

West Bengal State Council of Technical &
Vocational Education and Skill
Development
(Technical Education Division)



Syllabus
of

Diploma in Civil Engineering [CE]

Part-III (6th Semester)

2023

**CURRICULAR STRUCTURE FOR PART – III SECOND SEMESTER (SIXTH SEMESTER)
OF THE FULL-TIME DIPLOMA COURSE IN CIVIL ENGINEERING**

| SL. NO. | SUBJECT CODE | SUBJECT OF STUDY | HOURS PER WEEK | | | CREDITS | Marks |
|---------|--------------|--|----------------|----------|-----------|-----------|------------|
| | | THEORETICAL PAPERS | LECTURE | TUTORIAL | PRACTICAL | | |
| 1 | CEPC601 | Public Health Engineering | 2 | 0 | 0 | 2 | 100 |
| | | LABORATORY/SESSIONAL PAPERS | | | | | |
| 2 | CEPC602S | Civil Engineering Lab-III: Module-VII: Public Health Engineering Lab | 0 | 0 | 2 | 1 | 100 |
| 3 | CEPC603S | Advanced Surveying Practices | 0 | 0 | 2 | 1 | 100 |
| | | ELECTIVE, MANDATORY COURSES AND SEMINAR | | | | | |
| 4 | CEPE604 | Elective IV: one subject out of Tendering and Accounts (CEPE604/I) / Advanced Construction Technology (CEPE604/II) | 3 | 0 | 0 | 3 | 100 |
| 5 | | Entrepreneurship and Start-ups | 3 | 0 | 0 | 3 | 100 |
| 6 | | Compulsory Open Elective: Open Elective I: Engineering Economics & Project Management | 3 | 0 | 0 | 3 | 100 |
| 7 | | Open Elective II : one subject has to be taken from list of open elective subjects as provided by WBSCT&VE&SD* | 3 | 0 | 0 | 3 | 100 |
| 8. | CEPR605S | Major Project-II | 0 | 0 | 4 | 2 | 100 |
| 9. | CESE606S | Seminar and Viva -Voce | 1 | 0 | 0 | 1 | 100 |
| | | TOTAL | 15 | 0 | 8 | 19 | 900 |

NOTE: -

1. All subjects (theoretical as well as sessional/practical) are full paper with 100 marks in aggregate as per AICTE and WBSCT&VE&SD

2. Advanced Surveying Field Practices may also be conducted in 2-3 weeks field work continuously instead of having 2 practical classes per week for the entire semester.

Note: Civil students will be benefited if they choose Solid waste management/ Disaster Management/ Construction Management as the subject for Open Elective II from the list provided by WBSCT&VE&SD

| | | | |
|-----------------------------|--------------------------------------|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Public Health Engineering | Course Code | CEPC601 |
| Subject offered in Semester | Sixth | Number of Credits | 2 (L:2, T: 0, P: 0) |
| Prerequisites | NIL | Course Category | PC |
| Question distribution | As per standing norms of WBSCT&VE&SD | Marks distribution | As per standing norms of WBSCT&VE&SD |

Course Objectives: Following are the objectives of this course:

- To learn the principles for identification of sources of surface and subsurface water
- To learn calculation of population and requirement of drinking water
- To understand the flow-diagram of water supply scheme highlighting different features
- To know evaluation of characteristics and treatment of sewage.

| Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester] | Distribution of unit |
|--|-----------------------------|
| Module A/Group A | Unit I and II |
| Module B/Group B | Unit III and V |
| Module C /Group C | Unit IV |

Course Content

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: Domestic, Industrial, commercial & institutional, public use, losses & wastes, fire demand. 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, Estimation 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, Meaning and importance of different parameters of water- Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Arsenic, Nitrogen and its compounds, Bacteriological tests, Ecoli, Bcoli index, MPN, Sampling of water, Water quality standards as per IS:10500.

UNIT II Purification of water

- Purification of Water: Objectives of water treatment, Screening, 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 - mechanism 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, break-point chlorination, residual chlorine and its importance, Flow diagram of water treatment plants.
- Miscellaneous water Treatments: Removal of colour, taste and odour, Introduction to water softening and Defluoridation techniques.

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.

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, Rainwater-pipe, Soil-pipe, Sullage-pipe, Vent-pipe. Building Sanitary fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Traps- types (P, Q, S, intercepting trap, gully trap, floor trap), 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.

UNIT V Characteristics and treatment of Sewage

- Analysis of sewage: Characteristics of sewage - Major parameters, B.O.D., C.O.D. and its significance, Central Pollution Control Board Norms for discharge of treated sewage.
- Treatment of Sewage: Objects of sewage treatment and flow diagram of conventional sewage treatment plant - 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.

Suggested learning resources

- Sharma S.C, Environmental Engineering, Khanna Publishing House, NewDelhi
- Garg, S.K., Environmental Engineering Vol. I and Vol. II, KhannaPublishers
- Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
- Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
- Rao, C.S., Environmental Pollution Control Engineering, New Age International

- Punmia, B C, Environmental Engineering, vol. I and II, LaxmiPublishers
- Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw Hill
- Basak N N, Environmental Engineering, McGraw HillPublishers.

Course outcomes: After completing this course, student will be able to:

- Know the procedure to identify the sources of surface and subsurface water
- Estimate the quantity of drinking water required for a population
- Draw labelled layout for water supply scheme.
- Select suitable water treatment technique.
- Evaluate the characteristics and suggest treatment of sewage.

| | | | |
|-----------------------------|---|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Civil Engineering Lab-III: Module-VII: Public Health Engineering Lab | Course Code | CEPC602S |
| Subject offered in Semester | Sixth | Number of Credits | 1 (L:0, T: 0, P: 2) |
| Prerequisites | NIL | Course Category | PC |
| Question distribution | | Marks distribution | As per standing norms of WBSCT&VE&SD |

Course Objectives: Following are the objectives of this course:

- To learn the tests for measuring quality of drinking water.
- To learn the tests for measuring quality of Domestic waste water.
- To learn determination of BOD and COD requirement in sewage.

List of Practical to be performed: (Items 1 & 2 compulsory and at least six experiments from the rest)

| | |
|----|--|
| 1 | Draw sketches of various valves used in water supply pipe line |
| 2 | Draw a sketch of one pipe and two pipe system of plumbing |
| 3 | Determine pH value of given sample of water/sewage. |
| 4 | Determine the turbidity of the given sample of water. |
| 5 | Determine residual chlorine in a given sample of water. |
| 6 | Determine suspended, dissolved solids and total solids of given sample of water/sewage. |
| 7 | Determine the dissolved oxygen in a sample of water/sewage. |
| 8 | Determine Fluoride concentration in given water sample. |
| 9 | Determine Arsenic concentration (semi-quantative) in given water sample. |
| 10 | Determine the optimum dose of coagulant in a given raw water sample by jar test. |
| 11 | Determine B.O.D. & C.O.D. of given sample of sewage. |
| 12 | Prepare a report of a field visit to water treatment plant and/or sewage treatment plant if possible |

Note: Item no. 12 may be included in internship.

Suggested learning resources:

- Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
- Basak N N, Environmental Engineering, McGraw Hill Publishers.
- Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers

- Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
- Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
- Rao, C.S., Environmental Pollution Control Engineering, New Age International
- Punmia, B C, Environmental Engineering, vol. I and II, LaxmiPublishers
- Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw Hill Publishers.
- BIS: 10500 - DRINKING WATER — SPECIFICATION, BIS, New Delhi.
- CPCB: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS, CPCB, New Delhi

Course outcomes: After completing this course, student will be able to:

- Perform various tests to assess quality of drinking water
- Perform various tests to assess quality of domestic sewage
- Understand the function of various components of water treatment and sewage treatment plants.

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|-----------------------------|-------------------------------------|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Advanced Surveying Practices | Course Code | CEPC603S |
| Subject offered in Semester | Sixth | Number of Credits | 1 (L:0, T: 0, P: 2) * |
| Prerequisites | NIL | Course Category | PC |
| Question distribution | | Marks distribution | As per standing norms of WBSCT&VE&SD |

*** Advanced Surveying Field Practices may also be conducted in 2 - 3 weeks field work continuously instead of having 2 practical class per week for the entire semester.**

Course Objectives: Following are the objectives of this course:

- To know methods of Theodolite surveying and their uses.
- To learn tacheometric surveying and curve setting.
- To understand the principles of Electronic Distance Measurement and Total station and their uses.
- To know the concept of GPS

List of Practical to be performed: [item number 3 and 5 are desirable]

1. Theodolite traverse Survey: A simple closed traverse of at least 5 sides for any suitable site. Preparation of Gale's traverse table. Plotting the traverse with details on A1 size imperial drawing sheet and calculation of area of the closed traverse. Interior details will have to be filled up by theodolite or by plane table which is found to be more suitable.
2. Simple circular curve setting: Setting out a simple circular curve by Rankine's method of Deflection angles (both one theodolite and two theodolite methods) for a given problem and plotting the curve showing the necessary supporting calculations in a tabular form mentioning suitable scale on A-1 size imperial drawing sheet.
3. Surveying with Total Station: Introduction, description of different parts of total station and reflector prism with stand, set up and orientation,

measurement of distances, measurement of horizontal and vertical angles, methods of measuring remote height and area, etc., Construction of a closed traverse of minimum 5 sides for any suitable site- collection and saving of field data in total station, downloading and transfer of raw data from total station to computer, processing of raw data with the help of any suitable software for preparation of drawing.

4. Use Theodolite as a Tacheometer to compute reduced levels and horizontal distances.
5. GPS Surveying: Working with hand held GPS instrument. Collection coordinates of different objects. Downloading raw data from GPS instrument and prepare a report sheet (excel or doc or pdf format).

Suggested learning resources:

- Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi ruh prakashan, Pune.
- Basak, N. N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
- Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
- Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
- Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
- Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying vol II, Laxmi Publications Pvt. Ltd., New Delhi.
- Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
- Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
- Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
- De, Alak, Plane Surveying, S.Chand Publications, New Delhi

Course outcomes: After completing this course, student will be able to:

- Prepare plans using Theodolite surveys.
- Find distances and elevations using Tachometer.
- Make measurements using Total Station.
- Locate coordinates of survey stations using GPS

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|-----------------------------|--|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Elective IV: Tendering and Accounts | Course Code | CEPE604/I |
| Subject offered in Semester | Sixth | Number of Credits | 3 (L: 3, T: 0, P:0) |
| Prerequisites | NIL | Course Category | PE |
| Question distribution | As per standing norms of WBSCT&VE&SD | Marks distribution | As per standing norms of WBSCT&VE&SD |

Objective:- Following are the objectives of this course:

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

| Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester] | Distribution of unit |
|--|-----------------------------|
| Module A/Group A | Unit I and II |
| Module B/Group B | Unit III |
| Module C /Group C | Unit IV and V |

Contents:

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.

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 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.

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.

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.

Suggested learning resources:

- Datta, B. N., Estimating and Costing in Civil engineering, UBS Publishers Pvt. Ltd., New Delhi
- Raina, V. K., Construction Management and Contract Practices, Shroff Publishers & Distrib- uters Pvt. Ltd.
- Rangawala, S. C., Estimating and Costing, Charotar Publishing House PVT. LTD., Gujrat
- Birdie, G. S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd., New Delhi
- Patil, B. S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai
- Chakraborti, M., Estimating and Costing, Specification and Valuation in Civil Engineering, Monojit Chakraborti, Kolkata.

Course outcomes: After completing this course, student will be able to:

- Understand various types of contract and when they are used
- Suggest the relevant type of contract for the given civil engineering work.

- Prepare the typical Tender document for the given civil engineering work.
- Decide type of payment for the executed work.
- Justify the rent fixation and valuation of given civil structure.

| | | | |
|-----------------------------|--|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Elective IV: Advanced Construction Technology | Course Code | CEPE604/II |
| Subject offered in Semester | Sixth | Number of Credits | 3 (L: 3, T: 0, P:0) |
| Prerequisites | NIL | Course Category | PE |
| Question distribution | As per standing norms of WBSCT&VE&SD | Marks distribution | As per standing norms of WBSCT&VE&SD |

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.

| Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester] | Distribution of unit |
|--|-----------------------------|
| Module A/Group A | Unit I and II |
| Module B/Group B | Unit III |
| Module C /Group C | Unit IV and V |

Course Content:

Unit – I Advanced Construction Materials

- Fibres: Use and properties of steel, polypropylene, carbon and glass fibres.
- Plastics: Use and properties of PVC, RPVC, HDPE, GFRP, CFRP.
- Miscellaneous Materials: Properties and uses of acoustics materials, wall claddings, plasterboards, micro-silica, waterproofing materials, adhesives, PMC (Polymer modified concrete)

- Use of waste products and industrial by products in bricks, blocks, concrete and mortar.

Unit- II Advanced Concreting Methods and equipment

- Ready Mix Concrete: Necessity and use of ready mix concrete. Products and equipment 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 equipment required for Tremie method, Drop bucket method. Properties, workability and water cement ratio of the concrete.
- Special concrete: procedure and uses of special concretes: High Strength Concrete, High Performance Concrete, Roller compacted concrete, Self-compacting concrete (SCC), Steel fibre reinforced concrete, Foam concrete, Guniting, shotcreting.

Unit- III Advanced Technology in Constructions

- Construction of bridges and flyovers: equipment and machineries required for foundation and super structure.
- Construction of multi-storeyed Building: equipment and machinery required for construction of multi-storeyed building such as use of lifts, belt conveyors, slip-form, 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. equipment 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 Equipment

- Hoisting equipment: 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 equipment: Working of belt conveyors, types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

Unit- V Miscellaneous Machinery and Equipment

- Excavation Equipment: 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 Equipment: Output of different types of rollers such as plain rollers, ship footed rollers, vibratory, pneumatic rollers rammers.
- Miscellaneous Equipment: Working and selection of equipment: Pile driving equipment, Pile hammers, Hot mix bitumen plant, bitumen paver, grouting equipment, gunting 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.

Suggested learning resources:

- Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
- Chudly, R., Construction Technology Vol. I to II, ELBS-Longman Group.
- Peurifoy, R. L., Construction Planning Equipment and Methods, McGraw Hill Co. Ltd. New York.
- Seetharaman, S., Construction Engineering and Management, Umesh Publication, New Delhi.
- Sengupta, B. and Guha., Construction Management and Planning, McGraw Hill Education, New Delhi.
- Smith, R. C., Materials of Construction, McGraw Hill Co. Ltd.
- Satyanarayana, R Saxena, S. C., Construction Planning and Equipment, Standard Publication, New Delhi.

- Rangawala,S. C., Construction of Structures and Management of works, Charotar Publication, Anand.
- Ghose,D. N., Materials of Construction, McGraw Hill Publishing Co, New Delhi.

Course outcomes: After competing this course, student will be able to:

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

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|-----------------------------|---------------------------------------|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Entrepreneurship and Start-ups | Course Code | |
| Subject offered in Semester | Sixth | Number of Credits | 3 (L: 3, T: 0, P: 0) |
| Prerequisites | NIL | Course Category | HS |
| Question distribution | As per standing norms of WBSCT&VE&SD | Marks distribution | As per standing norms of WBSCT&VE&SD |

Detailed course content will be provided by the council separately

| | | | |
|-----------------------------|--|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Compulsory Open Elective: Open Elective I: Engineering Economics & Project Management | Course Code | |
| Subject offered in Semester | Sixth | Number of Credits | 3 (L: 3, T: 0, P: 0) |
| Prerequisites | NIL | Course Category | OE |
| Question distribution | As per standing norms of WBSCT&VE&SD | Marks distribution | As per standing norms of WBSCT&VE&SD |

Detailed course content will be provided by the council separately

| | | | |
|-----------------------------|--|--------------------|---|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Open Elective II : one subject has to be taken from list of open elective subjects as provided by WBSCT&VE&SD | Course Code | |
| Subject offered in Semester | Sixth | Number of Credits | 3 (L: 3, T: 0, P:0) |
| Prerequisites | NIL | Course Category | OE |
| Question distribution | As per standing norms of WBSCT&VE&SD | Marks distribution | As per standing norms of WBSCT&VE&SD |

Detailed course content of all subjects under open elective II will be provided by the council separately

| | | | |
|-----------------------------|-------------------------------------|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Major Project II | Course Code | CEPR605S |
| Subject offered in Semester | SIXTH | Number of Credits | 2 (L:0, T: 0, P: 4) |
| Prerequisites | NIL | Course Category | PR |
| Question distribution | | Marks distribution | As per standing norms of WBSCT&VE&SD |

Objective: - Following are the objectives of this course:

- To prepare detailed cost estimate of building and various ancillary items of the project.
- To develop professional abilities such as preparation of tender documents and scheduling of the project.
- To develop presentation skill.
- To enhance creative thinking and combination of a complete civil engineering project.

The project report shall be in the following format:

(The project shall be undertaken by a group of 4 to 6 students)

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

NOTE: Same Planning, Drawings and detailings of the problem given in the semester 4 will have be used in Major Project I and Major Project II in semester 5 and 6. All drawing will be done by using CAD

Contents:-

- Title of the Project:-Planning and designing of (G+2) Residential Complex for Middle Income Group.
- The details of the Project are given below:

- Each building (RCC framed structure) shall comprise of two symmetrical flat per floor each containing two rooms, bath, WC, kitchen, front verandah with a provision of common staircase and mumty for utilization of roof space and overhead water tank (around 210 sq m. covered area for each building unit and total 100 Nos of flat in the Complex of around 10000 sq m. of total land area) Ground floor to be used for parking spaces.
- The following provisions are to be considered during the project planning:- a) Security room(Single room with WC, Load bearing wall structure), b) Central Park, c) Play Ground, d) Hume Pipe Culvert in between the complex and the 12m wide main road, e) Boundary Wall with main gate, f) Submersible Pump, g) Pump House (Load bearing wall structure), h) Surface Drainage System, i) Bituminous road over WBM inside the complex etc.

1) The project report shall include detailed Estimate and costing of:-

- (i) (G+2) Building Unit.
- (ii) Security Room.
- (iii) Pump House.
- (iv) Boundary Wall with main gate.
- (v) Submersible Pump.
- (vi) Hume Pipe Culvert.
- (vii) Bituminous road over WBM.
- (viii) Surface Drainage System.

2) The detailed report shall contain total Cost of the Project, Bar Chart, Project completion time using CPM/PERT & Preparation of tender documents for NIT (Notice inviting tender).

(Rate should be taken as per West Bengal PWD Schedule w.e.f 01.11.2017 with latest Corrigendum.)

3) PPT Presentation of the whole projects group wise

Course outcomes: After completing this course, student will be able to:

- Solve the problem by working in a group.
- Estimate the total cost of the project.
- Prepare tender documents and NIT.
- Know about project scheduling.

| | | | |
|-----------------------------|-------------------------------------|--------------------|--------------------------------------|
| Name of the Course | Diploma in Civil Engineering | Course duration | 6 semester |
| Course Title | Seminar and Viva-voce | Course Code | CESE606S |
| Subject offered in Semester | Sixth | Number of Credits | 1 (L: 1, T: 0, P:0) |
| Prerequisites | NIL | Course Category | SE |
| Question distribution | | Marks distribution | As per standing norms of WBSCT&VE&SD |

NOTE: Seminar will cover any topic(s) related to the subjects taught from semester 1 to semester 6. Viva-voce will cover any subject covered from semester 1 to semester 6.

Syllabus of Engineering Economics & Project Management

| | |
|------------------|---|
| Course Code: | OE302 |
| Course Title: | Engineering Economics & Project Management |
| No. of Credits: | 3 (L: 3, T: 0, P: 0) |
| Prerequisites: | NIL |
| Course Category: | Open Elective (Compulsory for all branches) |

Course Objectives:

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- 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.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, Rational Choice Theory

1.4 Theory of Demand:

- The law of demand
- Different types of demand (Individual demand & Market demand)
- Determinants of demand
- Demand function
- Change in demand (Shift of demand curve) and the change in quantity demanded.
- Definition and types of Elasticity of demand (price, income & cross price elasticity) with mathematical derivation, Concept of elastic and inelastic goods, Measurement of price elasticity of demand (Point elasticity and Arc elasticity), Variation of price elasticity on different points of a linear demand curve, ranging from zero to infinity, Relationship between price, total revenue and price elasticity of demand (mathematical derivation).

1.5 Theory of Supply:

- Definition of supply
- Determinants of supply
- Supply function
- Supply curve and shift of supply curve.

1.6 Market mechanism:

- Definition of Market
- Price mechanism: determination of equilibrium price and quantity demand & supply (Numerical examples with graphical illustration).
- Stability of equilibrium.
- Basic comparative static analysis: Change in equilibrium due shift of demand & supply curve (Numerical problems with graphical illustration).

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1: **Theory of Production:** Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), law of return (graphical and mathematical derivation), and Long run production function (returns to scale).

2.2: **Theory of Cost:** Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc. with the diagrammatic concept., Relationship between AC AND MC.

2.3: Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1: Perfect Competition: Features of Perfectly Competitive Market.

3.2: Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3: Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1: Definition and classification of projects

1.2: Importance of Project Management.

1.3: Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1: Economic and Market analysis.

2.2: Financial analysis: Basic techniques in capital budgeting – Payback period method, Net Present Value method, Internal Rate of Return method.

2.3: Environmental Impact study – adverse impact of the project on the environment.

2.4: Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5: Evaluation of the financial health of a project – Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1: **Gantt Chart** – a system of bar charts for scheduling and reporting the progress of a project (basic concept).

3.2: **Concept of Project Evaluation and Review Technique (PERT) and Critical Path method (CPM)**: basic concept and application with real-life examples.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [Total marks: 20]

2. Subjective questions: Five questions to be answered taking at least two from each group. [Total marks: 5x8=40]

B. Assignment (10 Marks)

Guideline for Assignment (10 Marks)

Students may be instructed to prepare a report on a project (preferably the based on the Major Project in 6th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

- 1. Principles of Economics – Case and Fair, Pearson Education Publication*
- 2. Principles of Economics – Mankiw, Cengage Learning*
- 3. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill.*
- 4. Project Management – Gopala krishnan – Mcmillan India Ltd*

| | |
|---------------------|---------------------------------------|
| Course Title | Entrepreneurship and Start-ups |
| Course Code | HS 302 |
| Number of Credits | 3 |
| Pre Requisites | None |
| Total Contact Hours | 3(L: 2; T: 1)/week = 45 hrs |
| Course Category | HS |

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

| | |
|------|---|
| CO 1 | Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business |
| CO 2 | Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal |
| CO 3 | Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business. |
| CO 4 | Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses |

Detailed Course Content

| Unit | Name of the Topic | Hours |
|------|---|-------|
| | ENTREPRENEURSHIP – INTRODUCTION AND PROCESS | |
| 1. | <ul style="list-style-type: none"> • Concept, Competencies, Functions and Risks of entrepreneurship • Entrepreneurial Values& Attitudes and Skills • Mindset of an employee/manager and an entrepreneur • Types of Ownership for Small Businesses <ul style="list-style-type: none"> ○ Sole proprietorship ○ Partnerships ○ Joint Stock company- public limited and private limited | 10 |

| | | |
|----|---|----|
| | <p>companies</p> <ul style="list-style-type: none"> • Difference between entrepreneur and Intrapreneur | |
| 2. | <p>PREPARATION FOR ENTREPRENEURIAL VENTURES</p> <ul style="list-style-type: none"> • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. <p>Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. <u>They may not be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.</u></p> | 20 |
| 3. | <p>ESTABLISHING SMALL ENTERPRISES</p> <ul style="list-style-type: none"> • Legal Requirements and Compliances needed for establishing a New Unit- <ul style="list-style-type: none"> ○ NOC from Local body ○ Registration of business in DIC ○ Statutory license or clearance ○ Tax compliances | 03 |
| 4. | <p>START-UP VENTURES</p> <ul style="list-style-type: none"> • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. <p>Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. <u>No questions are to be set from the case studies.</u></p> | 04 |

| | | |
|----|---|----|
| 5. | FINANCING START-UP VENTURES IN INDIA <ul style="list-style-type: none"> • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits | 06 |
| 6. | EXIT STRATEGIES FOR ENTREPRENEURS <ul style="list-style-type: none"> • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – <u>Basic Concept only</u> | 02 |

Examination Scheme

❖ End Semester Examination: 60 marks

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

| Question Type | Number of questions to be set | Number of questions to be answered |
|--|-------------------------------|------------------------------------|
| MCQ, Fill in the blanks, True or False (Carrying 1 mark each) | 25 | 20 |

Group B: 40marks

| Question Type | Number of questions to be set | Number of questions to be answered |
|---|-------------------------------|------------------------------------|
| Subjective Type questions (Carrying 8 marks each) | 10 | 5 |

❖ Internal Assessment: 40 marks

- Class test : 20 marks
- Assignment: 10 marks
- Class attendance: 10 marks

Suggested Learning Resources

| Sl. No. | Title of Book | Author | Publication |
|----------------|---|-------------------------------------|---|
| 1. | Entrepreneurship Development | Sangeeta Sharma | Prentice Hall of India Learning Private Ltd |
| 2. | Entrepreneurship Development | S. Anil Kumar | New Age International |
| 3. | Fundamentals of Entrepreneurship | Sangram Keshari Mohanty | Prentice Hall of India Learning Private Ltd |
| 4. | Fundamentals of Entrepreneurship | Dr. G.K. Varshney | Sahitya Bhawan Publication |
| 5. | Managing New Ventures: Concepts and Cases on Entrepreneurship | Anjan Raichaudhuri | Prentice Hall of India Learning Private Ltd |
| 6. | How to Start a Business in India | Simon Daniel | Buuku, Chennai |
| 7. | Entrepreneurship and Small Business Management | S.S. Khanka | S. Chand & Sons, New Delhi |
| 8. | Entrepreneurship Development and Business Ethics | Abhik Kumar Mukherjee & Shaunak Roy | Oxford University Press |
| 9. | Entrepreneurship Development and Business Ethics | Dr B Chandra & Dr B Biswas | Tee Dee Publications |
| 10. | Entrepreneurship Development Small Business Entrepreneurship | Poornima Charantimath | Pearson Education India |

| | | | |
|-----------------------------|--------------------------------------|--------------------|--------------------------------------|
| Name of the Course | Diploma in Engineering | Course duration | 6 semester |
| Course Title | Solid Waste Management | Course Code | |
| Subject offered in Semester | Sixth | Number of Credits | 3 (L:3, T: 0, P: 0) |
| Prerequisites | NIL | Course Category | OE |
| Question distribution | As per standing norms of WBSCT&VE&SD | Marks distribution | As per standing norms of WBSCT&VE&SD |

Course Objectives:

Following are the objectives of this course:

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

| Module /Group [as per directives from WBSCT&VE&SD in framing questions of end semester] | Distribution of unit |
|--|-----------------------------|
| Module A/Group A | Unit I and II |
| Module B/Group B | Unit III and V |
| Module C /Group C | Unit IV |

Course Content:

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.
- Composition of municipal solid waste.

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.

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.

Unit IV Techniques for Disposal of Solid Waste

- Solid waste management techniques – solid waste management hierarchy, waste prevention, waste reduction, reusing, recycling and materials recovery techniques (Only introduction)
- 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, Ill effects of unplanned solid waste dumping
- 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
 - Energy generation from Waste (elementary idea)

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.

Suggested learning resources:

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, New Delhi.
3. George Techobanoglous, Kreith, Frank., Solid Waste, McGraw Hill Publication, New Delhi.
4. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.
5. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.
6. V. Rajaram, F.Z. Siddiqui, S. Agarwal, M. E. Khan, Solid and Liquid Waste Management, PHI learning, Delhi.

Course outcomes: After competing this course, student will be able to:

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