

Faculty of Engineering and Technology
Radha Govind University
Chandausi, Sambhal (U.P.)



Evaluation Scheme & Syllabus for
Department of Civil Engg.
DIPLOMA –CIVIL ENGINEERING
III Year (5th & 6th Semester)
(Effective from session _____)

DIPLOMA - CIVIL ENGG. STUDY AND EVALUATION SCHEME

3rd Year, 5th Semester

SUBJEC CODE	SUBJECT SNAME	STUDY SCHEM E Periods /Wee k			Credits	MARKSINEVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMEN T			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
DCE 501	TRANSPORTATION ENGINEERING	2	-	-	2	30	-	30	70	-	70	100
DCE 502	Estimating Costing And Valuation	1	-	4	3	30	-	30	70	-	70	100
DCE 503	Geotechnical Engineering	2	-	-	2	30	-	30	70	-	70	100
DCE 504	Design of Steel Structure And Drawing	1	-	4	3	30	-	30	70	-	70	100
DCE 506	Program Elective-I a) Green Building And Energy conservation b) Repair and Maintenance of Building	2	-	-	2	30	-	30	70	-	70	100
DCE 506	Open Elective-I a) Disaster Management b) Project Management	2	-	-	2	30	-	30	70	-	70	100
DCE 507	TRANSPORTATION ENGINEERING Lab	-	-	4	2	-	25	25	-	25	25	50
DCE 508	Geotechnical Engineering Lab	-	-	4	2	-	25	25	-	25	25	50
DCE 509	Summer Internship (4-6 Weeks)	-	-	-	2	-	-	-	-	50	50	50
Total					20	180	75	255	420	75	495	750

For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.

Note: -1 Students will present a seminar/viva on their summer internship along with certificate, project and report.

2. Students will submit the certificate.

DIPLOMA –CIVIL ENGG. STUDY AND EVALUATION SCHEME

3rd Year, 6th Semester

SUBJECT CODE	SUBJECT NAME	STUDY SCHEME Periods /Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
DCE 601	Program Elective- II a) Construction Management b) Advance Construction Technology	3	1	-	4	30	-	30	70	-	70	100
DCE 602	Entrepreneurship And Start- Up*	2	-	-	2	30	-	30	70	-	70	100
DCE 603	Open Elective-II a) Renewable Energy Technology b) Energy Conservation And Audit	2	-	-	2	30	-	30	70	-	70	100
DCE 604	Project Work	04	-	16	12	-	240	240	-	160	160	400
Total					20	90	240	330	210	160	370	700

For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.

Note: *Common Course with other diploma programmes . "Entrepreneurship and Start-up" course is also mandatory in Industrial internship/training mode.

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DCE 501 TRANSPORTATION ENGINEERING

COURSE OBJECTIVES:

Following are the objectives of this course:

- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To identify the components of railway tracks.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Identify the types of roads as per IRC recommendations.

CO2- Understand the importance of the roads, development of roads and classification of roads, highway pavements, Geometrical design.

CO3- Study the highway alignment, road machineries and construction of different types of Roads.

CO4- Understand the components of railway and methods of laying the rails.

CO5- Learn the Railway fixtures, Types of stations, station yards, Signalling and Control of movement of trains.

DETAILED COURSE CONTENT

UNIT – I OVERVIEW OF TRANSPORTATION ENGINEERING (3 periods)

- Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics. Functions of IRC, CRRI, MoRT & H, NHAI
- Different modes of transportation – Land way, Waterway, Airway.
- General classification of roads.
- Selection and factors affecting road alignment.

UNIT– II GEOMETRIC DESIGN OF HIGHWAY (8 periods)

- Camber: Definition, purpose, types as per IRC – recommendations.
- Kerbs: Road margin, road formation, right of way.
- Design speed and various factors affecting design speed as per IRC – recommendations.
- Gradient: Definition, types as per IRC – Recommendations.

- Sight distance (SSD): Definition, types Intermediate sight distance and Over taking sight distance, IRC – recommendations, simple numerical.
- Curves: Necessity, types: Horizontal, vertical curves.
- Extra widening of roads: numerical examples.
- Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation.
- Standards cross-sections of national highway in embankment and cutting.

UNIT– III CONSTRUCTION OF ROAD PAVEMENTS (8 periods)

- Different types of road materials in use: soil, aggregate and binders and their Tests – CBR, Test on aggregates-Flakiness and Elongation Index tests, Impact Value, Abrasion value, Aggregate crushing value. Test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test.
- Pavement – Definition, Types, Structural Components of pavement and their functions
- Construction of WBM road. Merits and demerits of WBM & WMM road.
- Construction of Flexible pavement/Bituminous Road, Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in Bituminous Road -prime coat, tack coat, seal coat, Merits and Demerits of Bituminous Road.
- Cement concrete road -methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.
- Pavement Maintenance and Highway Drainage.
- Road Construction Machinery: Pavemaker, Roller, Excavator, Grader, Bulldozer, Hot mix plant, Dumper, Drag line, Back-hoe etc.

UNIT– IV BASICS OF RAILWAY ENGINEERING (5 periods)

- Classification of Indian Railways, zones of Indian Railways
- Mass Transit System
- Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge.
- Rail, Rail Joints - requirements, types.
- Creep of rail: causes and prevention.
- Sleepers - functions and Requirement, types - concrete sleepers and their density
- Ballast - function and types, suitability.

- Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs types of anchors and anti-creepers.

UNIT– V TRACK GEOMETRICS, CONSTRUCTION AND MAINTENANC (4 periods)

- Alignment- Factors governing rail alignment.
- Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms-permanent land, formation width, side drains,
- Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail.
- Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle.
- Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station.
- Station yard: Classification- Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshalling yards.
- Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, Organization of track maintenance, Duties of permanent way inspector, gang mate and key man.

SUGGESTED LEARNING RESOURCES:

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93- 82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, New Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand Publication, New Delhi.
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests.
- Actual practical work, exercises and viva-voce.
- Presentation and viva-voce .

TRANSPORTATION ENGINEERING LAB

LIST OF PRACTICALS TO BE PERFORMED:

- 1 California Bearing Ratio (CBR) Test
- 2 Flakiness and Elongation Index of aggregates.
- 3 Angularity Number of aggregates.
- 4 Aggregate impact test
- 5 Los Angeles Abrasion test
- 6 Aggregate crushing test
- 7 Softening point test of bitumen.
- 8 Penetration test of bitumen.
- 9 Flash and Fire Point test of bitumen.
- 10 Ductility test of Bitumen.
- 11 Visit to railway track for visual inspection of fixtures, fasteners and yards.
- 12 Prepare the photographic report containing details for experiment No. 11.

DCE 502

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ESTIMATING COSTING AND VALUATION

COURSE OBJECTIVES:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Select modes of measurements for different items of works.

CO2- Understand the procedure of approximate estimate for various construction projects

CO3- Understand rate analysis for various items of works using Standard data and Schedule of Rates.

CO4- Interpret various systems of payment used in construction contracts.

CO5- Justify rate for given items of work using rate analysis techniques.

DETAILED COURSE CONTENT

UNIT – I FUNDAMENTALS OF ESTIMATING AND COSTING

(10 periods)

- Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision.
- Measurement : Units of measurement for various items of work, Rules for deduction in different category of work as per IS:1200
- Types of estimates – Approximate and Detailed estimate.
- Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and maintenance estimate, renovation estimate.
- Roles and responsibility of Estimator.
- Standard formats of Measurement sheet, Abstract sheet, Face sheet.
- Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200.

UNIT– II ESTIMATE

(20 periods)

- Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, work charged establishment, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting.
- Long wall and Short wall method, Centre line method.
- Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements.
- Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method.
- A small residential building with a flat roof comprising of - Two rooms with W.C., bath, kitchen and verandah WBM road and pre-mix carpeting Single span RCC slab culvert Earthwork for plain and hill roads RCC work in beams, slab, column and lintel, foundation 10 users septic tank.

UNIT– III RATE ANALYSIS (15 periods)

- Calculation of quantities of materials for : Cement mortars of different proportion, Cement concrete of different proportion, Brick/stone masonry in cement mortar of different proportion, Plastering, pointing and painting, D.P.C. and flooring.
- Categories of labours, their daily wages, types and number of labours for different items of work.
- Rate Analysis: Definition, purpose and importance. Procedure for rate analysis.
- Preparing rate analysis of different items of work pertaining to buildings and roads.

UNIT– IV TENDER AND CONTRACTORSHIP (15 periods)

- Tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period.
- Meaning of contract, Types of contracts, their advantages, dis-advantages and suitability, system of payment.
- Exercises on writing detailed specifications of different types of building works: Earthwork, Brick work and RCC work.

UNIT– V REAL ESTATE (REGULATION AND DEVELOPMENT) ACT-2016 AND VALUATION (10 periods)

- Introduction: Purpose and Salient features of Act.
- Definition and functions of Real Estate projects, Promoter, Agent and Allottees .
- Registration of Real Estate Projects.
- Valuation: Purpose of valuation, principles of valuation.
- Definition of various terms related to valuation like depreciation, sinking fund, salvage and

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

SUGGESTED LEARNING RESOURCES

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGraw Hill Education, , New Delhi.
3. Rangwala, S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
4. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
5. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.

DCE 503

GEOTECHNICAL ENGINEERING

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COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand and determine physical and index properties and classification of soil.
- To estimate permeability and shear strength of soil.
- To know the load bearing capacity of soil.
- To learn various soil stabilization and compaction methods.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Identify and classify various types of soils.

CO2- Interpret the physical properties of soil related to given construction activities.

CO3- :Apply permeability, effective stress and shear strength test for foundation analysis.

CO4- Compute optimum values for moisture content for maximum dry density of soil

CO5- Interpret bearing capacity soil and selection of foundation. Soil sampling and Stabilization.

DETAILED COURSE CONTENT

UNIT – I OVERVIEW OF GEOLOGY AND GEOTECHNICAL ENGINEERING

(3 periods)

Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks.

- Importance of soil as construction material in Civil engineering structures and as foundation bed for structures.

UNIT– II PHYSICAL AND INDEX PROPERTIES OF SOIL (7 periods)

- Soil as a three-phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight,

submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.

- Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.
- Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.
- Effective Stress (Concept only), Stresses in subsoil, Definition and meaning of total stress, effective stress and neutral stress, Principle of effective stress, Importance of effective stress in engineering problems.

UNIT– III PERMEABILITY AND SHEAR STRENGTH OF SOIL

(7 periods)

- Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems).
- Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear and vane shear test–laboratory methods.

UNIT– IV COMPACTION AND CONSOLIDATION (5 periods)

- Concept of compaction and consolidation, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line. Factors affecting compaction, field methods of compaction – rolling, ramming and vibration. Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.
- Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non cohesive Soils.

UNIT– V BEARING CAPACITY OF SOIL AND STABILIZATION OF SOIL

(6 periods)

- Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity.

- Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131.
- Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction
- Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil – dry strength test, dilatancy test and toughness test.

Suggested learning resources:

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Ramamurthy, T.N. & Sitharam, T.G., Geotechnical Engineering (Soil Mechanics), S Chand and Company LTD., New Delhi.
4. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
5. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student-centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce.

GEOTECHNICAL ENGINEERING LAB

LIST OF PRACTICALS TO BE PERFORMED:

1. Identification of rocks from the given specimen.
2. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II).
3. Determine specific gravity of soil by pycnometer method as per IS 2720 (Part- III).
4. Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part- XXIX).
5. Determine dry unit weight of soil in field by sand replacement method as per IS2720 (Part- XXVIII).
6. Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- V).
7. Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
8. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part- IV).
9. Use different types of soil to identify and classify soil by conducting field tests Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.
10. Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).
11. Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).
12. Determine shear strength of soil by direct shear test as per IS 2720 (Part-XIII).
13. Determine shear strength of soil by vane shear test as per IS 2720 (Part-XXX).
14. Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part- VII).
15. Determination of CBR value on the field as per IS2720 (Part - XVI).

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DESIGN OF STEEL STRUCTURE AND DRAWING**COURSE OBJECTIVES: -**

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per BIS code of practice IS: 800.

COURSE OUTCOMES:

After undergoing the subject, students will be able to:

CO1- Explain structural properties of steel and its designation as per Indian Standards.

CO2- To understand the detailing and drafting of welded and bolted connections.

CO3- To understand the detailing and drafting of Compression members and tension members.

CO4-Explain different types of trusses, their different components and usability.

CO5-Analyze and design of simply supported steel beams

- Select various types of plate girders.
- Supervise fabrication and erection of steel structure like trusses, columns and girders.

DETAILED COURSE CONTENT**UNIT – I INTRODUCTION****(5 periods)**

- Structural Steel and Sections: Properties of structural steel, Designation and classification of structural steel sections as per IS handbook and IS: 800:2007,
- Tubular Sections
- Types of sections used for beams, tension and compression members

UNIT – II RIVETED, BOLTED AND WELDED CONNECTIONS (20 periods)

- Riveted Connections: Types of Rivet, Permissible stresses in rivets, types of riveted joints, specifications as per IS800, Failure of riveted joint, strength and efficiency of riveted joint, Design of Riveted Connection only axially loaded number (No staggered riveting)
- Bolt Connections: Types of bolt, permissible stresses in bolt, types of bolted joints, specifications for bolted joints as per IS 800. Failure of a bolted joint. Assumptions in the theory of bolted joints. Strength and efficiency of a bolted joint. Design of bolted joints for axially loaded members (No Staggered bolts).

- Welded connections: Types of welds and welded joints, advantages and disadvantages of welded joints design of fillet and butt weld for axially loaded members

UNIT – III TENSION AND COMPRESSION MEMBERS (15 periods)

- Tension Members: Analysis and design of single and double section tension members and their rivetted and welded connections with gusset plate as per IS:800 2007. Introduction to Lug Angle and Tension splice.
- Compression Members: Angle struts, type of section used, effective length, radius of gyration, slenderness ratio and its limits, permissible compressive stress Analysis and design of single and double angle sections compression members subjected to axial load. Introduction to analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on lacing and battening)

UNIT – IV BEAMS, ROOF TRUSSES AND COLUMN BASES (10 periods)

- Beams : Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder
- Roof Trusses: Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)
- Column Bases : Types of column bases i.e. slab base, gusseted base. Design of slab base and concrete block. Introduction to gusseted base (no numerical problems on gusseted base). Introduction to beam columns design of simple built up beams (Symmetrical I section with cover plates only)

UNIT – V STEEL STRUCTURE DRAWINGS (20 periods)

Drawing No. 1: Roof Truss –Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.

(ii) Drawing No.2 :Column and Column Bases - Drawing of splicing of steel columns. Drawings of slab base, gusseted base and grillage base for single section steel columns.

(iii) Drawing No.3 :Column Beam Connections (a) Sealed and Framed Beam to Beam Connections (b) Sealed and Framed Beam to Column Connections

(iv) Drawing No. 4 :Plate Girder (Bolted) Plan and Elevation of Plate Girder with details at supports and connection of stiffness, flange angles and cover plate with web highlighting curtailment of plates.

(v) Drawing No. 5 :Draw atleast one sheet using CAD software.

RECOMMENDED BOOKS

- Civil Engineering Drawing by Layal JS; SatyaParkashan, New Delhi
- Civil Engineering Drawings by Chandel RP
- Civil Engineering Drawing by Kumar; NS; IPH, New Delhi
- Civil Engineering Drawing by Malik RS and Meo GA; Asian Publishing House, New Delhi
- Steel Structures Design and Drawing by SinghBirinder; Kaption Publishing House, New Delhi
- e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student-centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

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DEE 505

PROGRAM ELECTIVE-I

(Green Building And Energy Conservation)

COURSE OBJECTIVES:

Following are the objectives of this course:

- To know various aspects of green buildings
- To use different steps involved in measuring environmental impact assessment.
- To relate the construction of green building with prevailing energy conservation policy and regulations.
- To know and identify different green building construction materials.
- To learn different rating systems and their criteria.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Identify various requirements for green building.

CO2- Use different steps in environmental impact assessment.

CO3- Relate the construction of green building with prevailing energy conservation policy and regulations.

CO4- Supervise the construction of green building construction using green materials.

CO5- Focus on criteria related to particular rating system for assessment of particular Green building.

DETAILED COURSE CONTENT

UNIT I : Introduction To Green Building And Design Features (5 periods)

- Definition of Green Building, Benefits of Green building, Components/features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.
- Site selection strategies, Landscaping, building form, orientation, building envelope and fenestration, material and construction techniques, roofs, walls, fenestration and shaded finishes, advanced passive heating and cooling techniques, waste reduction during construction

UNIT–II Energy Audit And Environmental Impact Assessment (Eia) (6 periods)

- Energy Audit: Meaning, Necessity, Procedures, Types, Energy Management Programs
- Environmental Impact Assessment (EIA): Introduction, EIA regulations, Steps in environmental impact assessment process, Benefits of EIA, Limitations of EIA, Environmental clearance for the civil engineering projects.

UNIT– III Energy And Energy Conservation (6periods)

- Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Bio-mass Energy, Geo Thermal Energy.
- Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Bio fuels.
- Energy conservation: Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency.

UNIT– IV Green Building (6 periods)

- Introduction: Definition of Green building, Benefits of Green building,
- Principles: Principles and planning of Green building
- Features: Salient features of Green Building, Environmental design (ED) strategies for building construction.
- Heating Ventilation Air Conditioning (HVAC) unit in green Building.
- Process: Improvement in environmental quality in civil structure
- Materials: Green building materials and products- Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board, Insulated concrete forms. reuse of waste material-Plastic, rubber, Newspaper wood, Nontoxic paint, Green roofing.

UNIT V Rating System (5 periods)

- Introduction to (LEED) criteria,
- Indian Green Building council (IGBC) Green rating,
- Green Rating for Integrated Habitat Assessment. (GRIHA) criteria
- Functions of Government organization working for Energy conservation and Audit(ECA)
- National Productivity council (NPC)
- Ministry of New and Renewable Energy (MNRE)
- Bureau of Energy efficiency (BEE)

SUGGESTED LEARNING RESOURCES:

1. Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hoboken, New Jersey.
2. Chauhan, D S Sreevasthava, S K., Non-conventional Energy Resources, New Age International Publishers, New Delhi.
3. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
4. Jagadeesh, K S, Reddy Venkatta Rama & Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.
5. Sam Kubba., Handbook of Green Building Design and Construction, ButterworthHeinemann.
6. Means R S, Green Building - Project Planning and Cost Estimating, John Wiley & Sons
7. Sharma K V, Venkateshaiah P., Energy Management and Conservation, IK International.

DCE 505

PROGRAM ELECTIVE-I

(Repair And Maintenance of Building)

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COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn about types of maintenance techniques
- To understand causes of various types of damages.
- o know about relevant materials for repair.
- To learn methods of retrofitting for different structures.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Decide which type of maintenance is needed for a given damaged structure

CO2- Assess causes of damages various types of structures.

CO3- Select the relevant material for repair of the given structure.

CO4- Apply relevant method of retrofitting for re-strengthening of structures.

CO5- Suggest relevant technique to restore the damages of the given structural elements.

DETAILED COURSE CONTENT

UNIT – I BASICS OF MAINTENANCE

(5 periods)

- Need for Maintenance: Importance and significance of repair and maintenance of buildings, Meaning of maintenance, Objectives of maintenance, Factors influencing the repair and maintenance

UNIT– II DAMAGES: CAUSES AND ITS DETECTION

(6 periods)

- Agencies Causing Deterioration (Sources, Causes, Effects): Definition deterioration/ decay Factors causing deterioration, their classification, Human factors causing deterioration, Chemical factors causing deterioration, Environmental conditions causing deterioration, Miscellaneous factors.
- Effects of various agencies of deterioration on various building materials i.e. bricks, timber, concrete, paints, metals, plastics, stones.

- Investigation and Diagnosis of Defects : Systematic approach/procedure of investigation, Sequence of detailed steps for diagnosis of building defects/problems, List non-destructive and others tests on structural elements and materials to evaluate the condition of the building and study of three most commonly used tests.

UNIT– III DEFECTS AND THEIR ROOT CAUSES

(5 periods)

- Define defects in buildings, Classification of defects.
- Main causes of building defects in various building elements: Foundations, basements and DPC, Walls, Column and Beams, Roof and Terraces, Joinery, Decorative and protective finishes, Services, Defects caused by dampness.

UNIT– IV MATERIALS FOR REPAIR, MAINTENANCE AND PROTECTION

(3 periods)

- Compatibility aspects of repair materials.
- State application of following materials in repairs: Anti-corrosion coatings, Adhesives/bonding aids, Repair mortars, Curing compounds, Joints sealants, Waterproofing systems for roofs, Protective coatings.

UNIT– V REMEDIAL MEASURES FOR BUILDING DEFECTS

(9 periods)

- Preventive maintenance considerations
- Surface preparation techniques for repair
- Crack repair methods: Epoxy injection, Grooving and sealing, Stitching Adding reinforcement and grouting and Flexible sealing by sealant
- Repair of surface defects of concrete: Bug holes, Form tie holes. Honey comb and larger voids
- Repair of corrosion in RCC elements: Steps in repairing and Prevention of corrosion in reinforcement
- Material placement techniques with sketches: Pneumatically applied (The gunite techniques), Open top placement, Pouring from the top to repair bottom face, Birds mouth, Dry packing, Form and pump, Preplaced – aggregate concrete, Trowel applied method
- Repair of DPC against Rising Dampness: Physical methods, Electrical methods, Chemical methods
- Repair of walls: Repair of mortar joints against leakage and Efflorescence removal
- Waterproofing of wet areas and roofs: Water proofing of wet areas, Water proofing of flat RCC roofs, Various water proofing systems and their characteristics
- Repair of joints in buildings: Types of sealing joints with different types of sealants, Techniques for repair of joints and Repair of overhead and underground water tanks.

SUGGESTED LEARNING RESOURCES:

1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi
2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies
3. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth
4. Relevant BIS codes
5. Aarti Chaurasiya, Repair & Maintenance of Buildings, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-5502-178-6

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DCE 506 OPEN ELECTIVE-I (DISASTER MANAGEMENT)

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

COURSE OUTCOMES:

After completing this course, student will be:

CO1-Acquainted with basic information on various types of disasters

CO2-Knowing the precautions and awareness regarding various disasters

CO3-Decide first action to be taken under various disasters

CO4-Familiarised with organization in India which are dealing with disasters able to select IT tools to help in disaster management.

CO5- Apply Remote Sensing and GIS techniques to analyze disaster-prone areas, vulnerability patterns and damage assessment for different types of natural and man-made disasters.

DETAILED COURSE CONTENT

UNIT – I: UNDERSTANDING DISASTER

(5 periods)

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity– Disaster and Development, and disaster management.

UNIT – II: TYPES, TRENDS, CAUSES, CONSEQUENCES AND CONTROL OF DISASTERS

(6 periods)

Geological Disasters (earthquakes, landslides, tsunamis, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – ClimateChange and Urban Disasters.

UNIT- III: DISASTER MANAGEMENT CYCLE AND FRAMEWORK (6 periods)

Disaster Management Cycle – Paradigm Shift in Disaster Management. Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro- zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

UNIT– IV: DISASTER MANAGEMENT IN INDIA (5 periods)

Disaster Profile of India – Mega Disasters of India and Lessons Learnt. Disaster Management Act 2005 – Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Government Agencies

UNIT– V: APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT (6 periods)

Geo-informatics in Disaster Management (RS, GIS, GPS and RS). Disaster Communication System (Early Warning and Its Dissemination). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters. S&T Institutions for Disaster Management in India.

SUGGESTED LEARNING RESOURCES:

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management.
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi.
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi.
4. Alexander, David, Natural Disasters, Kluwer Academic London.
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation.
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

DCE 506 OPEN ELECTIVE-I
(PROJECT MANAGEMENT)

COURSE OBJECTIVES:

Following are the objectives of this course:

- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

COURSE OUTCOMES:

After completing this course, student will be:

CO1-Explain the principles of Project Management.

CO2- Create and manage project schedules.

CO3- Create structure and manage the project commitments.

CO4- Acquire to Gain enterprise support.

CO5-Apply crashing procedures for time and cost optimization.

DETAILED COURSE CONTENT

UNIT – I: CONCEPT OF A PROJECT **(5 periods)**

Classification of projects- importance of project management- The project life cycle establishing project priorities (scope-cost-time) project priority matrix- work break down structure.

UNIT – II: CAPITAL BUDGETING PROCESS **(5 periods)**

Planning- Analysis-Selection-Financing-Implementation Review. Generation and screening of project ideas- market and demand analysis- Demand forecasting techniques.

Market planning and marketing research process- Technical analysis.

UNIT- III: FINANCIAL ESTIMATES AND PROJECTIONS **(5 periods)**

Cost of projects-means of financing-estimates of sales and production-cost of production working capital requirement and its financing-profitability projected cash flow statement and balance sheet. Break even analysis.

UNIT– IV: BASIC TECHNIQUES IN CAPITAL BUDGETING **(5 periods)**

Non discounting and discounting methods- pay- back period- Accounting rate of returnnet present value-Benefit cost ratio-internal rate of return. Project risk. Social cost benefit analysis and economic rate of return. Non-financial justification of projects.

UNIT– V: PROJECT ADMINISTRATION

(8 periods)

Progress payments, expenditure planning, project scheduling and network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade off. Concepts and uses of PERT cost as a function of time, Project Evaluation and Review Techniques/cost mechanisms. Determination of least cost duration. Post project evaluation. Introduction to various Project management software's.

SUGGESTED LEARNING RESOURCES:

1. Project planning, analysis, selection, implementation and review – Prasannachandra – TataMcGraw Hill.
2. Project Management – the Managerial Process – Clifford F. Gray & Erik W. Larson – McGrawHill.
3. Project management - David I Cleland - Mcgraw Hill International Edition, 1999
4. Project Management – Gopala krishnan – Mcmillan India Ltd.
5. Project Management-Harry-Maylor-Pearson Publication.

SUMMER INTERNSHIP (4-6 WEEK) (INDUSTRIAL TRAINING)

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It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of 4 weeks duration to be organized during the semester break starting after second year i.e. after 4th semester examinations.

The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5th Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 4th semester for further details. The teacher along with field supervisors will conduct performance assessment of students. The

components of evaluation will include the following:

Punctuality and regularity 15%

Initiative in learning new things 15%

Presentation and VIVA 15%

Industrial training report 55%

DCE 601 PROGRAM ELECTIVE-II

(Construction Management)

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COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand the contract management and associated labour laws.
- To prepare and understand the principles involved in site layout.
- To know the procedure for scheduling of various activities in construction project.
- To understand the labour laws, procedure for arbitration, settlements.
- To know different safety measures in construction projects.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Understand how construction projects are managed, assess their feasibility, and plan resources effectively for civil engineering projects.

CO2- Understand contracts and tenders, as well as how construction companies manage money and paperwork, including the importance of keeping good records.

CO3- understand how to plan construction projects, schedule activities, and manage resources to meet project goals within budget and time constraints.

CO4-Understand the importance of quality in construction, learn methods to maintain it, and gain knowledge about resolving disputes in construction projects.

CO5- Understand the importance of safety in construction and the roles of different parties involved in safety management.

DETAILED COURSE CONTENT

UNIT – I CONSTRUCTION INDUSTRY AND MANAGEMENT

(8 periods)

- Significance of construction management, Main objectives of construction management and overview of the subject, Functions of construction management, planning, organizing, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job, Classification of construction into light, heavy and industrial construction
- Stages in construction from conception to completion, The construction team: owner, engineer, architect and contractors, their functions and inter-relationship, Resources for construction industry

UNIT – II CONSTRUCTION PLANNING

(12 periods)

- Importance of construction planning - Stages of construction planning - Pre-tender stage, Contract stage

- Contracts and e-tendering - Different types of contracts - Penalties and Arbitration

- Scheduling construction works by bar charts -

Definition of activity, identification of activities though -

Preparation of bar charts for simple construction work -

Preparation of schedules for labour, materials, machinery and finances for small works

- Scheduling by network techniques - Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology.

- Methods of recording progress: Analysis of progress, Taking corrective actions keeping head office informed, Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization

UNIT- III ORGANIZATION

(10 periods)

- Types of organizations: Line, line and staff, functional and their characteristics

- Site Organization : Principle of storing and stacking materials at site, Location of equipment, Preparation of actual job layout for a building, Organizing labour at site

- Important Acts for Labour welfare:

- Labour Welfare Fund Act 1936 (as amended)

- Payment of Wages Act 1936 (as amended)

- Minimum Wages Act 1948 (as amended)

- Acts relating to Labour Safety

UNIT IV ACCOUNTS AND ENTREPRENEURSHIP

(17 periods)

- Introduction, technical sanction, allotment of funds, re-appropriation of funds bill, contractor ledger, measurement book running and final account bills complete, preparation of bill of quantities (BOQ), completion certificate & report, hand receipt, acquittance roll. Muster Roll labour, casual labour roll duties and responsibility of different cadres, budget-stores, returns, account of stock, misc.

P.W. advances T & P – verification, survey report, road metal material charged direct to works, account - expenditure & revenue head, remittance and deposit head, definition of cash, precaution in custody of cash book, imprest account, temporary advance, treasury challan, preparation of final bills. Students must learn to prepare accounts register.

- Definition and concept, role and significance, risk and awards, Requirement of an entrepreneur development, Programmes Existing in India
- GST - Income Tax - Excise duty - Labourcess

UNIT– V INSPECTION, QUALITY CONTROL AND SAFETY IN CONSTRUCTION

(9 periods)

- Need for inspection and quality control, Principles of inspection, Stages of inspection and quality control for - Earth work - Masonry - RCC - Sanitary and water supply services
- Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures. Safety campaign and safety devices, safety training Fire safety.

SUGGESTED LEARNING RESOURCES

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Gahlot, P.S. and Dhir, B.M Construction planning and management New Age International(P) Ltd. Publishers, New Delhi.
3. Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. New Delhi
4. Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
5. Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi
6. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.

DCE 601 PROGRAM ELECTIVE-II

(ADVANCE CONSTRUCTION TECHNOLOGY)

COURSE OBJECTIVES:

Following are the objectives of this course:

- To gain knowledge on different materials in advanced construction
- To know different methods in concreting.
- To know the relevance of advanced construction methods for particular site condition.
- To identify the requisite hoisting and conveying machinery for the given situation.

COURSE OUTCOMES:

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

- CO1- Use relevant materials in advanced construction of structures.
- CO2- Use relevant method of concreting and equipment according to type of construction
- CO3- Apply advanced construction methods for given site condition.
- CO4- Select suitable hoisting and conveying equipment for a given situation.
- CO5- Identify advanced equipment required for a particular site condition.

DETAILED COURSE CONTENT

UNIT – I ADVANCED CONSTRUCTION MATERIALS (9 periods)

- Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
- Plastics: Use and properties of PVC, RPVC, HDPE, FRP, GRP.
- Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plaster boards, micro-silica, waterproofing materials, adhesives.
- Use of waste products and industrial by products in bricks, blocks, concrete and mortar.

UNIT- II ADVANCED CONCRETING METHODS AND EQUIPMENTS (12 periods)

- **Ready Mix Concrete:** Necessity and use of ready mix concrete. Products and equipments for ready mix concrete plant. Conveying of ready mix concrete, transit mixers.
- **Vibrators for concrete consolidation:** Internal, needle, surface, platform and form vibrators.
- **Underwater Concreting:** Procedure and equipments required for Tremie method, Drop bucket method. Properties, workability and water cement ratio of the concrete.

- Special concrete: procedure and uses of special concretes: Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, concreting.

UNIT– III ADVANCED TECHNOLOGY IN CONSTRUCTIONS (15 periods)

- Construction of bridges, flyovers and Tunnels: Equipments and machineries required for foundation and super structure i.e. Boom placer, Hydraulic rig, Slipform etc.
- Construction of multi-storeyed Building: Equipments and machinery required for construction of multi-storeyed building such as use of lifts, belt conveyers, pumping of concrete.
- Prefabricated construction: Methods of prefabrication, Plant fabrication and site fabrication, All prefabricated building elements such as wall panels, slab panels, beams, columns, door and window frames etc. Equipments and machineries used for placing and Jointing of prefabricated elements.
- Strengthening of embankments by soil reinforcing techniques using geo-synthetics

UNIT– IV HOISTING AND CONVEYING EQUIPMENTS (10 periods)

- Hoisting Equipments: Principles and working of Derrick-Pole, Gin Pole, Crane, Power driven scotch derrick crane, Hand operated crane, Locomotive crane, Tower crane, Lattice Girder, Winches, Elevators, ladders. Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes.
- Conveying Equipments: Working of belt conveyers, types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

UNIT– V MISCELLANEOUS MACHINERIES AND EQUIPMENTS (10 periods)

- Excavation Equipments: Use, working and output of following machinery – bull dozers, scrapers, graders, Clam Shell, trenching equipment, Tunnel boring machine, Wheel mount-ed belt loaders, power shovels, JCB, and drag lines.
- Compacting Equipments: Output of different types of rollers such as plain rollers, ship foot-ed rollers, vibratory, pneumatic rollers rammers.
- Miscellaneous Equipments: Working and selection of equipments: Pile driving equipments, Pile hammers, Hot mix bitumen plant, bitumen paver, grouting equipment, guniting equip- ments, floor polishing and cutting machine selection of drilling pattern for blasting, Ben- tonite /mud slurry in drilling, Explosives for blasting, Dynamite, process of using explosives.

SUGGESTED LEARNING RESOURCES:

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Chudly, R., Construction Technology Vol. I to II, ELBS-Longman Group.

3. Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. NewYork.
4. Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
5. Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education,New Delhi.
6. Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.

DCE 602

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Entrepreneurship And Start-UP

COURSE OBJECTIVES:

To foster an entrepreneurial mind set by equipping students with the skills to identify business opportunities, formulate comprehensive business plans, understand management functions, and navigate the financial and legal landscapes of starting and sustaining a venture.

COURSE OUTCOMES(CO):

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

CO1: Explain the concept of entrepreneurship, classify business structures, and distinguish between the roles of an entrepreneur and manager.

CO2: Identify feasible business ideas using activity maps and develop a preliminary Business Plan based on case study analysis.

CO3: Analyze market strategies using STP and SWOT analysis, and formulate the Vision, Mission, and Objectives for a start-up.

CO4: Discuss the fundamental functions of management, organizational structures, and the processes of recruitment, selection, and training.

CO5: Select appropriate financing methods (Govt schemes, Venture Capital) and apply Intellectual Property Rights (IPR) concepts to protect business ideas.

CO6: Describe the strategies for business succession, harvesting, and the legal types of dissolution.

COURSE CONTENTS

Unit – I: Introduction to Entrepreneurship and Start – Ups (05 Periods)

Definitions, Classification of Entrepreneur Traits of an Entrepreneur, Entrepreneurship, Motivation Types of Business Structures- On the Basis of size and on the basis of ownership Similarities/differences between entrepreneurs and managers

Unit – II: Business Ideas and their implementation (04 Periods)

Discovering ideas and visualizing the business

Activity map

Business Plan (Case Study)

Unit – III: Ideas to Start-up**(08 Periods)**

Marketing and Accounting- Definition and Importance. Market Analysis – STP (Segmentation, Targeting, Positioning) Competition evaluation and Strategy Development – Vision, Mission, Goal, Objectives. Risk analysis- SWOT Analysis.

Unit – IV: Management**(06 Periods)**

Definition Concept and Functions of Management Company's Organization Structure- Concept and Classification Recruitment and Selection- Definition, Training and Development- Importance.

Unit – V: Financing and Protection of Ideas**(03 Periods)**

Financing methods available for Entrepreneurship/ Startups in India (Government Scheme, Banking, NBFCs, SHG and Micro Financing). Intellectual Property Rights- Overview of - Copyrights, Trademark, Geographical Indicators, Patenting and Licenses Communication of Ideas to potential investors – Investor Pitch.

Unit – VI: Succession, Dissolution and Harvesting strategy (02 Periods)

Ways of succession

Types of Dissolution

INSTRUCTIONAL STRATEGY

Entrepreneurship and start-ups includes: use experiential learning, integrate real-world projects, provide mentorship, foster interdisciplinary collaboration, partner with businesses, invite industry professionals for lectures, organize business plan competitions, offer practical consulting opportunities, and help students launch real ventures to build entrepreneurial skills and mindsets.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/Proto type making.

RECOMMENDED BOOKS:

1. The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company – Steve Blank and Bob Dorf, K & S Ranch, ISBN: 978-0984999392
2. Entrepreneurship Development (A New Venture Creation) – Vasant Desai, Himalaya Publishing House
3. Entrepreneurship Development – S.S. Khanka, S. Chand & Company Ltd., New Delhi

4. Entrepreneurship Development – Gupta and Srinivasan, S. Chand & Company Ltd., New Delhi
5. Demand: Creating What People Love Before They Know They Want It – Adrian J. Slywotzky with Karl Weber, Headline Book Publishing, ISBN: 978-0755388974
6. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses – Eric Ries, Penguin UK, ISBN: 978-0670921607

DCE 603 OPEN ELECTIVE-II
RENEWABLE ENERGY TECHNOLOGY

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COURSE OBJECTIVES

- To understand present and future scenario of world energy use.
- To understand fundamentals of solar energy systems.
- To understand basics of wind energy
- To understand bio energy and its usage in different ways.
- To identify different available non-conventional energy sources

COURSE OUTCOMES:

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

- Understand present and future energy scenario of the world.
- Understand various methods of solar energy harvesting.
- Identify various wind energy systems.
- Evaluate appropriate methods for Bio energy generations from various Bio wastes.
- Identify suitable energy sources for a location.

DETAILED COURSE CONTENT

UNIT-I: INTRODUCTION (05 periods)

World Energy Use; Reserves of Energy Resources; Environmental Aspects of Energy Utilization; Renewable Energy Scenario in India and around the World; Potentials; Achievements/ Applications; Economics of renewable energy systems.

UNIT-II: SOLAR ENERGY (06 periods)

Solar Radiation; Measurements of Solar Radiation; Flat Plate and Concentrating Collectors; Solar direct Thermal Applications; Solar thermal Power Generation Fundamentals of Solar Photo Voltaic Conversion; Solar Cells; Solar PV Power Generation; Solar PV Applications.

UNIT-III: WIND ENERGY

(05 periods)

Wind Data and Energy Estimation; Types of Wind Energy Systems; Performance; Site Selection; Details of Wind Turbine Generator; Safety and Environmental Aspects.

UNIT-IV: BIO-ENERGY

(06 periods)

Biomass direct combustion; Biomass gasifies; Biogas plants; Digesters; Ethanol production; Bio diesel; Cogeneration; Biomass Applications.

UNIT-V: OTHER RENEWABLE ENERGY SOURCES

(06 periods)

Other Renewable Energy Sources: Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.

REFERENCE BOOKS:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, Delhi (ed. 2018)
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN Spon Ltd., UK, 2006.
3. Solar Energy, Sukhatme. S.P., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, GN Tiwari and MK Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment-A Policy Analysis for India, NH Ravindranath, UK Rao, B Natarajan, P Monga, Tata McGraw Hill.

DCE 603 OPEN ELECTIVE-II
ENERGY CONSERVATION AND AUDIT

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COURSE OBJECTIVES:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Undertake energy conservation and energy audit.

COURSE OUTCOMES(CO):

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

CO1: Explain the national energy scenario, key provisions of the Energy Conservation Act 2001, and assess the role of BEE.

CO2: Apply energy-saving techniques in induction motors and transformers and evaluate the performance of energy efficient equipment.

CO3: Analyze energy-saving opportunities in various applications using efficiency metrics and modern control technologies

CO4: Evaluate cogeneration technologies and tariff structures to optimize energy usage.

CO5: Conduct a basic energy audit using appropriate instruments and procedures and prepare a report.

COURSE CONTENTS

Unit – I: Energy Conservation (02 Periods)

Basics Energy Scenario: Primary and Secondary Energy, Energy demand and supply, National scenario. Energy conservation and Energy audit; concepts and difference Indian Electricity Conservation Act 2001 and its latest amendments; relevant clauses of energy conservation BEE and its Roles. Star Labeling: Need and its benefits.

Unit – II: Energy Conservation in Electrical Machines (06 Periods)

Need for energy conservation in induction motor and transformer.

Energy conservation techniques in induction motor by: Improving Power quality. Motor survey Matching motor with loading. Operating in star mode. Replacement by energy efficient motor.

Energy conservation techniques in Transformer. Replacement by energy efficient transformers.

Energy Conservation Equipment: Soft starters, Automatic star delta convertor, Variable Frequency Drives, Automatic p.f. controller (APFC), Intelligent p. f. controller (IPFC) Energy efficient motor; significant features, advantages, applications and limitations.

Unit – III: Energy conservation in Electrical Installation systems (06 Periods)

Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems Energy Conservation in Lighting System a) Replacing Lamp sources. b) Using energy efficient luminaries. c) Using light-controlled gears. d) Installation of separate transformer / servo stabilizer for lighting. Energy Conservation techniques in fans, electronic regulators.

Unit– IV: Energy conservation through Cogeneration and Tariff (08 Periods)

Co-generation : concept, significance for energy conservation, Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration). Factors governing the selection of cogeneration system. Advantages of cogeneration.

Tariff: Types of tariff structure, Transformers Tariff structure, Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff. Application of tariff system to reduce energy bill. Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC).

Unit– V: Energy Audit of Electrical System (06 Periods)

Energy audit (definition as per Energy Conservation Act) Energy audit instruments and their use. Questionnaire for energy audit projects. Energy flow diagram (Sankey diagram) Simple payback period, Energy Audit procedure (walk through audit and detailed audit). Energy Audit report format.

INSTRUCTIONAL STRATEGY

Engage students in experiments and demonstrate that illustrate principles of Energy Conservation, incorporate case studies and examples from everyday life to demonstrate the importance of Energy Conservation.

MEANS OF ASSESSMENT

- Class test/quizzes
- Home assignments
- Attendance
- Sessional Test

- Practical Tasks
- Presentation/Seminar

RECOMMENDED BOOKS:

1. Guidebooks No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).
2. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
3. Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539
4. Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708
5. Sharma, K. V., Venkateshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298
6. Mehta, V. K., Principles of Power System, S. Chand & Co. New Delhi, 2016, ISBN 9788121905947
7. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria & Sons, New Delhi ISBN-13: 9789350141014.

DCE 604
PROJECT WORKS

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COURSE OBJECTIVE:

Major projects for civil engineering diploma students are essential because it provides them advantage like apply theoretical knowledge to real-world problems, develop critical skills like problem-solving and teamwork, provide hands-on experience with tools and technologies, encourage innovation and creativity, prepare students for their careers by demonstrating initiative and independence, Familiarize students with industry standards.

COURSE OUTCOMES:

After undergoing this subject, the student will be able to:

- Use effectively oral, written and visual communication
- Demonstrate skill and knowledge of current technological tools and techniques specific to the professional field of study.
- Identify, analyse and solve problems creatively through sustained critical investigation.
- Develop leadership abilities.
- Apply fundamental and disciplinary concepts and methods in ways appropriate to their areas of study.

Major projects are crucial for civil engineering diploma students for several reasons:

1. Application of Knowledge: They allow students to apply theoretical concepts learned in class to practical, real-world problems, reinforcing their understanding.
2. Skill Development: Projects help in developing essential skills such as problem-solving, critical thinking, teamwork, and project management, which are highly valued in the engineering industry.
3. Hands-On Experience: Students gain hands-on experience with tools, materials, and technologies used in mechanical engineering, which is invaluable for their future careers.
4. Innovation and Creativity: Working on projects encourages students to think creatively and come up with innovative solutions to engineering challenges.
5. Career Preparation: Completing projects demonstrates a student's ability to take initiative, work independently, and successfully complete tasks, making them more attractive to potential employers.
6. Industry Standards: Projects familiarize students with industry standards and practices,

preparing them for professional work environments.

7. Networking: Collaborating on projects provides opportunities to build networks with peers, faculty, and industry professionals, which can be beneficial for future career prospects.

Note: The Project selected in the 5th semester will be continued in 6th Semester.

As a major project activity each student is supposed to study the operations at site and prepare a detail project report of the observations/processes/activities by him/her. The students should be guided by the respective subject teachers. Each teacher may guide a group of 4 to 5 students. The teachers along with field supervisors/engineers will conduct performance assessment of students. Criteria for assessment will be as follows:

S.NO.	CRITERIA
1.	Attendance and Punctuality
2.	Project Progress Presentation-I
3.	Project Progress Presentation-II
4.	Project Model & final Presentation
5.	Report Writing