

Name of the Course: **Diploma in Civil Engineering** Subject: **Advanced Surveying**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks : **100**

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical : Nil	End Semester Exam(ESE) : 70
Credit :- 3	Total Marks in semester - 100

Aim:-

1. Development of advanced skill in surveying.

Objective:-The Students will be able to:

- Record the data in field book and plot the collected data.
- Find out horizontal and vertical distances with a tachometer
- Set out simple curve using Theodolite.
- Introduction of Modern Survey equipments/methodology – Total station and EDM.
- Apply principles of surveying and leveling for Civil Engineering works.

Pre-Requisite :-

- Student should have skill in reading, drawing and sketching.
- Students should know the basic principles, requirements and purpose of surveying.

Unit no	Topic	Contact period	Marks
1	Electronic distance measurement (EDM)	7	8
2	Theodolite Survey	12	18
3	Tacheometric Survey	7	10
4	Curves	6	10
5	Volume measurement	4	8
6	Aerial Survey and Remote sensing & GIS	7	8
7	Construction Surveying	5	8

Contents: Theory (Advanced Surveying) 3 Hrs/week Marks

Unit -1 Electronic distance measurement (EDM)

- 1.1 Introduction
- 1.2 Basic concept
- 1.3 Classification of electromagnetic radiation
- 1.4 Basic principles of electronic distance measurement, computing the distance from phase difference
- 1.5 Basic description of different types of instruments, TOTAL STATION instruments, 1.6 Effect of atmospheric condition on wave velocity, instrumental error in EDM
- 1.7 Education of slope measurement in EDM

Unit 2 Theodolite Survey

- 2.1 Components of Transit Theodolite and Their functions. Technical terms used. Temporary adjustments of Transit Theodolite Swinging the telescope, Transiting, Changing the face.
- 2.2 Measurement of Horizontal angle, method of Repetition, errors eliminated by method of repetition
- 2.3 Measurement of Deflection angle.
- 2.4 Measurement of Vertical angle.

- 2.5 Measurement of magnetic bearing of a line by Theodolite .
- 2.6 Prolonging a Straight line.
- 2.7 Sources of errors in Theodolite Surveying.
- 2.8 Permanent adjustment of transit Theodolite (only relationship of different axes of theodolite.).
- 2.9 Traversing with Theodolite – Method of included angles, locating details, checks in closed traverse, Calculation of bearings from angles.
- 2.10 Traverse Computation - Latitude, Departure, Consecutive Co-ordinates, error of Closure, Distribution of a angular error, balancing the traverse by Bowditch rule and Transit Rule, Gale's traverse table (simple problems on above topic.)
- 2.11 Area of a closed traverse – meridian distance method, double meridian distance method, double parallel distance method, departure and total latitude method, independent coordinate methodology (simple numerical problems)s

Unit – 3 Tacheometric Survey

- 3.1 Principle of Tacheometry. Instruments in tacheometry
- 3.2 Essential requirements of Tacheometer.
- 3.3 Different types of tacheometric measurement – a. stadia system (fixed hair method and movable hair method) b. tangential system c. subtense bar system
- 3.4 Determination of tacheometric constants- additive constant and multiplying constant, simple numerical problems on above topics.
- 3.5 Distance and elevation formula : Fixed hair method: Use of Theodolite as a Tacheometer I. Inclined sight and staff vertical for both angle of elevation and angle of depression ii. Inclined sight with staff normal to the line of sight (for both angle of elevation and angle of depression) (No derivation). [numerical problem based on above conditions]

Unit – 4 Curves

- 4.1 Types of curves used in road and railway alignments, Notations of simple circular curve, Designation of curve by radius and degree of curves.
- 4.2 Method of Setting out curve by offset from Long chord method and Rankine's method of deflection angles. Simple Numerical problems on above topics.
- 4.3 setting out a compound curve, reverse curve and a transition curve (spiral), a summit curve and a valley curve

Unit – 5 Volume measurement

- 5.1 Introduction, different method of volume computation – cross section method, unit area or borrow pit method and contour method
- 5.2 Cross section method – level section, two level section, side hill two level section, three level section and multilevel section; formula for volume computation -volume average end areas, trapezoidal rule, prismoidal rule (simple numerical problems)
- 5.3 Volume through transitions – in highway/railway construction, volume from spot level 9 for foundation of underground reservoir, volume from contour plan
- 5.4 salient features of Mass Haul diagram and its applications

Unit – 6 Aerial Survey and Remote sensing & GIS

- 6.1 Aerial Survey Introductions, definition, Aerial photograph
- 6.2 Remote Sensing – Introduction, Electro-Magnetic Energy , Remote sensing system-Passive system , Active system, Applications – mineral, land use / Land cover, Natural Hazards and Environmental engineering system.

Unit – 7 Construction Surveying

- 7.1 Introduction, requirements of setting out, horizontal and vertical control
- 7.2 Setting out a pipe line
- 7.3 Setting out of building and structure
- 7.4 Staking out a highway

LIST OF Assignment: (minimum 12 practical from list given below)

1. Understanding the components of Theodolite and their functions, reading the vernier and temporary adjustments of theodolite.
2. Measurement of Horizontal angle by transit theodolite.

3. Measurement of Horizontal angle by method of Repetition.
4. Measurement of vertical angles by theodolite.
5. Measurement of Magnetic bearing of a line using theodolite.
6. Measurement of deflection angle by taking open traverse of 4 –5 sides.
7. To find Reduced levels and horizontal distances using theodolite as a Tacheometer.
8. To find constants of a given Tacheometer.
9. Study and use of 1 second Micro Optic Theodolite for measurement of Horizontal and Vertical angles
- 10 Study of E.D.M. for knowing its components.
11. Use of EDM for finding horizontal and vertical distances and reduced levels.
12. Determine the geographical parameters by total station.

Text Books:

Name	Authors	Publisher	Editions
Surveying and Levelling	R. Subramanian	Oxford University Press	
Fundamental of surveying	S.K.Roy	PHI	
Plane surveying	A.M.Chandra	New age international	
Surveying and Levelling vol. I and II	S. K. Duggal	TATA MC GRAW-HILL	
Surveying and Levelling vol. I and II	Dr. B. C. Punmia	Laxmi Publication	

Name of the Course: **Diploma in Civil Engineering** Subject: **Geo-Technical Engineering-I**
 Course code: **CE** Course Duration :6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical :Nil	End Semester Exam(ESE) : 70
Credit :- 3	Total Marks in semester - 100

Aim:-

Study of geo-technical virtue of the surroundings required for building construction.

Objective:- Students will be able to:

1. Explain soil as three phase system and establish relationship between properties of soil.
2. Determine properties of soil by following standard test., procedure and plot particle size distribution curve.
3. Determine permeability by constant head and falling head test using Darcy's Law
4. Obtained OMC & MDD for any soil sample by performing Proctor Compaction test.
5. Calculate shearing strength of soil, using Coulomb's law

Pre-Requisite:-

- Students should think over the nature and profile of the geo-region where the building is to be constructed.
- Student should be conversant with the basics of Mechanics of Structure and Fluid Mechanics

Unit no	Topic	Contact period	Marks
1	Overview Geotechnical Engineering	2	2
2	Physical Properties of Soil	8	12
3	Permeability of Soil & Seepage Analysis	4	10
4	Compaction of Soil & Stabilization	6	10
5	Compressibility & Consolidation of soil	12	10
6	Shear Strength of Soil	6	10
7	Earth Pressure	6	8
8	Site Investigation And Sub Soil Exploration	4	8

Contents :**Theory (Geotechnical Engineering I) 3 Hrs/week**

Unit -1Overview Geotechnical Engineering

- 1.1 Definition of soil – with respect to Civil Engineers, formation of soil, general types of soil
- 1.2 Importance of soil in Civil Engineering as construction material in Civil Engineering Structures and as foundation bed for structures
- 1.3 Field application of geotechnical engineering in foundation design, pavement design, design of earth retaining structures, design of embankments, underground and buried structures, slope stability, settlement related problems (brief ideas only)
- 1.4 Historical development of 'Geotechnical Engineering'
- 1.4 Implication of the term 'Geotechnical Engineering'

Unit -2 Structure, Physical & index Properties of Soil and its weight-volume relationship

- 2.1 Introduction to soil structure – a. soil particle structure – tetrahedral unit and octahedral unit, Kaolinite mineral, halloysite mineral, montmorillonite, illite b. soil mass structure – single grained, flocculent and honey-combed structure
- 2.2 Clay particle-water relationship
- 2.3 Soil as a three phase system
- 2.4 Definition of Water/moisture content- determination of water content by oven drying method as per IS code & rapid water/moisture content determination
- 2.5 Definition of Void ratio, density index, porosity, degree of saturation, air content,
- 2.6 Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight
- 2.7 Determination of bulk unit weight and dry unit weight by core cutter method and sand replacement method as per IS code
- 2.8 Specific gravity of soil solid - determination of specific gravity by pycnometer.
- 2.9 Deduction of different inter-relations among the physical properties of soil mass
- 2.10 Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, plasticity index, liquidity index, flow index, toughness index, activity number, shrinkage ratio, classification based on these index properties
- 2.11 Determination of liquid limit, plastic limit and shrinkage limit as per I.S code.
- 2.12 Particle size distribution, mechanical sieve analysis as per IS code, particle size distribution curve, effective diameter of soil, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils.
- 2.13 Classification of soils – its requirement, field identification of soil – dilatancy test, shaking test, toughness test, sedimentation, IS classification of soil

Unit – 3 Permeability of Soil & Seepage Analysis

- 3.1 Definition of permeability and its application
- 3.2 Darcy's law of permeability, coefficient of permeability, typical values of coefficient of permeability for different soil, average and seepage velocity of flow
- 3.3 Factors affecting permeability of soil
- 3.4 Determination of coefficient of permeability in laboratory by constant head and falling head permeability tests (no deduction), simple problems related to determine coefficient of permeability.
- 3.5 Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines and equipotential lines, exit gradient, quick sand condition (no deduction)
- 3.6 Flow net, characteristics of flow net, application of flow net (nonnumerical problems)

Unit- 4 Compaction of Soil & Stabilization

- 4.1 Concept of compaction, purpose of compaction, field situations where compaction is required.
- 4.2 Standard proctor test & Modified proctor test – test procedure as per IS code, Compaction curve, optimum moisture content, maximum dry density, Zero air voids line.
- 4.3 Factors affecting compaction
- 4.4 Field methods of compaction – rolling, ramming, kneading & vibration and suitability of various compaction equipments.
- 4.5 California bearing ratio, CBR test, significance of CBR value
- 4.6 Concept of soil stabilization, necessity of soil stabilization
- 4.7 Different methods of soil stabilization – Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization & fly-ash stabilization

Unit- 5 Compressibility & Consolidation of soil

- 5.1 Principle of consolidation, spring-analogy method, Terzaghi's one dimension consolidation theory, its assumption and field of application, standard one dimensional consolidation test by consolidometer
- 5.2 Normally consolidated clay and over consolidated clay and over consolidation ratio

5.3 typical e-log p, e-p curve, compression index, coefficient of compressibility, coefficient of volume compressibility, coefficient of consolidation and their inter-relation (no deduction, only mathematical expression), swelling index

5.4 computation of ultimate settlement – simple numerical problems

5.5 difference between consolidation and compaction

Unit – 6 Shear Strength of Soil

6.1 Shear failure of soil, field situation of shear failure

6.2 Concept of shear strength of soil

6.3 Components of shearing resistance of soil – cohesion, internal friction

6.4 Mohr-coulomb failure theory, establishment of relation between major and minor principal stresses and angle of failure plane, Strength envelope, strength equation – for purely cohesive, cohesion less soils and for C- Φ soil

6.5 Laboratory determination of shear strength of soil – Direct shear test, Unconfined compression test & laboratory vane shear test, plotting strength envelope, determining shear strength parameters of soil

Unit -7 Earth Pressure

7.1 Estimation of vertical earth pressure – by approximate method, overburden pressure, pressure bulb, isobar (simple numerical problems on approximate method)

7.2 Lateral earth pressure – Rankine's theory of lateral earth pressure, assumptions and mathematical expression (no deduction) for the following cases – vertical faces with horizontal surface having cohesionless soil and cohesive soil with or without ground water table and with or without surcharge loading (simple numerical problems)

Unit – 8 Site Investigations and Sub Soil Exploration

8.1 Necessity of site investigation & sub-soil exploration.

8.2 Types of exploration – general, detailed.

8.3 Method of site exploration open excavation & boring

8.4 Criteria for deciding the location and number of test pits and bores

8.5 Disturbed & undisturbed soil samples for lab testing and field testing

8.6 Empirical correlation between soil properties and SPT values.

8.7 Format for soil report of a residential project

List of assignment: Numerical Problems as per discretion of subject teacher

Text Books:

Name of the book	Author	Edition	Publisher
Soil Mechanics and Foundation Engineering	P.P.Raj		Pearson
Soil mechanics and foundation engineering	B M Das		Thomson
Soil mechanics and foundation engineering	B C Punmia		
Soil mechanics and foundation engineering	VNS Murthy		Dhanpat Rai & Sons

Reference books:

Name of the book	Author	Edition	Publisher
Soil Mechanics in Engineering Practice	Karl Terzaghi, Peck and Mesri		Jhon Willey & Sons
Soil Mechanics	Lambe and Whitman		Willey Eastern Limited

Name of the Course: **Diploma in Civil Engineering** Subject: **Transportation Engineering I**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical : Nil	End Semester Exam(ESE) : 70
Credit :- 3	Total Marks in semester - 100

Aim:-

Development of conceptual knowledge in transportation engineering.

Objective :-

Students should be able to:

1. Know component parts of railway
2. Understand methods of survey and investigation of alignment of railway
3. Organize
4. Understand

Pre-Requisite :-

1. Student should take survey of required places to know basic terms.
2. Student should have the knowledge and modes of transportation.

Unit no	Topic	Contact period	Marks
1	Overview of Transportation Engineering	2	4
2	Railway Engineering	22	26
3	Bridge Engineering	14	26
4	Tunnel Engineering.	10	14

Contents: Theory (Transportation Engineering -I) 3 Hrs/week Marks

Unit -1 Overview of Transportation Engineering

- 1.1 Role of transportation in the development of nation.
- 1.2 Modes of transportation system – roads, railway, airways, waterways, other mode of transport, Importance of each mode, comparison and their relative merits and demerits.
- 1.3 Necessity & importance of Cross drainage works for roads & railways.

Unit -2 Railway Engineering.

2.1 Railway as a mode of land transport, Classification of Indian Railways, zones of Indian Railway, classification of indian railway lines, general features of Indian railway, organization of Indian railway; Alignment- Factors governing rail alignment; Rail Gauges – types, factors affecting selection of gauge, advantages of uniform gauge; Rail track cross sections – standard cross section of BG & M.G; Single & double line in cutting and embankment.

2.2 **Permanent ways:** Ideal requirement, component parts, conning of wheel, tilting of rail and adzing of sleepers

Rails: function & its types. Requirement of ideal rail section, standard rail section, weight, length and specification of rail section, important test for determining servicibility of rail section, wear in rail and methods to reduce wear; defects in rail, failure in rail

Rail Joints – requirements, types; welded rails – purpose, advantage and success of welding of rails, length of welded rails; Creep of rail – causes, measurement & prevention of creep.

Sleepers: functions & Requirement, types – wooden, metal, concrete sleepers & their suitability and relative merits and demerits, sleeper density. (problem on sleeper density)

Ballast: function & requirements of good ballast, different types with their properties, relative merits & demerits., size and section of ballast, quantity and renewal of ballast, terminology – packing, boxing and ballast crib

Rail fixtures & fastenings: fish plate, bearing plates, spikes, bolts, keys, anchors & anti creepers.

2.3 Railway Track Geometrics: Gradient & its types, grade compensation on curves (problems) Super elevation – governing formula, limits of Super elevation on curves, cant deficiency, cant excess and negative cant (along their permissible value), realignment of curves by string line method

2.4 Branching of Tracks: Definition of point & crossing, a simple split switch turnout consisting of points and crossing lines. Sketch showing different components, their functions & working.

Line sketches of track junctions- symmetrical split, three throw switch, crossovers, scissor cross over, diamond crossing, single and double slip, gathering lines or ladder track, triangle

Inspection of points and crossings

2.5 Station and Yards: Site selection for railway stations, Requirements of railway station, Types of stations (way side, crossing, junction & terminal), Station yards, types of station yard, Passenger yards, Goods yard, Locomotive yard – its requirements, water column, Marshalling yard – its types; level crossing

2.6 Track laying: Preparation of subgrade; collection of materials; setting up a material depot and carrying out initial operations such as adzing of sleepers bending of rails, assembling of crossing. Definition of base and rail head, transportation by material trollies, rail carriers and material train; methods of track laying (parallel, telescopic and American method); organization of labour at rail head; ballasting the track

2.7 Track Maintenance: Necessity, types, routine maintenance of formation and side slopes, rails, fixtures and drainage, special maintenance of defective rails and sleepers; Tools required and their function, organisation, duties of permanent way inspector, gang mate, key man

2.8 Track Drainage: need for proper track drainage, Sources of percolated water in track, requirements of a good track drainage system, practical tips of good surface drainage, track drainage system, subsurface drainage

2.9 Modern Method of track maintenance: Mechanised method of track maintenance, off-track tampers, on-track tampers, future of track machines in Indian railways, measured shovel packing, directed track maintenance, classification of track renewal, criteria of track renewal, through sleeper renewal, track relaying works, mechanised relaying, track renewal trains

Unit – 3 Bridge Engineering :

3.1 Site selection and investigation, Factors affecting selection of site of a bridge. Bridge alignment, Collection of design data, Classification of bridges according to function, material, span, size, alignment, position of HFL.

3.2 Component parts of bridge. Plan & sectional elevation of bridge showing component parts of substructure & super structure. Different terminology such as effective span, clear span, economical span, waterway, afflux, scour, HFL, freeboard, etc.

Foundation – function, types (well foundation & caisson [open type only], their details of construction with sketches, laying of foundation on a. dry soil b. soil charged with water and c. under water, coffer dam – their types and construction, depth of foundation

Piers- definition, parts, function - requirements, types -solid (masonry and RCC), open cylindrical and abutment piers, terminology – height of piers, water way, afflux and clearance.

Abutment – function, types

Wing walls – functions and types.

Bearing – functions, types of bearing for RCC & steel bridges.

Approaches –in cutting and embankment.

Bridge flooring- open and solid floors

3.3 Permanent and Temporary Bridges:- *Permanent Bridges* - Sketches & description in brief of culverts, causeways, masonry, arch, steel, movable steel bridges, RCC girder

bridge, prestressed girder bridge, cantilever, suspension bridge.

Temporary Bridges- timber, flying, floating bridges

3.4 Inspection & Maintenance Of Bridge: Inspection of bridges, Maintenance of bridges & types – routine & special maintenance.

Unit – 4 Tunnel Engineering.

4.1 Definition, necessity, advantages, disadvantages

4.2 Classification of tunnels.

4.3 Shape and Size of tunnels

4.4 Tunnel Cross sections for highway and railways

4.5 Tunnel investigations and surveying –Tunnel surveying locating center line on ground, transferring center line inside the tunnel.

4.6 Shaft - its purpose & construction.

4.7 Methods of tunnelling in Soft rock-needle beam method, fore-poling method. line plate method, shield method.

4.8 Methods of tunnelling in Hard rock-Full-face heading method, Heading and bench method, drift method.

4.9 Precautions in construction of tunnels

4.10 Drilling equipments-drills and drills carrying equipments

4.11 Types of explosives used in tunnelling.

4.12 Tunnel lining and ventilation.

Text Books:-

Titles of the Book	Name of Authors	Edition	Name of the Publisher
A Text Book of Railway Engineering	S.C. Saxena		Dhanpatrai& sons
Railway Engineering	Chandra and Agarwal		Oxford
Railway Track	K.R. Antia		The New Book Co. Pvt. Ltd Mumbai
Principles of Railway Engineering	S.C. Rangwala		Charotar Publication
Principles and Practice of Bridge Engineering	S.P. Bindra		Dhanpat rai & sons
A Text Book of Transportation Engineering	N.L.Arora and S.P.Luthra		IPH New Delhi
Elements of Bridge Engineering	J.S. Alagia		Charotar Publication
Bridge Engineering	D.R. Phatak		Everest Publisher
Elements of Bridges	D. JohnosVictor		Oxford & IBH Publishing co.
Road, Railway and Bridges	Birdi & Ahuja.		Std. Book House
Tunnel Engineering	S.C. Saxena		Dhanpatrai & sons

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Estimating & Costing**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks :**100**

Teaching Scheme	Examination Scheme
Theory – 4 lecture per week	CT- 20
Tutorial - nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 4	Total Marks in the semester – 100

Aim:-

1. Study of financial budget and costing of building construction.

Objective:-

Students should be able to

1. Decide approximate cost of civil engineering structure.
2. Prepare check list of items of construction.
3. Prepare estimate for civil engineering work.
4. Prepare rate analysis of item of construction.
5. Take measurement of completed work.
6. Compare actual quantity with estimated quantity

Pre-Requisite:-

1. Student should know accounting process, mensuration and drawing.

Unit no	Topic	Contact period	Marks
1	Overview of Estimating & Costing	6	8
2	Building estimate	30	32
3	Estimate of other structure	18	16
4	Rate analysis	10	14

Contents: Theory (Estimating & Costing) 4 Hrs/week

Unit -1 Overview of Estimating & Costing

1.1 Meaning of the terms estimating, costing. Purpose of estimating and costing, factors affecting estimate

1.2 Types of estimate - Approximate and Detailed. Approximate estimate Types- Plinth area rate method, Cubic Content method, Service Unit method, Typical bay method, Approximate Quantity method, Problems on Plinth area rate method & application of Service unit method for selection of service unit for different types of civil Engineering Structures, Approximation for W.S. Sanitary & Electrification, Knowledge of empirical method of approximate material estimation as per CBRI formulae and its application

1.3 Types of detailed estimate: Detailed estimate for new work, Revised estimate, Supplementary estimate, Revised & Supplementary estimate, Maintenance & Repair estimate, complete estimate; phase of the detailed estimate – quantity survey and abstract estimate, Uses of detailed estimate

1.4 Explanation of relevant technical terms: Contingencies, work-charge establishment, overhead, tools and plants, schedule of rates and quantities, specification, administrative approval, technical sanction, plinth area, carpet area, floor area, horizontal and vertical circulation area, floor area ratio

1.5 Degree of accuracy, mode of measurement as per BIS 1200

Unit 2: Building estimate

Note: single storeyed building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mumty for utilisation of roof space

2.1 Centre line method and long & short wall method

2.2 Items of work –earth work in excavation for foundation, brick flat soling(under foundation and floor subgrade, foundation concrete, brick in substructure, earth work in filling, DPC, plinth filling by silver sand, brickwork in superstructure, formwork, RCC excluding reinforcement, reinforcement (by percentage of component of structure, lime terracing or other similar roof treatment, finishing items – plastering, painting (on plastered surface wall, RCC surface, doors windows, grill etc), floor – (IPS, terrazzo, tiles, stone), rain water pipe,

2.3 Preparation of bar bending schedule – lintel and chajja, column, slab (one way and two way), beam and their estimate

2.4 Estimate of door and window – panelled door, one third glazed and two-third panelled timber window, fully glazed steel window provided with a grill (inclusive of all fittings and fixtures)

2.5 estimate of a tube-well

2.6 estimate of a septic tank with soakpit

2.7 Estimate for surface drain with plinth protection around the building and under ground reservoir

2.8 Estimation of symmetrical/unsymmetrical boundary wall with a provision of gate.

Unit 3 Estimate of other structure

3.1 Estimate of a single span slab culvert/pipe culvert

3.2 estimate of a man-hole

3.3 Estimate of simple fink type roof truss

Unit – 4 Rate analysis

4.1 Meaning of term Rate analysis and its purposes –Factors affecting rate analysis,lead, lift, task work, materials and labour component, MarketRate and labour rate.

4.2 Transportation of Materials, load factor for different materials. Standard lead, extra lead, Transportation Charges, Labour - Categories of labours, labour rates, overheads, contractor's profit, water charges, taking out quantities of materials for different items of works (earthwork, brickwork, flooring, roofing, plastering and pointing, whitewash, colour wash, distemper, synthetic enamel, plastic paints, emulsion paint, cement concrete, reinforcement, formwork, grill for window

4.3 Preparing rate analysis of different items of work - (earthwork, brickwork, flooring, roofing, plastering and pointing, whitewash, colour wash, distemper, synthetic enamel, plastic paints, emulsion paint, cement concrete, reinforcement, formwork, grill for window

Assignments:

Skills to be developed:

Intellectual Skills:

- a. List various items of work with their units in a Civil Engineering Structure.
- b. Calculate quantities of various items of work.
- c. Prepare rate analysis.

List of Assignments: (Drawings shall be provided for the above exercises by subject teacher.)

1. The entire job as per syllabus are to be submitted in the form of assignments.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
M. Chakraborti	Estimating & costing, Specification and Valuation in Civil Engineering		M. Chakraborti , Calcutta
B.N. Datta	Estimating & costing in Civil engineering		UBS Publishers
S.C. Rangwala	Estimating & costing		Charotar Publication
B.S. Patil	Civil Engineering Contracts and Accounts Vol I , II		Orient Longman
G. S. Birdie	ESTIMATING & COSTING		DhanpatRai and Sons

Video cassettes / cds: msbtecai package

Q. E. PRO software

IS CODES:

IS 1200- Method of Measurement of building and Civil engineering works

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Irrigation Engineering**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks :**100**

Teaching Scheme	Examination Scheme
Theory – 3 lecture per week	CT - 20
Tutorial - nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks in the semester – 100

Aim:-

Study of irrigation engineering.

Objective:-

The students will be able to:

- 1 Collect the data for irrigation system.
- 2 Calculate the yield from catchments.
3. Calculate the capacity of Canals
4. Calculate the storage capacity of reservoirs.
5. Find out and fix the control levels of reservoirs.
6. Decide the section of Dams, Weirs and Barrages.
7. Classify the Canals and design the Canals.
8. Classify different irrigation systems.

Pre-Requisite :-

1. Student should be able to read and draw morphological nature of land.
2. Student should know regarding hydrological pressures.

Unit no	Topic	Contact period	Marks
1	Introduction	2	4
2	Hydrology	4	6
3	Water Requirement Of Crops	4	7
4	Investigation And Reservoir Planning	5	7
5	Dams And Spillways	7	10
6	Bandhara, Percolation Tanks And Lift Irrigation	4	6
7	Diversion Head Works	6	7
8	Canals	6	7
9	Watershed Management	4	6
10	Water logging and Land Drainage	4	6
11	FLOOD CONTROL	2	4

Content : Theory (Irrigation Engineering) 3 hours per week

Unit-1 Introduction

Definition – Irrigation and irrigation engineering, advantages of irrigation, ill effects of over irrigation, types of irrigation project – purpose wise and administrative wise, Methods of irrigation.

Unit -2 Hydrology

Definition of rainfall , rain gauge and rain gauge station, types of rain gauges (names only), average annual rain fall and its calculation, definition of run- off, factors affecting run off, calculation of run off by run of coefficient, Inglis' formula, Stranges and Binnie's tables and curves. Maximum flood discharge and methods of calculation, Yeild and Dependable yield and methods calculation.

Unit – 3 Water Requirement Of Crops

Cropping seasons and crops in West Bengal. Definition – Crop period, base period, Duty, Delta, factors affecting Duty, relation between Duty, Delta and base period, Definition – CCA , GCA, IA, intensity of irrigation, time factor, capacity factor. Problems on water requirement and capacity of canal .Modified Penman method .Assessment of irrigation water.

Unit – 4 Investigation And Reservoir Planning

Survey for irrigation project, Data collected from irrigation project. Silting of reservoir, Factors affecting silting , Methods to control levels and respective storage in reservoir.

Unit – 5 Dams And Spillways

Types of dams – Earthen dams and Gravity dams (masonry and concrete) ,Comparison of earthen and gravity dams with respect to foundation, seepage, construction and maintenance of Earthen Dams – Components and their function, typical cross section seepage through embankment and foundation seepage control, though embankment and foundation, methods of constructions, types of failure of earthen dams and remedial measures.

Gravity Dams- Theoretical and practical profile, typical cross section, drainage gallery, joint in gravity dam, high dam and low dam

Spillways-Definition, function, location and components. Emergency and services, ogee spillway and bar type spillway, discharge over spillway. Spillway with and with out gates.

Unit – 6 Bandhara, Percolation Tanks And Lift Irrigation

Advantages and disadvantages of bandhara irrigation layout and component parts,solid and open bandhara, Layout of lift irrigation scheme, Irrigation department standard design and specification.

Unit – 7 Diversion Head Works

Weirs – components parts, function and types, layout of diversion head works withits components and their function, canal head regular, silt excluders and slit ejectors.

Barrages – components and their function, Difference between weir and barrage, Irrigation department standard design and specifications.

Unit – 8 Canals

CANALS – classification of canals according to alignment and position in the canalnetwork. Design of most economical canal section, Canal lining – Definition, purpose, types of canal lining advantages of canal lining properties of good canal lining material.

Cross Drainage works- different C.D. Works and their practical applications, canal falls, escapes, cross regulators and canaloutlets.

Unit-9 Watershed Management

Introduction- Definition of watershed, definition of watershed management, need for watershed management. Soil conservation, need of Soil conservation, Water Harvesting-Definition, need of rainwater harvesting, techniques of rainwater harvesting.

Unit- 10 Water logging and Land Drainage

Introduction – ill effects of water logging, causes of water logging, factors responsible for water logging.
 Anti-water-logging measures – preventive measure – names of the different measures with short description; curative measures – names of the different measures with short description
 Definition and necessity of land reclamation, characteristics of affecting fertility of soils, Purposes of land reclamation processes; methods of land reclamation – name the methods with brief description.
 Land drainage – methods of drainage with brief description mentioning location, construction and cost.

Unit – 11 FLOOD CONTROL

Definition of flood, causes of flood, effects of flood.

Methods of flood control – flood control reservoirs, flood walls, channel improvement, flood ways.

Assignments: shall consist of the following :

Data should be collected from IRRIGATION ENGINEERING DEPARTMENT or Irrigation Project and processed accordingly

1. Collection of information and prepare list of documents and drawings required for irrigation project.
2. Calculation of yield from given Topo sheet of a catchment area, plotting catchment area, determination of catchment area by plan meter.
3. Canal capacity calculation from a given command area and cropping pattern.
4. Plotting of area capacity curve of a given contour map of irrigation project
5. From a given data fixation of control levels of reservoir.
6. Layout of drainage in earthen dam on A4 size plate
7. Neat labeled sketch of ogee spillway with gate and energy dissipation arrangement.
8. Study of National Water Policy and Maharashtra Water Policy.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
S. K. Garg	Irrigation and hydraulic structure		Khanna publisher, New Delhi
Irrigation Engineering	H.M.Raghunath		Wiley-india
B.C.Punmia	Irrigation Engineering		Laxmi Publication, Delhi
P.N.Modi	Irrigation Water Resources Water Power		Standard Book House
Birdi & Das	Irrigation Engineering		Dhanpat Rai & Sons

Name of the Course: **Diploma in Civil Engineering** Subject: **Field Survey Practice-I**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks :**100**

Teaching scheme	Examination scheme
Theory - Nil	Term Work (TW) - 50
Tutorial - Nil	Practical(PR) - 50
Sessional/Practical – 3 classes/hour per week or can be conducted as crash course in 12 days	Total marks - 100
Credit of the subject - 2	

Practical:

Skills to be developed:

Intellectual skills:

1. Identify the different instruments for linear measurement and levelling
2. Record and observing necessary observation with the survey instruments
3. Classify and discriminating various types of survey instruments.
4. Identify the errors of the survey instruments.

Motor skills:

1. Measure distances, bearings and finding reduced levels with survey instruments.
2. Prepare drawing using survey data.
3. Prepare contour map of a given terrain/topography.
4. Measure area of an irregular shape figure with planimeter.

Instructions:

- 1) Group size for survey practical work should be maximum 15 students. (May be compromised depending on instrument condition and other local condition of the polytechnic)
- 2) Each student from a group should handle the instrument independently to understand the function of different components and use of the instrument.
- 3) Drawing, plotting should be considered as part of practical. A student from a group should know the basic philosophy of raw data collection, data handling, calculation required for plotting and drawing.
- 4) 3-4 full day per project is required for carrying out project work.

Surveying projects:-

- 1) **Chain & compass traverse survey** – a simple closed traverse of 5-6 sides enclosing a building
 Reconnaissance, preparation of index map, selection of station and finalisation of station, taking FB & BB of lines, ranging a line, chaining a line, calculation of included angles, angular error adjustment, closing error and its balancing by Bowditch method, taking offset with chain and tape, setting out right angles, locating details and plotting them on a A1 size imperial drawing Sheet.
- 2) **Block contouring** – a block of 100 x 150m with spot levels at 10x10m plotting the contours (indirect method) on A-1 size imperial drawing sheet with a contour interval suitable for the site.
- 3) **Profile levelling survey** – running a longitudinal section for a length of 500 m for a road /canal /railway alignment. Cross section shall be taken suitably. Plotting plan, L- section including profile leveling and Cross section on a A1 size imperial drawing sheet.
- 4) **Plane table surveying –Demonstration** of accessories and other function; centering, levelling and orientation of plane table; traversing by plane table and adjustment of closing error graphically; plane surveying of a small area including filling in details by radiation and intersection method on a A1 size imperial drawing sheet

Name of Course: **Diploma in Civil Engineering** Subject: **Application of CAD in Civil Engineering I**
 Course code: **CE** Course Duration: 6 semester Course offered in Semester: **Fourth**.
 Subject code: Question code: Marks : **75**

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work (TW) - 35
Tutorial: Nil	Practical(PR) - 40
Practical : 3	Total marks in the semester - 75
Credit :- 2	

Aim:-

1. Development of computer based knowledge in surveying.

Objective: -Students will be able to:

1. Use different CAD commands for drawing.
2. Prepare line plans with CAD software.
3. Prepare submission drawing/working drawing for the buildings with CAD software.
4. Prepare drawings of civil engineering structures.

Pre-Requisite:-

- Student should know basic functions of computers
- Student should follow the topics of AutoCAD covered in earlier semester

Unit no	Topic	Contact period	marks
1	Getting started	2	3
2	Basic command to get started	4	3
3	Setting up a drawing	3	5
4	Developing drawing strategies	8	8
5	Using layers to organize drawing	6	6
6	Using Blocks and W blocking	5	5
7	Generating elevation	6	10
8	Working with hatches and fills	3	5
9	Controlling drawing texts	3	6
10	Dimensioning in drawing	3	8
11	External references	1	5
12	Getting families with proper shape	3	8
13	Printing an auto CAD drawing	1	3

Contents: practicals/sessional (Application of CAD in Civil Engineering I) 3 Hrs/week

1. Getting started:

Starting up AutoCAD, introduction to the graphics window, command window, drop down menus, toolbars (flying out, calling up and arranging etc of toolbars)

2. Basic command to get started

Point and line command, coordinates, relative coordinates, Cartesian and Polar coordinates, drawing a box (as an example rectangle) by coordinates; offset, fillet, extend, divide and trim commands (use to generate walls and opening as exercise).

3. **Setting up a drawing**

Drawing unit, drawing size and scale, the grid, drawing limit, drawing with grid and shape, saving a drawing

4. **Developing drawing strategies**

Note: the preliminary exercise should be based on rectangular building because at the initial stage too complex drawing may distract and confuse the students

Laying out the walls, exterior walls and interior walls, creating wall opening, creating doors, swing of doors, copying objects, mirroring objects, finishing the swinging doors, drawing a sliding glass door, paneled door (by using fillet command) drawing steps and threshold

The balcony (balcony should be circular/elliptical to learn the control over circle and elliptical command)

Laying out Kitchen: counter, stove and refrigerator sink

Constructing bathroom and W.C. (setting and running object shapes): drawing shower unit, bathing block and W.C.

5. **Using layers to organize drawing**

Layers as an organizing tool, setting up layers, layers and line-type properties dialog box. Assigning objects to layers. Freezing and turning off layers, drawing the header (portion above opening beneath the ceiling), Drawing the roof, Colour, Line types and layers. Assigning a colour or line-type to an object, Making a colour and a line-type current. Assigning an individual line-type scale factor.

6. **Using Blocks and W blocking**

Making a block for a door, Inserting the door block, Finding the block in a drawing, Using grips to detect a block, Using the list command to detect a block. Using the properties button to detect a block, Creating the window block., inserting the window block, rotating a block during insertion, using guidelines when inserting a block, using point filters to insert a block, using blips to help in inserting block, finishing the windows revising a block, W blocking, inserting a DWG file into a DWG file

7. **Generating elevation**

Drawing the front elevation, setting up lines for height, trimming lines in elevation, drawing the roof in elevation, putting in the door, step and windows, finishing touches, generating the other elevations, making rear elevation making the left and right elevation, drawing scale consideration, interior elevations/sections

8. **Working with hatches and fills**

Ornamenting the front elevation by hatching looking at hatch pattern special effects modifying hatch pattern providing hatch to floor (for ornamentation)

9. **Controlling drawing texts**

Setting up text styles, text and drawing scales, defining text styles, using single line text, placing title of views in the drawing, placing room label in the floor plan, using text in a grid, creating a title block and border, using multiline text

10. **Dimensioning in drawing**

Dimension styles, making a new dimension style, placing dimension on the drawing, horizontal dimension, vertical dimension, other dimension, radial, leader line, angular and aligned dimension modifying dimension text, dimension overrides, dimensioning short distances

11. **External references**

Drawing site plan, using bearings (surveyor's unit), laying out property lines, setting up external reference dialog box, controlling the appearance of an External reference (External reference), Modifying an External reference drawing, application for External reference, additional features of

external references, the External reference path, binding External reference, other features of External reference

12. Getting families with proper shape

Setting up proper space, drawing a border in paper space, designing a title block for paper space, creating floating view path, zooming view part to 1/Xp, working with multiple viewport in paper space, setting up multiple viewports, aligning viewports, finishing drawing setting up viewports to different scale adding text to paper space turning off viewports, tile mode variable and tiled viewpoint

13. Printing an auto CAD drawing

The print / plot configuration dialog box, device and default information, pen parameter, paper size, and orientation, scale rotation and origin, additional parameters, printing a drawing, determining line weight for a drawing setting up the other parameters for the print, previewing a print, printing a drawing with paper space, printing drawing with multiple viewports, printing site plan.

Practical:

1. Draw a wooden door (2/3 rd glazed and 1/3 paneled using sash-bar) with standard dimension
2. Draw a wooden window (raised panel with fanlight) with standard dimension
3. Building drawing

Note 1 : single storied building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mumty for utilisation of roof space. Same plan used in subject 'Estimating and Costing' as well as 'Civil Engineering Drawing' is to be used.

- Development of line plan – ground floor plan and roof plan with provision for drainage layout
- Elevation (front elevation)
- Two Sectional elevation (section must pass through stair-case, bath WC, kitchen and front verandah)
- Site plan (to be developed from a Mouza map for conception of location plan)
- Foundation details (trench plan, section of main wall and a partition wall/ isolated footing with tie beam if provided)

Note 2: any theoretical aspects required for practicals mentioned above should be covered in the practical periods

Text Books:-

Name of Books	Name of the author	Edition	Name of the Publisher
Autodesk official training guide	Scott Onstott		Wiley-India
Autodesk official training guide	George Omura		Wiley-India
Reference Manual of AutoCAD			AutoDesk

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil

Name of Course: **Diploma in Civil Engineering** Subject: **Professional Practices-II**
 Course code: **CE** Course Duration: 6 semester Course offered in Semester: **Fourth**
 Subject code: Question code: Marks : **50**

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work (TW) - 25
Tutorial: Nil	Practical(PR) - 25
Practical: 3 sessional/practical classes/week	Total marks - 50
Credit :- 2	

Aim:

1. Development and evaluation of individual skills.
2. Enhancement in soft skills through innovation.
3. Development of professional approach.

Objective :-

Student will be able to:

- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

Pre-Requisite:-

1. Communication skill must be perfect.

Contents: Sessional /Practical classes (Professional Practices-II) 3 Hrs/week

Unit -1Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries (Any three)

- i) Bridge under construction
- ii) Adarsh Gram
- iii) Railway station
- iv) Construction of basement/retaining wall/sump well

Unit -2Lectures by Professional / Industrial Expert / Student Seminars based on information search, expert lectures to be organized from any two of the following areas:

- i) Construction of Flyovers: Special Features
- ii) Ready Mix concrete
- iii) Safety in Construction
- iv) Latest Trends in Water proofing
- v) Software for drafting

Unit - 3Information search can be done through manufacturers, catalogue, internet, magazines; books etc. and submit a report.(any three) Following topics are suggested :

- i) Collection and reading of drawings of buildings from architect / Practicing engineers and listing of various features from the drawings.
- ii) Market survey for pumps, pipes and peripherals required for multi storied buildings

- iii) Non Conventional Energy Sources with focus on solar energy
- iv) Elevators installation and maintenance
- v) Any other suitable areas

Unit – 4 Seminar:

Seminar topic should be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)

Unit – 5 Mini Project / Activities (any one)

- a) Optimum design of concrete
- b) Preparing three dimensional model of residential building using CAD

Text Books:- Nil

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of Course: **Diploma in Civil Engineering** Subject: **Civil Engineering lab II**
Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **Fourth**
Subject code: Question Code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 50
Tutorial: NIL	Practical (PR) - 50
Practical : 3	Total marks - 100
Credit :- 2	

Group-I Mix design of concrete by B.I.S-10262: 2009 – with and without admixture,

Group II Non Destructive test of concrete:

- Compressive strength of hardened concrete by Rebound Hammer Test
- Ultrasonic Pulse Velocity test to determine quality of concrete that is: (1) homogeneity of concrete, (2) change in concrete with time, (3) modulus of elasticity (4) presence of crack.
- Rebar locator
- Concrete core cutter test

Group III Test on bitumen:

- Determination of grade of bitumen sample
- Determination of softening point, flush point and fire point of a bitumen sample
- Determination of ductility of bitumen
- Determination of viscosity of bitumen
- Marshall stability test

Name of the Course : All Branches in Diploma in Engineering and Technology (Development of Life Skills - II)		
Course code : CE/ME/IE/EJ/DE/ET/EX/EE/EP/CO/IF/IS/ CO/CM/IF/CV/MH/FE/IU/CD/ED/EI		Semester : FOURTH
Duration: One Semester (16 hours)		Maximum Marks: 50
Teaching Scheme		Examination Scheme:
Theory: 01 hrs / week		Internal Sessional: 25
Tutorial: -- hrs / week		External Sessional : 25
Practical: 02 hrs / week		
UNITS	CONTENTS	Hours
Unit - 1	Interpersonal Relation Importance, Interpersonal conflicts, Resolution of conflicts, Developing effective interpersonal skills - communication and conversational skills, Human Relation Skills (People Skills)	5
Unit - 2	Problem Solving I) Steps in Problem Solving (Who? What? Where? When? Why? How? How much?) 1. Identify, understand and clarify the problem 2. Information gathering related to problem 3. Evaluate the evidence 4. Consider feasible options and their implications 5. Choose and implement the best alternative 6. Review II) Problem Solving Technique 1. Trial and Error, 2. Brain Storming 3. Thinking outside the Box	8
Unit - 3	Presentation Skills Concept, Purpose of effective presentations, Components of Effective Presentations : understanding the topic, selecting the right information, organising the process interestingly, Good attractive beginning, Summarising and concluding, adding impact to the ending, Use of audio-visual aids - OHP, LCD projector, White board, Non-verbal communication : Posture, Gestures, Eye-contact and facial expression, Voice and Language - Volume, pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language Handling questions - Respond, Answer, Check, Encourage, Return to presentation Evaluating the presentation - Before the presentation, During the presentation, After the presentation	8

Unit - 4	Looking for a Job Identifying different sources announcing Job vacancies, Skim, scan and read advertisements in detail, write efficacious CVs, write covering letters to accompany CVs, write Job Application Letters - in response to advertisements and self-applications	5
Unit - 5	Job Interviews Prepare for Interviews : Intelligently anticipating possible questions and framing appropriate answers, Do's and don'ts of an interview (both verbal and non-verbal), Group Discussion: Use of Non-verbal behaviour in Group Discussion, Appropriate use of language in group interaction, Do's and don'ts for a successful Group Discussion	10
Unit - 6	Non-verbal - graphic communication Non - verbal codes: A - Kinesics, B - Proxemics, C- Haptics, D - Vocalics, E- Physical appearance, F- Chronemics, G - Artifacts Aspects of Body Language	6
Unit - 7	Formal Written Skills: Memos, E-mails, Netiquettes, Business correspondence - Letter of enquiry, Letter of Placing Orders, Letter of Complaint	6
Total		48

Sessional Activities	
Unit - 1 Interpersonal Relation	Case Studies: 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies
Unit - II Problem Solving	Case Studies: 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies
Unit - III Presentation Skills	Prepare a Presentation (with the help of a Powerpoint) on a Particular topic. The students may refer to the Sessional activity (sl. No. 8) of the Computer Fundamental syllabus of Semester 1. For engineering subject-oriented technical topics the co-operation of a subject teacher may be sought. Attach handout of PPT in the sessional copy
Unit - IV Looking for a job	Write an effective CV and covering letter for it. Write a Job Application letter in reponse to an advertisement and a Self Application Letter for a job.

Unit - V Job Interviews & Group Discussions	Write down the anticipated possible questions for personal interview (HR) along with their appropriate responses Face mock interviews. The co-operation of HR personnels of industries may be sought if possible Videos of Mock Group Discussions and Interviews may be shown
Unit - 7 Formal Written Skills	write a memo, write an effective official e-mail, write a letter of enquiry, letter of placing orders, letter of complaint