

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	3	-	-	3
Subject Name	Design of Steel and RCC structure				
Subject Code	DCE20S501				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

1. To learn the concept of limit state design for tension and compression steel members.
2. To learn the concept of limit state design of steel beams.
3. To understand design of RCC elements.
4. To know the design of short and long RCC columns.

Course Outcomes

After competing this course, student will be able to:

- CO1:** Design of steel tension and compression member.
CO2: Design of steel I and Channel sections.
CO3: Design of singly and doubly reinforced RCC beam.
CO4: Design of RCC beam for shear and development length.
CO5: Design of short and long RCC columns.

Unit	Syllabus	Periods
UNIT-I	Design of Steel Tension and Compression Members (Limit State Method): Types of sections used for Tension members, Strength of tension member by-yielding of section, rupture of net cross-section and block shear, design of axially loaded single angle and double angle tension members with bolted and welded connections. Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design compressive stress. Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No	12

	numerical problems).Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.	
UNIT-II	Design of Steel beams (Limit State Method): Standard beam sections, bending stress calculations. Design of simple I and channel section. Check for shear as per IS 800.	8
UNIT-III	Design of Reinforced Concrete Beams by Limit State Method: Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456. Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section. Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of A_{st} and A_{sc} .	10
UNIT-IV	Shear, Bond and Development length in Design of RCC member: Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement. Types of bond, Bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90° hook, Lapping of bars. Simple numericals on: Shear reinforcement, Adequacy of section for shear. Introduction to serviceability limit state check.	12
UNIT-V	Design of axially loaded RCC Column: Definition and classification of column, Limit state of compression members, Effective length of column. Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc. Design of axially loaded short column - Square, Rectangular, and Circular only.	10

Text Books:

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam P., Design of Steel Structures, S. Chand and Company, Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

Reference Books:

1. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune, 2014.
2. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
3. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
4. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
5. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	3	-	-	3
Subject Name	Estimating, Costing and valuation				
Subject Code	DCE20S502				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

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

Course Outcomes

After competing this course, student will be able to:

- CO1:** Select modes of measurements for different items of works.
CO2: Prepare approximate estimate of a civil engineering works.
CO3: Prepare detailed estimate of a civil engineering works.
CO4: Use relevant software for estimating the quantities and cost of items of works.
CO5: Justify rate for given items of work using rate analysis techniques.

Unit	Syllabus	Periods
UNIT-I	Fundamentals of Estimating and Costing: Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision. 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. Checklist of items in load bearing and framed structure. 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. Rules for deduction in different category of work as per IS: 1200. Description / specification of items of building work as per PWD /DSR.	12

UNIT-II	Approximate Estimates: Approximate estimate- Definition, Purpose. Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, typical bay method, approximate quantity method (with simple numerical). Approximate estimate for roads, Railways, bridges/culvert, irrigation projects and water supply projects.	8
UNIT-III	Detailed Estimate: Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of de- tailed estimate- Taking out quantities and Abstracting. Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numerical). Long wall and Short wall method, Centre line method. Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements. Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc. Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.	10
UNIT-IV	Estimate for Civil Engineering Works: Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method. Detailed estimate for septic tank, Community well. Use of computer /softwares / programmes for detailed estimate Preparation of Civil Engineering Works.	12
UNIT-V	Rate Analysis: Rate Analysis: Definition, purpose and importance. Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit, Procedure for rate analysis. Task work- Definition, types. Task work of different skilled labour for different items. Categories of labours, their daily wages, types and number of labours for different items of work. Transportation charges of materials - Lead and Lift Hire charges of machineries and equipment. Preparing rate analysis of different items of work pertaining to buildings and roads.	10

Text Books:

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.

Reference Books:

1. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company (P) Ltd. New Delhi.
2. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.

SYLLABUS
Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	3	-	-	3
Subject Name	(DE)Traffic Engineering				
Subject Code	DCE20S503				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

1. To understand the issues involved in traffic flow.
2. To know and understand the tools for traffic studies.
3. To delineate various traffic control measures.
4. To understand measures for preventing accidents.

Course Outcomes

After competing this course, student will be able to:

CO1: Analyze road traffic characteristics.

CO2: Undertake various types of road traffic studies.

CO3: Use relevant road traffic signs, signal and markings.

CO4: Identify the intersection depending on the traffic flow.

CO5: Suggest preventive measures to avoid accidents by analysing the traffic conditions at site.

Unit	Syllabus	Periods
UNIT-I	Fundamentals of Traffic Engineering: Traffic engineering- Definition, objects, scope, Relationship between speed, volume and density of traffic, Road user's characteristics-physical, mental, emotional factors. Vehicular characteristics-width, length, height, weight, speed, efficiency of breaks. Road characteristics - gradient, curve of a road, design speed, friction between road and tyre surface. Reaction time - factors affecting reaction time. PIEV Theory.	12

UNIT-II	Traffic Studies: Traffic volume count data- representation and analysis of data. Necessity of Origin and Destination study and its methods. Speed studies - Spot speed studies, and its presentation. Need and method of parking study.	8
UNIT-III	Road Signs and Traffic Markings: Traffic control devices –definition, necessity, types. Road signs - definition, objects of road signs. Classification as per IRC: 67-Mandatory or Regulatory, Cautionary or warning, informatory signs, Location of cautionary or warning sign in urban and non-urban areas, Points to be considered while designing and erecting road signs. Traffic markings- definition, classification, carriage way, kerb, object marking and reflector markers.	10
UNIT-IV	Traffic Signals and Traffic Islands: Traffic signals- Definition, Types, Traffic control signals, pedestrian signals. Types of traffic control signals - Fixed time, manually operated, traffic actuated signals and location of signals. Compute signal time by fix time cycle, Webster’s and IRC method and sketch timing diagram for each phase. Traffic islands –Definition, advantages and disadvantages of providing islands. Types of traffic islands - rotary or central, channelizing or Refuge Island. Road intersections or junctions - Definition, Types of road intersection. Intersection at grade- Types, basic requirements of good intersection at grade. Grade separated intersection- advantages and disadvantages, types - flyovers-partial and full Cloverleaf pattern, Diamond intersection, and Trumpet type, underpass.	12
UNIT-V	Road Accident Studies and Arboriculture: Road Accidents-Definition, types and causes for collision and non-collision accidents. Measures to prevent road accidents. Collision and condition diagram. Street lighting –definition, necessity, types-luminaire, foot candle, lumen, factors affecting their utilization and maintenance. Arboriculture- definition, objectives, factors affecting selection of type of trees. Maintenance of trees-protection and care of road side trees.	10

Text Books:

1. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
2. Kadiyali L.R., Transportation Engineering, Khanna Book Publishing Co., Delhi.
3. Vazirani, V N, Chaondola, S P, Transportation Engineering Vol. I & II, Khanna Publishers. Delhi.

Reference Books:

1. Saxena, S C, Traffic planning and design, Dhanpat Rai & Sons Delhi.
2. Kumar R S, Introduction to Traffic Engineering, University Press (India), Pvt. Ltd.

SYLLABUS
Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	3	-	-	3
Subject Name	(DE)Traffic Engineering				
Subject Code	DCE20S503				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

1. To understand the issues involved in traffic flow.
2. To know and understand the tools for traffic studies.
3. To delineate various traffic control measures.
4. To understand measures for preventing accidents.

Course Outcomes

After competing this course, student will be able to:

CO1: Analyze road traffic characteristics.

CO2: Undertake various types of road traffic studies.

CO3: Use relevant road traffic signs, signal and markings.

CO4: Identify the intersection depending on the traffic flow.

CO5: Suggest preventive measures to avoid accidents by analysing the traffic conditions at site.

Unit	Syllabus	Periods
UNIT-I	Fundamentals of Traffic Engineering: Traffic engineering- Definition, objects, scope, Relationship between speed, volume and density of traffic, Road user's characteristics-physical, mental, emotional factors. Vehicular characteristics-width, length, height, weight, speed, efficiency of breaks. Road characteristics - gradient, curve of a road, design speed, friction between road and tyre surface. Reaction time - factors affecting reaction time. PIEV Theory.	12

UNIT-II	Traffic Studies: Traffic volume count data- representation and analysis of data. Necessity of Origin and Destination study and its methods. Speed studies - Spot speed studies, and its presentation. Need and method of parking study.	8
UNIT-III	Road Signs and Traffic Markings: Traffic control devices –definition, necessity, types. Road signs - definition, objects of road signs. Classification as per IRC: 67-Mandatory or Regulatory, Cautionary or warning, informatory signs, Location of cautionary or warning sign in urban and non-urban areas, Points to be considered while designing and erecting road signs. Traffic markings- definition, classification, carriage way, kerb, object marking and reflector markers.	10
UNIT-IV	Traffic Signals and Traffic Islands: Traffic signals- Definition, Types, Traffic control signals, pedestrian signals. Types of traffic control signals - Fixed time, manually operated, traffic actuated signals and location of signals. Compute signal time by fix time cycle, Webster’s and IRC method and sketch timing diagram for each phase. Traffic islands –Definition, advantages and disadvantages of providing islands. Types of traffic islands - rotary or central, channelizing or Refuge Island. Road intersections or junctions - Definition, Types of road intersection. Intersection at grade- Types, basic requirements of good intersection at grade. Grade separated intersection- advantages and disadvantages, types - flyovers-partial and full Cloverleaf pattern, Diamond intersection, and Trumpet type, underpass.	12
UNIT-V	Road Accident Studies and Arboriculture: Road Accidents-Definition, types and causes for collision and non-collision accidents. Measures to prevent road accidents. Collision and condition diagram. Street lighting –definition, necessity, types-luminaire, foot candle, lumen, factors affecting their utilization and maintenance. Arboriculture- definition, objectives, factors affecting selection of type of trees. Maintenance of trees-protection and care of road side trees.	10

Text Books:

1. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
2. Kadiyali L.R., Transportation Engineering, Khanna Book Publishing Co., Delhi.
3. Vazirani, V N, Chaondola, S P, Transportation Engineering Vol. I & II, Khanna Publishers. Delhi.

Reference Books:

1. Saxena, S C, Traffic planning and design, Dhanpat Rai & Sons Delhi.
2. Kumar R S, Introduction to Traffic Engineering, University Press (India), Pvt. Ltd.

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	3	-	-	3
Subject Name	(DE)Solid Waste Management				
Subject Code	DCE20S504				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

1. To know various sources of solid.
2. To learn techniques of collection and transportation of solid waste.
3. To know various methods of disposal of solid waste.
4. To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

Course Outcomes

After competing this course, student will be able to:

- CO1:** Identify the sources of solid waste.
CO2: Select the relevant method of collection and transportation of solid waste.
CO3: Suggest an action plan for composting of solid waste.
CO4: Devise suitable disposal technique for solid waste.
CO5: Use the relevant method for disposal of Bio-medical and E-waste.

Unit	Syllabus	Periods
UNIT-I	Introduction: Definition of solid waste, different solid waste – domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc. Sources of solid waste, Classification of solid waste – hazardous and non- hazardous waste. Physical and chemical characteristics of municipal solid waste.	12

UNIT-II	Storage, Collection and Transportation of Municipal Solid Waste: Collection, segregation, storage and transportation of solid waste. Tools and Equipment- Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers, Community bin - like movable and stationary bin. Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity, location. Role of rag pickers and their utility for society.	8
UNIT-III	Composting of Solid Waste: Concept of composting of waste, Principles of composting process. Factors affecting the composting process. Methods of composting – Manual Composting – Bangalore method, Indore Method, Mechanical Composting – Dano Process, Vermi composting.	10
UNIT-IV	Techniques for Disposal of Solid Waste: Solid waste management techniques – solid waste management hierarchy, waste prevention and waste reduction techniques. Land filling technique, Factors to be considered for site selection, Land filling methods-Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill, Advantages and disadvantages of landfill method, Recycling of municipal solid waste. Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste – Definition, Methods.	12
UNIT-V	Biomedical and E-waste management: Definition of Bio medical Waste. Sources and generation of Biomedical Waste and its classification, Bio medical waste Management technologies. Definition, varieties and ill effects of E- waste, recycling and disposal of E- waste.	10

Text Books:

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed. 2018.
2. Bhide, A. D., Solid Waste Management, Indian National Scientific Documentation Centre, NewDelhi.
3. George Techobanoglous, Kreith, Frank, Solid Waste, McGraw Hill Publication, New Delhi.

Reference Books:

1. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
2. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

SYLLABUS
Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	3	-	-	3
Subject Name	(DE)Advanced Construction Technology				
Subject Code	DCE20S505				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

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

Course Outcomes

After competing this course, student will be able to:

- 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.

Unit	Syllabus	Periods
UNIT-I	Advanced Construction Materials: 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, plasterboards, micro-silica, waterproofing materials, adhesives. Use of waste products and industrial by products in bricks, blocks, concrete and mortar.	12

UNIT-II	Advanced Concreting Methods and Equipments: 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, shotcreting.	8
UNIT-III	Advanced Technology in Constructions: Construction of bridges and flyovers: Equipments and machineries required for foundation and super structure. 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.	10
UNIT-IV	Hoisting and Conveying Equipment: 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.	12
UNIT-V	Miscellaneous Machineries and Equipments: Excavation Equipments: Use, working and output of following machinery – bull dozers, scrapers, graders, Clam Shell, trenching equipment, Tunnel boring machine, Wheel mounted belt loaders, power shovels, JCB, and drag lines. Compacting Equipments: Output of different types of rollers such as plain rollers, ship footed 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 equipment, floor polishing and cutting machine selection of drilling pattern for blasting, Bentonite/mud slurry in drilling, Explosives for blasting, Dynamite, process of using explosives.	10

Text Books:

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi.
2. Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. New York.

Reference Books:

1. Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
2. Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
3. Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
4. Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.

SYLLABUS

Civil Engineering

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year	V/III	3	-	-	3
Subject Name	Industrial Automation				
Subject Code	DOC20S506				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. To present the basic fundamentals of industrial automation and engineering.
2. To expose the Student to different element of automation, their properties, structures and imperfections present in them.

Course Outcomes:

- CO1:** State the principles of Industrial automation.
CO2: Discuss various types of automation.
CO3: Use different types of hydraulic and pneumatic systems.
CO4: Understand working of sensors and actuators.
CO5: Understand the working of industrial automation and control system.

Unit	Syllabus	Periods
UNIT-I	Introduction to Automation: Definition and fundamentals of automation, reasons for Automating, basic elements of an automated system: Power, Program and control system Advanced automation functions: safety, maintenance & repair diagnosis, error detection and recovery Levels of automation Automation principles and strategies: USA principle, ten strategies of automation and production system, automation migration strategy.	10

UNIT-II	Mechanization and Automation: Mechanization and automation, product cycle, hard Vs flexible automation, Capital- intensive Vs low cost automation Types of systems-mechanical, electrical, hydraulic, pneumatic and hybrid systems Automation using CAMS, Geneva mechanisms, gears etc. Assembly line Automation: automated assembly systems, transfer systems, vibratory bowl feeders, non-vibratory feeders, part orienting, feed track, part placing & part escapement systems. Introduction to Material storage/ handling and transport systems, and its automation using AS/RS, AGVS and conveyors etc.	10
UNIT-III	Pneumatics and hydraulics: Hydraulic and pneumatic devices-Different types of valves , Actuators and auxiliary elements in Pneumatics & hydraulics , their applications and use of their ISO symbols Synthesis and design of circuits (up to 3 cylinders)–pneumatic, electro pneumatics and hydraulics Design of Electro-Pneumatic Circuits using single solenoid and double solenoid valves; with and without grouping.	11
UNIT-IV	Sensors & Actuators Sensors: Selection of sensors (Displacement, temperature, acceleration, force /pressure) based on static and dynamic characteristics Interfacing: Concept of interfacing, bit accuracy and sampling speed, amplifying electronics, and microcontroller Actuators: Principle and selection of mechano-electrical actuators (1) DC motors (2) Stepper Motors (3) Solenoid Actuators (4) Servo Motors (5) BLDC.	10
UNIT-V	Industrial control systems: Process industries versus discrete manufacturing industries, Continuous verses discrete control, Computer process control, Forms of computer process control Discrete control using PLC- discrete process control, Programmable logic controller, its architecture, ladder digs, Ladder Logic Programming for different types of logic gates, Latching, Timers, Counter, Practical Examples of Ladder Programming.	14

Text Books:

1. Nagrath & Gopal “*Control System*”, TMH.
2. Majumdar S. R., “*Pneumatic Systems*”, Tata McGraw Hill, New Delhi.

Reference Books:

1. Esposito A., “*Fluid Power with Applications*”, Prentice Hal of India, New Delhi.
2. Groover, M.P., “*Automation, Production Systems & Computer Integrated Manufacturing*”, Prentice Hall of India, New Delhi.

SYLLABUS
Civil Engineering

Class	Diploma (EX/CSE/ME/CE)		L	T	P	C
Semester/Year	V/III		3	0	0	3
Subject Name	Sensor Network					
Subject Code	DOC20S507					
Paper	English					
	Hindi					
Max. Marks	100					
Course Objectives:						
<ol style="list-style-type: none"> 1. To learn about the issues and challenges in the design of wireless ad hoc networks. 2. To understand the working of MAC and Routing Protocols for ad hoc and sensor networks 3. To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks. 4. To understand various security issues in ad hoc and sensor networks and the corresponding solutions. 						
Course Outcomes:						
At the end of the course, the student should be able to:						
CO1. Identify different issues in sensor networks.						
CO2. To analyse protocols developed for sensor networks.						
CO3. To identify and understand security issues in sensor networks.						
CO4. Sensor data acquisition, processing and handling.						
CO5. Communication architecture and protocols for WSN (MAC, Link, Routing).						
Unit	Syllabus					Periods
UNIT - I	Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.					8
UNIT - II	Architectures Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.					12
UNIT - III	Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.					12

UNIT - IV	Infrastructure Establishment Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.	10
UNIT - V	Sensor Network Platforms and Tools Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level Software platforms, Node-level Simulators, State-centric programming.	10

TEXT BOOKS:

1. Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.

REFERENCE BOOKS:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols and Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

SYLLABUS
Civil Engineering

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year		3	0	0	3
Subject Name	Space Science				
Subject Code	DOC20S508				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

Students will be able to:

1. To impart knowledge in concepts of Interplanetary Space.
2. To understand fundamental Particles and basic forces.
3. To understand Kepler's Laws.

Course Outcomes:

Students will be able to:

- CO1.** Introduction to Planetary and Interplanetary Space.
CO2. Structure of Earth's Atmosphere.
CO3. Students should able to apply Observational and Experimental tools for Astronomy and space Science.
CO4. Students should able to fundamental Particles and basic forces.
CO5. Student should able to electromagnetic spectrum and Astronomer's tools.

Unit	Syllabus	Periods
UNIT-I	Solar System, Kepler's Laws, Earth-Moon System, Solar and Lunar types, Exploration of Solar System by Telescopes, Rockets and Satellites.	8
UNIT-II	Structure of Earth's Atmosphere- Lower, Middle and Upper Troposphere (0-10 km), Stratosphere (10-50km), Ionosphere (50-1000 km), Proton sphere (10,000 to 60,000 km towards sun), Interplanetary space (Beyond 60,000 km towards the sun), Earth as a Magnetic Comet.	8
UNIT-III	In-situ measurements of chemical, physical and dynamical parameters using Kites, Balloons, Aero planes, Rockets and Satellite Payloads.	7
UNIT-IV	Protons, Electrons, Neutrons, Neutrinos, Mesons, leptons, and quarks. The concept of Basic forces viz., strong, weak, electromagnetic and gravitational forces.	7

UNIT-V	The nature of light: Light as an electric vibration, the electromagnetic radiation from a heated object, Doppler shift. Optical telescopes, (Galileian, Newtonian, Cassegranian & Hubble Space Telescope), Magnifying power & Resolving power of telescopes, UV, x-ray, IR, Radio & gravitational Astronomy, Spectroscope.	8
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Ionospheric Radio Propagation by Kenneth Davis. National Bureau of Standards, Monograph 80 (1965), US Government Printing office, Washington D.C. 2. Physics of the Upper Atmosphere edited by J, A. Ratcliffe, Cavendish Laboratory, University of Cambridge. Academic Press New York and London (1960). 		
<p>Reference Books:-</p> <ol style="list-style-type: none"> 1. Research in Geophysics: Vol.1- Sun, Upper Atmosphere and space edited by Hugh Odishaw, National Academy of Sciences. Washington D.C. 2. Source book on the Space Sciences - Samuel Glasstone, Princeton, New Jersey. 3. The Upper Atmosphere - S K Mitra, The University of Michigan, Asiatic Society, 2010. 		

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	-	-	4	2
Subject Name	RCC Lab				
Subject Code	DCE20S509				
Paper	English	English			
	Hindi				
Max. Marks	50				

Course Objectives

Following are the objectives of this course:

1. To learn the concept of limit state design of tension and compression steel members.
2. To understand design of steel beams.
3. To learn the concept of limit state design of RCC beams.
4. To know the limit state design of RCC columns.

Course Outcomes

After competing this course, student will be able to:

CO1: Design of steel tension and compression member.

CO2: Design of steel beams including check for shear.

CO3: Design of singly and doubly reinforced RCC beam.

CO4: Design of shear reinforcement in RC beams.

CO5: Design of RCC column as per IS 456.

List of experiments to be performed:

Periods

1. Draw any five commonly used rolled steel sections and five built up sections.
2. Summarize the provisions of IS 800 required for the design of tension member in report form
3. Compile relevant clauses from IS 800 required for the design of a compression member and submit it in report form.
4. Draw sketches for single & double lacing of given built up columns.
5. Draw sketches for battening of given built up columns.

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6. Prepare a report on the IS 800 provisions pertaining to design of lacing & battening along with its significance.
7. Draw cross section, strain diagram & stress diagram for doubly reinforced section.
8. Design simply supported I section steel beam for udl.
9. Design beams section for shear as per IS 800 provisions.
10. Draw sketches of different types of column footings.
11. Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements.
12. Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.
13. Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.
14. Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.
15. Draw cross section, strain diagram & stress diagram for singly reinforced section.

Text Books:

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

Reference Books:

1. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune, 2014.
2. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
3. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
4. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
5. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	5th sem /3rd year	-	-	4	2
Subject Name	QSC Lab				
Subject Code	DCE20S510				
Paper	English	English			
	Hindi				
Max. Marks	50				

Course Objectives

Following are the objectives of this course:

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

Course Outcomes

After competing this course, student will be able to:

- CO1:** Select modes of measurements for different items of works.
CO2: Prepare approximate estimate of a civil engineering works.
CO3: Prepare detailed estimate of a civil engineering works.
CO4: Use relevant software for estimating the quantities and cost of items of works.
CO5: Justify rate for given items of work using rate analysis techniques.

List of experiment to be performed:

Periods

1. Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2. Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3. Study of items with specification given in the DSR (for any ten item).
4. Recording in Measurement Book (MB) for any four items.
5. Prepare bill of quantities of given item from actual measurements. (any four items).
6. Prepare approximate estimate for the given civil engineering works.

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| <ol style="list-style-type: none"> 7. Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR (1BHK Building with staircase). 8. Prepare detailed estimate from the given set of drawings using “standard measurement and abstract format” for RCC framed structure using description of item from DSR along with face sheet and prepare quarry chart, lead statement (G+1 Building) . 9. Calculate the reinforcement quantities from the given set of drawings for a room size of 3 mX 4 m with bar bending schedule (footing, column, beam, lintel with chajja, slab). 10. Prepare detailed estimate of road of one kilometer length from the given drawing. 11. Prepare detailed estimate of small Septic tank from the given set of drawings. 12. Prepare detailed estimate of well from the given set of drawing. 13. Use the relevant software to prepare detailed estimate of a Road. 14. Use the relevant software to prepare detailed estimate of a residential building. 15. Prepare rate analysis for the given five item of works. | |
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Text Books:

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors.
2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGrawHill Education, New Delhi.
3. Rangwala,S.C., Estimating and Costing, Charotar Publishing House, Anand.

Reference Books:

1. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company (P) Ltd. Delhi.
2. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
3. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.PWD Schedule of Rates.
4. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
5. Manual of Specifications and Standards for DBFOT projects, EPC works.

SYLLABUS
Civil Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	5th sem /3rd year	0	0	4	2
Subject Name	Major Project-I				
Subject Code	DCE20S512				
Paper	English	English			
	Hindi				
Max. Marks	50				

Course Objectives:

At the end of the course the students should demonstrate skills related to performing a group project activity. The students should be able to undertake and execute a major project.

Course outcomes:

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

CO1 Solve complex structural problems by applying appropriate techniques and tools.

CO2: Exhibit good communication skill to the engineering community and society.

CO3: Demonstrate professional ethics and work culture.

Syllabus
Periods

Major Project-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals 'contribution.

Continuous assessment of Major Project-I and Major Project-II at Mid Sem and End Sem will be monitored by the departmental committee.

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SEMESTER - VI

SYLLABUS
Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	6th sem /3rd year	3	-	-	3
Subject Name	Public Health Engineering				
Subject Code	DCE20S601				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

1. To learn the principles for identification of sources of surface and subsurface water.
2. To learn calculation of population and requirement of drinking water.
3. To understand the plotting of water supply scheme highlighting different features.
4. To know evaluation of characteristics and treatment of sewage.

Course Outcomes

After competing this course, student will be able to:

CO1: Know the procedure to identify the sources of surface and subsurface water

CO2: Estimate the quantity of drinking water required for a population

CO3: Draw labelled layout for water supply scheme.

CO4: Device suitable water treatment technique.

CO5: Evaluate the characteristics and suggest treatment of sewage.

Unit	Syllabus	Periods
UNIT-I	Sources, Demand and Quality of water: Water supply schemes - Objectives, components, Sources of water: Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes. Demand of water: Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town. Quality of water: Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved	12

	Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per IS 10500.	
UNIT-II	Purification of water: Purification of Water: Objectives of water treatment, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator. Filtration - mechanization of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, operational problems in filtration. Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants. Miscellaneous water Treatments: Introduction to water softening, Defluoridation techniques.	8
UNIT-III	Conveyance and Distribution of water: Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline. Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.	10
UNIT-IV	Domestic sewage and System of Sewerages: Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions- Sewage, sullage, types of sewage. Definition of the terms related to Building Sanitation-Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe. Building sanitary fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types, qualities of good trap. Systems of plumbing - one pipe, two pipe, single stack, choice of system. Principles regarding design of building drainage, inspection and junction chambers, their necessity, location, size and shape. Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.	12
UNIT-V	Characteristics and treatment of Sewage: Analysis of sewage: Characteristics of sewage, B.O.D., C.O.D. and its significance, Central Pollution Control Board Norms for discharge of treated sewage, Objects of sewage treatment and flow diagram of conventional sewage treatment plant. Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation pond, Oxidation ditch. Septic tank, Recycling and Reuse of domestic waste.	10

Text Books:

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi.
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers.
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai Publication.
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi.

Reference Books:

1. Rao, C.S., Environmental Pollution Control Engineering, New Age International.
2. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers.
3. Peavy H S, Rowe D R, and Techobanoglous G, Environmental Engineering, McGraw Hill Publication.
4. Basak N N, Environmental Engineering, McGraw Hill Publishers.

SYLLABUS
Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	6th sem /3rd year	3	-	-	3
Subject Name	Geotechnical Engineering				
Subject Code	DCE20S602				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

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

Course Outcomes

After competing this course, student will be able to:

CO1: Identify types of rocks and sub soil strata of earth.

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

CO3: Use the results of permeability and shear strength test for foundation analysis.

CO4: Interpret soil bearing capacity results.

CO5: Compute optimum values for moisture content for maximum dry density of soil through various tests.

Unit	Syllabus	Periods
UNIT-I	Overview of Geology and Geotechnical Engineering: 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. Field	12

	application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam.	
UNIT-II	Physical and Index Properties of Soil: 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.	8
UNIT-III	Permeability and Shear Strength of Soil: 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.	10
UNIT-IV	Bearing Capacity of Soil: 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. 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.	12
UNIT-V	Compaction and stabilization of soil: Concept of compaction, 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, ram- ming and vibration. Suitability of various compaction equipment-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation. 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.	10

Text Books:

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.

Reference Books:

1. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
2. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
3. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	6th sem /3rd year	3	-	-	3
Subject Name	(DE) Repairs and Maintenance of Structures				
Subject Code	DCE20S603				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

1. To learn about types of maintenance techniques.
2. To understand causes of various types of damages.
3. To know about relevant materials for repair.
4. To learn methods of retrofitting for different structures.

Course Outcomes

After competing 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.

Unit	Syllabus	Periods
UNIT-I	Basics of maintenance: Types of Maintenances - repair, retrofitting, re-strengthening, rehabilitation and restoration. Necessity, objectives and importance of maintenance. Approach of effective management for maintenance. Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance.	12

UNIT-II	Causes and detection of damages: Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement. Various aspects of visual observations for detection of damages. Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection micro- scope, digital crack measuring gauge. Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).	8
UNIT-III	Materials for maintenance and repairs: Types of repair material, material selection. Essential parameters for maintenance and repair materials such - bond with substrate, durability. Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement. Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates. Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement concrete, emulsions and paints.	10
UNIT-IV	Maintenance and repair methods for masonry Construction: Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation. Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints. Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing. Remedial measures for dampness & efflorescence in wall.	12
UNIT-V	Maintenance and repair methods for RCC Construction: Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation. Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer concrete, corrosion protection such as jacketing. Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy injection, grooving and sealing, stitching, grouting and guniting/shotcreting. Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring, underpinning and propping of framed structure.	10

Text Books:

1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers & Distributors Pvt. Ltd., New Delhi.

Reference Books:

2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies.

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	6th sem /3rd year	3	-	-	3
Subject Name	(DE) Advanced Design of Structures				
Subject Code	DCE20S604				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

- 1.To understand the concepts involved in the design of riveted and welded connections.
- 2.To know the provisions of BIS code for design of built up sections.
- 3.To analyze T and L shaped beam sections.
- 4.To understand the concept for design of one way and two way slabs.
- 5.To identify short and long columns and their design provisions.

Course Outcomes

After competing this course, student will be able to:

- CO1:** Design of riveted and welded connections.
CO2: Design of built up sections.
CO3: Design of T and L shaped beam sections.
CO4: Design of one way and two way slabs.
CO5: Design of RCC column and isolated footings.

Unit	Syllabus	Periods
UNIT-I	Design of connections in steel structures: Types of rivets, Riveted connections, Strength of riveted joints, Design of riveted joints for Axially loaded members. Types of weld, welded connections, Permissible stresses in weld, Strength of weld. Advantages and disadvantages of weld, Design of fillet weld and butt weld for axial load. Design of column bases for axially loaded columns only.	12

UNIT-II	Steel Beams: Different steel sections, Simple and built up sections, Permissible bending stresses, Design of built up sections (symmetrical I section with cover plates only), check for shear and deflection. Introduction to plate girder: Components and functions (no numerical).	8
UNIT-III	Design of RC flanged beam General features of T and L beams, Advantages, Effective width as per BIS 456: Design of singly reinforcement T beam, Stress and Strain diagram, Depth of neutral axis, Moment of resistance, T and L beams with neutral axis in flange only. Simple numericals on location of neutral axis, Effective width of flange.	10
UNIT-IV	Design of slab: Design of simply supported one-way slab for flexure, shear and deflection and checks, as per the provisions of BIS 456. Design of one-way cantilever slab, Chajjas, Flexure including checks for Development length and Shear stress. Design of two-way simply supported slab, Introduction to design of dog-legged staircases.	12
UNIT-V	Design of RCC Column and Footing design: Uni-axial bending: IS 456 provisions, Column with uni-axial moment, Effective length calculations, Minimum eccentricity. Design of footing for axially loaded column only.	10

Text Books:

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, New Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

Reference Books:

1. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune.
2. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co.,
3. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
4. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill
5. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	6th sem /3rd year	3	-	-	3
Subject Name	(DE) Tendering and Accounts				
Subject Code	DCE20S605				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives

Following are the objectives of this course:

1. To understand terminologies in contract and tender document and their significance.
2. To know different types of contracts and their uses.
3. To learn preparation of typical Tender documents for civil engineering work.
4. To get acquainted with rent fixation and valuation of civil structures.

Course Outcomes

After competing this course, student will be able to:

- CO1:** Understand various types of contract and when they are used.
CO2: Suggest the relevant type of contract for the given civil engineering work.
CO3: Prepare the typical Tender document for the given civil engineering work.
CO4: Decide type of payment for the executed work.
CO5: Justify the rent fixation and valuation of given civil structure.

Unit	Syllabus	Periods
UNIT-I	Procedure to execute the work: Administrative approval, Technical sanction, budget provision, expenditure sanction. Methods for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing labours on daily wages basis.	12
UNIT-II	Contracts: Definition of contract, objects of contract, requirements of contract, overview of Indian Contract Act. Types of engineering contract with advantages, disadvantages and their suitability - Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, Engineering	8

	Procurement Construction Contract (EPC), Annuity Contract. Introduction of FIDIC Conditions of contract. Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor. Build Operate Transfer (BOT) Project, BOT Toll contract, BOT (Annuity) contract, Design, Build, Finance, Operate and Transfer (DBFOT) contract, Hybrid Annuity contract, Operate Maintain and Transfer (OMT) contract, Operation & Maintenance contract (Introduction only).	
UNIT-III	Tender and Tender Documents: Definition of tender, necessity of tender, types of tender- Local, Global, Limited. E -Tendering System – Online procedure of submission and opening of bids (Technical and Financial). Notice to invite tender (NIT) - Points to be included while drafting tender notice, Drafting of tender notice. Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, letter of award. Meaning of terms - Earnest Money Deposit (EMD), Performance Security Deposit, Validity period, corrigendum to tender notice and its necessity, Unbalanced bid. Tender documents – Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C etc. Terms related to tender documents – contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, price variation clause (escalation), defect liability Period, liquidated Damages. Arbitration- Meaning, Qualification of an arbitrator, Appointment, Dispute and Settlement of disputes, Arbitration and Conciliation Act, Arbitration award.	10
UNIT-IV	Accounts: Various account forms and their uses – Measurement Books, E-Measurement book (E-MB), Nominal Muster Roll(NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts. Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Retention money, E - payment.	12
UNIT-V	Introduction to Valuation: Definition and purpose of Valuation, role of valuer. Definition - Cost, Price and Value, Characteristics of Value, Factors Affecting Value. Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value. Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method. Fixation of rent, Lease – types of lease, lease hold property and free hold property. Mortgage, Mortgage deed, precautions to be taken while making mortgage.	10
Text Books:		
<ol style="list-style-type: none"> 1. Datta, B. N., Estimating and Costing in Civil engineering, UBS Publishers Pvt. Ltd., New Delhi. 2. Raina, V. K., Construction Management and Contract Practices, Shroff Publishers & Distributers Pvt. Ltd. 3. Rangawala, S. C., Estimating and Costing, Charotar Publishing House PVT. LTD., Gujarat. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Birdie, G. S., Estimating and Costing, Dhanpat Rai Publishing Company (P) Ltd., New Delhi. 2. Patil, B. S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai. 3. Chakraborti, M., Estimating and Costing, Specification and Valuation in Civil Engineering, Monojit Chakraborti, Kolkata. 		

SYLLABUS
Civil Engineering

Class		Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year		VI/III	3	0	0	3
Subject Name		Entrepreneurship and Startups				
Subject Code		DOC20S606				
Paper	English					
	Hindi					
Max. Marks		100				
Course Objectives:						
<ol style="list-style-type: none"> 1. Acquiring Entrepreneurial spirit and resourcefulness. 2. Familiarization with various uses of human resource for earning dignified means of living. 3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation. 4. Acquiring entrepreneurial quality, competency, and motivation. 5. Learning the process and skills of creation and management of entrepreneurial venture. 						
Course Outcomes:						
At the end of the course, the student should be able to						
CO1. Understanding the dynamic role of entrepreneurship and small businesses.						
CO2. Organizing and Managing a Small Business.						
CO3. Financial Planning and Control.						
CO4. Forms of Ownership for Small Business.						
CO5. Strategic Marketing Planning.						
Unit	Syllabus					Periods
UNIT - I	Introduction to Entrepreneurship and Startup: Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation. Types of Business Structures, Similarities/differences between entrepreneurs and managers.					10
UNIT - II	Business Ideas and their implementation: Discovering ideas and visualizing the business, Activity map, Business Plan.					8

UNIT - III	Idea to Start-up: Market Analysis – Identifying the target market, Competition evaluation and Strategy Development, Marketing and accounting, Risk analysis.	10
UNIT - IV	Management: Company’s Organization Structure, Recruitment and management of talent, Financial organization and management.	10
UNIT - V	Financing and Protection of Ideas: Financing methods available for start-ups in India. Communication of Ideas to potential investors – Investor Pitch. Patenting and Licenses. Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy.	10

TEXT 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. The Lean Start-up: How today’s Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses Eric Rise Penguin UK ISBN – 978-0670921607.

REFERENCE BOOKS:

1. Demand: Creating What People Love Before They Know They Want It. Adrian J. Slywotzky with Karl Weber Headline Book Publishing ISBN – 978-0755388974.
2. The Innovator’s Dilemma: The Revolutionary Book That Will Change the Way You Do Business Clayton M. Chris- tensen Harvard business ISBN: 978-142219602.

SYLLABUS

Civil Engineering

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year	VI/III	3	0	0	3
Subject Name	Energy Conservation, Management & Audit				
Subject Code	DOC20S607				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives: -Students will be able to:

1. To impart knowledge in concepts of energy conservation.
2. To understand fundamental energy efficiency in boilers, furnaces, steam systems
3. To understand Energy Audit.

Course Outcomes:

Students will be able to:

- CO1.** Introduction of energy conservation.
CO2. Energy efficiency in thermal & electrical utilities
CO3. Objective and principles of Energy Management.
CO4. Energy Economics.
CO5. Climate Policy.

Unit	Syllabus	Periods
UNIT-I	Principles of energy conservation, Energy Conservation Act 2001 and its features, Electricity Act-2003 & its features, Energy consumption pattern, Resource availability, Energy pricing, Energy Security, Estimation of energy use in a building. Heat gain and thermal performance of building envelope - Steady and non-steady heat transfer through the glazed window and the wall - Standards for thermal performance of building envelope, Evaluation of the overall thermal transfer.	8
UNIT-II	Energy efficiency in boilers, furnaces, steam systems, cogeneration utilities, waste heat recovery, compressed air systems, HVAC&R systems, fans and blowers, pumps, cooling tower Energy efficiency for electric motors, lighting systems, Characteristics of Light, Types of Lighting, Incandescent Lighting, Fluorescent Lighting, Vapor Lighting, Street Lighting, LED Lighting, Lighting Design, Light Dimming, Tips for Energy Conservation, Products for Energy Conservation in lighting system.	10
UNIT-III	Definition, objective and principles of Energy Management, Need of Energy Audit and Management, types of energy audit, audit process, Guidelines for	9

	writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations and energy audit report, energy audit of building system, lighting system, HVAC system, Water heating system, heat recovery opportunities during energy audit, Industrial audit opportunities, Instruments for Audit and Monitoring Energy and Energy Savings	
UNIT-IV	Kyoto protocol, Clean development mechanism (CDM), Geopolitics of GHG control; Carbon Market.	7
UNIT-V	Simple Payback Period, Time Value of Money, Internal Rate of Return, Net Present Value, Life Cycle Costing, Equivalent uniform annual cost (EUAC), Life cycle cost, Discounting factor, Capital recovery, Depreciation, taxes and tax credit, Impact of fuel inflation on life cycle cost, Cost of saved energy, cost of energy generated, Energy performance contracts and role of Energy Service Companies (ESCOs).	8

Text Books:

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai.
4. De A.K., "Environmental Chemistry", Wiley Eastern Ltd.

Reference Books:-

1. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R).
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam.

SYLLABUS

Civil Engineering

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year	VI/III	3	0	0	3
Subject Name	Management Information System				
Subject Code	DOC20S608				
Paper	English				
	Hindi				
Max. Marks	100				
Course Objectives:					
The overall aim of this course is to provide students with an understanding at how to use and manage information system in order to revitalize business processes, improve business decision making, and gain competitive advantage.					
Course Outcomes:					
At the end of the course, the student should be able to:					
CO1. Know about MIS, MIS Theory, and Systems Approach.					
CO2. Understand the concept of decision making and MIS.					
CO3. Learn about conceptual system design, detailed system design.					
CO4. Understand implementation, evaluation and maintenance of MIS.					
CO5. Identify the major management challenges to building and using information systems in organizations.					
Unit	Syllabus				Periods
UNIT - I	Introduction of MIS What is MIS, Decision support systems, systems approach, The systems view of business, MIS organization within the Company. Management organizational theory and the systems approach: Development of organizational theory, Management and organizational behaviour, Management information and the systems approach.				10
UNIT - II	Information systems for decision-making: Evolution of an information system, Basic information systems, Decision making and MIS, MIS as technique for making programmed decisions, design assisting information systems. Strategic and project planning for MIS General business planning, appropriate MIS response, MIS planning-general, MIS planning-details.				10

UNIT - III	Conceptual System Design Define the problems, Systems objectives, Establish system constraints, Determine information needs, Determine information sources, Develop alternative conceptual designs and select one, Document the system concept, Prepare the conceptual design report.	10
UNIT - IV	Implementation, Evaluation and Maintenance of the MIS Plan the implementation, Acquire floor space and plan space layouts organized for implementation, Develop procedures for implementation, Train the operating personnel, Computer related acquisitions, Develop forms for data collection and information dissemination, Develop the files, Test the system, Cut over, Document the system, Evaluate the MIS, Control and maintain the system.	12
UNIT - V	Pitfalls in MIS Development Fundamental weaknesses, Soft spots in planning, Design problem, Implementation the TAR PITF.	8

TEXT BOOKS:

1. Ladon K.C., Landon, J.P., Management Information Systems, 4th edition, Prentice-Hall of India.
2. Murdick R.G., Russ J.B., Clagget J.R., Information Systems for modern management.
3. Kanter J., Managing with Information, 4th edition, Prentice - Hall of India.

REFERENCE BOOKS:

1. Effy OZ, Management Information Systems, 3rd edition, Thomson.
2. Jawadekar W.S., Management Information System.
3. Brien J.A.O., Irwin, Management Information Systems, McGraw Hill.
4. Dour's G.B., Olson M.H., Management Information Systems, 2nd edition, McGraw Hill.
5. Thireramp R.J., Decision Support Systems for Effective Planning and Control, PHI.
6. Sadagopan S., Management Information Systems, 4th edition, Prentice-Hall of India.

SYLLABUS
Civil Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	6th sem /3rd year	-	-	8	4
Subject Name	Major Project-II				
Subject Code	DCE20S609				
Paper	English	English			
	Hindi				
Max. Marks	100				

Course Objectives:

At the end of the course the students should demonstrate skills related to performing a group project activity. The students should be able to undertake and execute a major project.

Course outcomes:

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

CO1: Solve complex structural problems by applying appropriate techniques and tools.

CO2: Exhibit good communication skill to the engineering community and society.

CO3: Demonstrate professional ethics and work culture.

Syllabus
Periods

Major Project-II will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals 'contribution.

Continuous assessment of Major Project-I and Major Project-II at Mid Sem and End Sem will be monitored by the departmental committee.

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SYLLABUS

Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	6th sem /3rd year	-	-	2	1
Subject Name	Public Health Engineering Lab				
Subject Code	DCE20S611				
Paper	English	English			
	Hindi				
Max. Marks	50				

List of experiments to be performed:

1. Determine pH value of given sample of water.
2. Determine the turbidity of the given sample of water.
3. Determine residual chlorine in a given sample of water.
4. Determine suspended, dissolved solids and total solids of given sample of water.
5. Determine the dissolved oxygen in a sample of water.
6. Undertake a field visit to water treatment plant and prepare a report.
7. Determine the optimum dose of coagulant in a given raw water sample by jar test.
8. Draw sketches of various valves used in water supply pipe line.
9. Draw a sketch of one pipe and two pipe system of plumbing.
10. Determine B.O.D. of given sample of sewage.
11. Determine pH value of given sample of sewage.
12. Determine suspended solids dissolved and total solids for sample of sewage.
13. Determine the dissolved oxygen in the given sample of sewage.
14. Determine C.O.D. of given sample of sewage.
15. Prepare a report of a field visit to sewage treatment plant.

SYLLABUS
Civil Engineering

Class	Diploma	L	T	P	C
Semester/Year	6th sem /3rd year	-	-	2	1
Subject Name	Geotechnical Engineering Lab				
Subject Code	DCE20S612				
Paper	English	English			
	Hindi				
Max. Marks	50				

List of experiments 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 IS 2720 (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).