COURSE OUTCOMES

Upon successful completion of this course the students will able to:

1. Apply Finite Element Method.
2. Select appropriate element for finite element analysis.
3. perform finite element analysis for Civil Engineering problems.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		1					2								
2						2									
3				3			2								

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction: Introduction to Finite Element Method, General Procedure of Finite Element Analysis, History of the Finite element Method, Examples of Finite Element Analysis

Truss Elements: Bar Element, Nodal Equilibrium Equations, Element Transformation, Assembly of Global Stiffness Matrix, Boundary conditions, Element Strain and Stress.

Flexure Elements: Elementary Beam Theory, Beam Element, Beam Element Stiffness Matrix, Element Load Vector, Flexure Element with Axial Loading.

Method of Weighted Residuals: Method of Weighted Residuals, The Galerkin Finite Element Method, Application of Galerkin's Method to Structural Elements.

Interpolation Functions: Compatibility and Completeness Requirements, Polynomial forms, Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Iso-parametric Formulation, Axi-symmetric elements, Numerical Integration, Gaussian Quadrature.

Applications in Solid Mechanics: Plane Stress, Plane Strain, Axi-symmetric Stress analysis, General Three-dimensional Stress Elements, Strain and Stress Computation.

Text books:

1. Textbook of Finite Element Analysis, P.Seshu, Tata McGraw Publishing Co., Latest edition.
2. Finite Element Method with Applications in Engineering, Y.M. Desai, T.I. Eldho and A. H. Shah, Pearson Publication, Latest edition.
3. A First Course in Finite Elements, J. Fish and T. Belytschko , Wiley, Latest edition.

Reference books:

1. Fundamentals of Finite Element Analysis, D. V. Hutton, Tata McGraw Hill Education, Latest edition.
2. Introduction to Finite Elements in Engineering, T.R. Chandrupatla and A. D. Belegundu, Prentice Hall Publication, 4/e, Latest edition.
3. A First Course in the Finite Element Method, D.L. Logan, Cengage Publications , Latest edition.

CE453U(D): FORM WORK AND SUPPORT SYSTEM DESIGN

Teaching Scheme: 3L Total: 3Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3Hrs

COURSE DESCRIPTION:-

To bring about a thorough exposure to shoring, scaffolding and formwork procedures construction practice by studying the materials, planning and design aspects and erection procedures.

COURSE OBJECTIVES

1 study the materials associated with formwork
2. To study the design aspects of formwork under various requirements.
3. To study the planning and erection aspects of form work
4. To study about a few special types of forms

COURSE OUTCOMES

After successful completion of this course; student shall be able to

2. apply concept of materials of formwork.
2. design the formwork under various requirements.
3. design, planning and erection of form work
4. know special types of form work .
5. various techniques as per the requirement of design the form work.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	2	1					1		1		1		
2	1	2	2	3							2	1			2
3	2	2	1	3					2				2	2	
4	2	2	2						2		2	1	3		2
5	1	2	1	2					1		2				

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Formwork materials: Plywood -Types and grades -Textured surfaces and strength, Reconstituted wood, Steel, Aluminum. Form lining materials, Hardware and fasteners, Nails in Plywood ,Bolts, lag screws and connectors, Bolt loads. Tubular steel shores, Patented shores

Horizontal shores, Ellis shores, Dayton sure grip and Baker Roof shores, Safeway Symons shores, Dead shore, Raking and Flying shores.

Design considerations: Design considerations, Live loads and Wind pressure, Concrete pressure on form work, Concrete density -Height of discharge -Temperature -Rate of Placing. Consistency of concrete, Vibration, Hydrostatic pressure and pressure distribution.Examples Adjustment for non-standard conditions, Basic simplification Beam forms, Slab forms, Column forms, Wall forms. Allowable stresses, Check for deflection, bending and lateral stability Examples.

Overall planning: Overall Planning, Detailed planning, Standard units, Corner units, Schedule Planning at Tender stage, Development of basic system, Planning for maximum reuse, Planning examples Site layout plan, Crane arrangements, Recheck plan details, Planning for safety, Transporting plant Wales and ties Vertical transportable form work. Simple wood stresses,-Slenderness ratio, Allowable load Site Preparation, Size and spacing, Steel Tower Frames and Safety practices

Formwork for different systems: Location of job mill, Storage, Equipment, Form for Wall footings, Column footings, Slab on grade and paving work Highway and Airport paving External vibration Prefabricated panel systems Giant forms Curved wall forms Tolerance for walls Erections PracticesColumn heads-Beam or girder forms Suspended forms Suggested Tolerances Concrete Joint construction-Flying system forms. Causes of failures Case studies Finish of exposed concrete Design deficiencies Safety factors Stripping sequence Reshore installation -Advantages of reshoring.

Design considerations for different structures:
Shell forms Design considerations Loads -Building forms Strength requirements Tunnel forming components Curb and gutter forms Invert forms Arch forms Concrete placement methods- Cut and cover construction Tolerances Slip formsPrinciples Types AdvantagesFunctions of various components Planning Safety in slip forms Special structures built with slip form technique Code provisions Types of scaffoldsPutlog and Independent scaffold Single pole scaffolds Fixing tiesSpacing of ties bracing knots safety net General safety requirements Gantry and system scaffolds Shuttering for Precast members and continuous casting forms.

Launching / Erection system of Formwork : Introduction, types and methods of launching of formwork in Bridges, ESR's and multi storey buildings.

Text books:

1. Formwork for Concrete Structures, Robert L. Peurifoy and Garold D. Oberlender, McGraw Hill, Latest edition.

2. Formwork for Concrete, Hurd. M.K.,Special Publication American Concrete Institute, Detroit, Latest edition.

References

1.Construction Press, Michael P. Hurst, London and New York,
2. Formwork for Concrete, Austin C.K., Cleaver Hume Press ltd., London Latest edition.
3. Slip Form Techniques, Tudor Dinescu and Constantin Radulescu, Abacus Press Tum Bridge Wells, Kent, Latest edition.
4. Guide for Concrete Formwork , American Concrete Institute, Michigan , Latest edition.
5. Safety Requirements for Scaffolding, American National Standards Institute. Broadway, New York, Latest edition
6 . Technical Monograph for Formwork, Indian Concrete Institute, Latest edition

CE454U: SEMINAR

Teaching Scheme: Total: 2Hr **Credit: 1**
Evaluation Scheme: 25 ICA + 0 ESE **Total Marks: 25**

COURSE DESCRIPTION

Description:The course explores the knowledge of presentation and effective communication.The course develops ability to work on multidisciplinary teams, identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

1.Each Student shall select a topic related to Civil Engineering for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.

2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the Guide.

3. The two-member committee appointed by the department shall be constituted for finalizing the topics of Seminar. Seminar shall be related state of the art topic of his choice approved by the committee.

4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound).

Assessment of seminar:

Stage-I

PRN	Name of the student	Seminar Topic	Topic Selection	Literature Survey	-	-	-	Total
			5	5	-	-	-	10

Stage-II

PRN	Name of the student	Seminar Topic	Topic Selection	Literature Survey	Report Writing	Depth of Understanding	Presentation	Total
		10 (From stage I)			5	5	5	25

Guide lines for ICA: ICA shall be based on topic selection, presentation and seminar report submitted by the student in the form of thermal bound. Assessment of the Seminar for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines.

CE455U: PROJECT PHASE- II

Teaching Scheme: Total: 2Hr **Credit: 5**

Evaluation Scheme: 75 ICA + 125 ESE **Total Marks: 200**

COURSE DESCRIPTION

1. Project phase I work decided in VII semester shall be continued as Project phase II

2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.

3. Project phase II will be monitored twice in a semester by presentation of student in front of a committee constituted in phase I

4. Project phase II may involve fabrication, design , experimentation , data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability.The stage also includes testing , possible results and report writing.

5. Each students project group is required to maintain log book for documenting various activities of Project phase II and submit group project report at the end of Semester-VIII in the form of Hard bound. Assessment of the project phase II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given inTable-D.

Guide lines for ESE:In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Name of the Project:_____ Name of the Guide:_____

Table- A

		Assessment by Guide				Assessment by Committee		
SN	Name of Student	Attendance /Participation/ Team work	Material procurement / assembling/ Designing / Programming	Case study/ Execution	Project Report	Dept of Understanding	Presentation	Total
		20	20	30	10	20		

CE456U: Professional Internship

Teaching Scheme: 3L Total: 3Hr **Credit: 2**

Evaluation Scheme: 50 ICA **Total Marks: 50**

COURSE DESCRIPTION

The purpose of this internship to allows civil engineering students to gain practical experience in the civil engineering practices followed in the structural engineering., environmental, construction, geotechnical, hydro systems, materials, structures, sustainability, transportation or other related areas before receiving their undergraduate degrees. The student identifies companies willing to hire him/her on a full time basis for a period (minimum required), usually in the summer.

COURSE OBJECTIVES

1. To strengthen the association of students with construction industry.
2. To create awareness amongst the students the recent trends of civil engineering in industries.
3. To percept the role and responsibility of civil engineer in the industry.
4. To solve problems in civil, environmental or construction work-related situations by applying knowledge acquired in course related courses

COURSE OUTCOMES (COS):

After completion of the internship students will be able to:

1. learn the application of knowledge in real world problems.
2. apply knowledge and skills in real world problems through construction activities.
3. get exposure to team-work.
4. deal with the leadership quality.
5. deal with industry-professionals and ethical issues in the work environment

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		1	2	1					1		1		1		
2		2	2	3							2	1			2
3	2		1	3					2				2	2	
4	2	2	2								2	1	3		2
5	1	2	1	2					1		2				

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Course Content-cum-instructions:

This course shall be completed preferably during the summer vacation after sixth semester but in exceptional cases can be completed during the winter vacation after seventh semester or during the weekends of seventh semester. Under any circumstances; this course shall be completed before the commencement of eighth semester. Industrial visit Industry visits for minimum four industries local or outstation shall be carried out by each student. Department shall arrange the industrial visits during the summer/winter vacations after sixth/seventh semester or in exceptional cases weekends during the seventh semester. Industries shall be related to solar energy/ power electronics/ telecom sector/ computer hardware-software/ manufacturing/ automobile automation/ bio-tech-agriculture sector/power station, Tv-radio station/ sugar-chemical factory/ any other relevant industry approved by course coordinator.

For this course, the instructions and guidelines of AICTE shall be followed. The guidelines, instructions and various format Can be obtained using following link:

https://www.aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf

In addition to above Industrial Training:

Individual or group of students shall undergo industrial training in any industry of own interest and convenience related to any interdisciplinary topic/field/ nature for minimum one week fulltime or two weeks part time so that total training period should be more than 40 hours

Course Deliverable
Every student shall submit the appropriate (visit/training/attendance/visit for special study) certificate along with a report in the format provided by department/course coordinator duly signed by course coordinator and HoD. Evaluation system It includes Internal Continuous Assessment (ICA) and Guidelines for ICA are given bellow.

Internal Continuous Assessment (ICA)
The ICA shall be evaluated by course coordinator appointed by the HoD. Course coordinator shall judge the student on the basis of presentation, deliverables of the course described earlier. The guidelines and format prescribed by AICTE may be used for ICA

https://www.aicte-india.org/sites/default/files/AICTE%20Internship%20Policy.pdf

CE457AU: BASICS OF ENTREPRENEURSHIP

Teaching Scheme: 0L Total: 0Hr **Credit: 0**
Evaluation Scheme: 50 ICA **Total Marks: 50**

COURSE DESCRIPTION

The goals of this programme are to inspire students and help them imbibe an entrepreneurial mind-set. The students will learn what entrepreneurship is and how it has impacted the world and their country. They will be introduced to key traits and the DNA of an entrepreneur, and be given an opportunity to assess their own strengths and identify gaps that need to be addressed to become a successful entrepreneur. Students will also develop skills in written business communication and oral presentations that allow students to integrate entrepreneurship concepts and interact with business experts. This course has an interdisciplinary approach and is therefore open to students from other Majors.

COURSE OBJECTIVES:

1. To strengthen the concept of entrepreneurship.
2. To create awareness/significance of E-cell amongst the students.
3. To strengthen the various forms of business organization.
4. To solve problems in civil, environmental or construction work

COURSE OUTCOMES (COS):

After successful completion of this course; student shall be able to

1. develop awareness about entrepreneurship and successful entrepreneurs.
2. develop an entrepreneurial mind-set by learning key skills such as design, personal selling, and communication.
3. understand the DNA of an entrepreneur and assess their strengths and weaknesses from an entrepreneurial perspective.
4. understand the various form of business organizations.
5. understand the mission, vision and strategy formulation.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	2	1					1		1		1		
2	1	2	2	3							2	1			2
3	2	2	1	3					2				2	2	
4	2	2	2						2		2	1	3		2
5	1	2	1	2					1		2				

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Course Contents:

Introduction to Entrepreneurship Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, Myths about entrepreneurs, agencies in entrepreneurship management and future of entrepreneurship types of entrepreneurs.

The Entrepreneur Why to become entrepreneur, the skills/ traits required to be an entrepreneur, Creative and Design Thinking, the entrepreneurial decision process, skill gap analysis, and role models, mentors and support system, entrepreneurial success stories.

E-Cell Meaning and concept of E-cells, advantages to join E-cell, significance of E-cell, various activities conducted by E-cell

Communication Importance of communication, barriers and gateways to communication, listening to people, the power of talk, personal selling, risk taking & resilience, negotiation.

Introduction to various form of business organization (sole proprietorship, partnership, corporations, Limited Liability company), mission, vision and strategy formulation.

REFERENCES:

Textbooks:

1. Entrepreneurship,AndrewZacharakis, William D. Bygrave , John Wiley& Sons Latest Edition.
2. Entrepreneurship,Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha, McGraw Hill (India)Education, New Delhi , Latest Edition.

Reference Books:

1. How Entrepreneurial Management Transforms Culture and Drives Growth,Eric Ries,Penguin Publication, Latest edition.
2. All in Startup –Launching a New Idea when Everything is on the Line, Diana Kander , John Wiley &Sons Latest edition.

Website:

1. https://wikieducator.org/Introduction_to_entrepreneurship/IENT101/Syllabus
2. https://www.entrepreneurship.org/

Journals:

1. **https://journals.sagepub.com/home/joe**
2. **https://onlinelibrary.wiley.com/journal/1932443x**
3. **https://www.inderscience.com/jhome.php?jcode=ijgsb**

CE458AU Spreadsheet for civil Engineering Applications

Teaching Scheme: 0L Total: 0Hr **Credit: 0**
Evaluation Scheme: 50 ICA **Total Marks: 50**

COURSE DESCRIPTION

This course deals with the most widely used software Microsoft Excel through Spreadsheets and Visual Basic for Application (VBA) macros which is the popular in simple engineering applications. It also includes the depiction in Auto CAD software since the drawing creation process can be done through Excel formulas or macros.

COURSE OBJECTIVES

To give an overview of Microsoft Excel and its applications in civil engineering.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to :

1. understandExcel Functions, Macros.
2. create MACRO.
3. apply Excel for Numerical methods.
4. analyse civil engineering problems using Excel programs

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		1									1				
2				1		2									
3						2									
4	1			2			1								

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to spreadsheet: Worksheet and Workbook, Data type, Formula, Built-In function, Array formula, Data formatting, Error message, Printing, Making Charts, Engineering Drawing, Visual Basic for application, creating Macro, recording Macro, running Macro, VBA Dictionary

SpreadsheetFunctions: Math and Trigonometry functions, Logical functions, Lookup functions, Text functions, Data analysis functions, Linear regression, Polynomial regression, Interpolation, Statistical data.

Creating MACRO: Function procedure, Sub procedure, Control structures, looping, branching, User Defined Functions, structure of Program, Input-Output form, Modules, Chart Macro.

Matrix Program: Matrix, types of Matrix, Matrix operations, Matrix methods for Structural analysis, Upper structure, Sub structure, Numerical Integration, Numerical Differentiation

Civil Engineering Applications : 2D Frame structural analysis, 2D Truss analysis, Laterally loaded structure, One-Dimensional consolidation , AUTOCAD Script file, creating Scripts in Worksheet, creating Scripts in VBA.

Text books:

1. An Introduction to EXCEL for Civil Engineers, Pangaribuan G., e-Book, CreateSpace Independent Publishing, 2016.
2. Microsoft Office Excel 2007 Step by Step, Curtis F. D., Microsoft Press, 2007.
3. Formulas and Functions with Microsoft Excel 2003,McFedries,P., QUE Publishers, 2004

Reference books:

1. Microsoft Office Excel 2007 for Dummies, Harvey G., Wiley, 2007.
2. Spreadsheet Tools for Engineers Using Excel 2007, Gottfried B., McGraw-Hill Education, 2009.
3. Matrix Structural Analysis using Spreadsheets, Ganju T. N., Tata McGraw Hill, 2002