

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



Syllabus
of

Diploma in Survey Engineering [SE]

Part-II (4th Semester)

First Draft 2022

CURRICULAR STRUCTURE OF DIPLOMA IN SURVEY ENGINEERING													
WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT													
TEACHING & EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES													
SURVEY ENGINEERING							FOURTH SEMESTER						
SLNO	CODE	COURSE TITLE	CREDIT	CLASS/WK			EXAMINATION SCHEME						
				L	T	P	INTERNAL			ESE	PIA	PEA	TOTAL
							INT	AS/QZ	ATD				
1	SEPC202	Surveying –III	2	2	-	-	20	10	10	60	-	-	100
2	SEPC204	Photogrammetry and Remote Sensing	3	3	-	-	20	10	10	60	-	-	100
3	SEPC206	Mine Surveying	3	3	-	-	20	10	10	60	-	-	100
4	SEPC208	Geodesy and Astronomy	2	2	-	-	20	10	10	60	-	-	100
5	SEPC210	Triangulation & Trilateration	2	2	-	-	20	10	10	60			100
6	SEPE202	Program Elective -I	3	3	-	-	20	10	10	60	-	-	100
7	SEPC212	Computer Aided Drawing and Survey Software	2	-	-	4	-	-	-	-	60	40	100
8	SEPC214	Field Surveying Practice -II	2	-	-	4	--	-	-	--	60	40	100
9	PR202	Minor Project	2	-	-	4	-	-	-	-	60	40	100
TOTAL			21	15	-	12	-	-	-	-	-	-	900
SEPE1: Any one of the two subjects: 1. Estimating, Costing, Specification and Valuation, 2.Theory of Structures.													
STUDENT CONTACT HOURS PER WEEK: 27 Hrs. Theories and Practical Period of 60 Minutes each.													
L–Lecture, T–Tutorial, P–Practical, INT-Internal Assessment, AS/QZ–Assignment/Quiz, ATD–Attendance, ESE – End Semester Exam, PIA– Practical Internal Assessment, PEA– Practical External Assessment.													

Name of the Course: Diploma in Survey Engineering	
Course Title: Surveying-III	Course Code: SEPC202
Number of Credits: 2	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: 2 hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz: 10 Marks
Total Contact Hours: 30 hrs	End Semester Examination: 60 marks

Pre-requisites : Students should have the knowledge of drawing, sketching, and basic knowledge of Surveying of Levelling.

Course Category : PC

Course Objective

- To know how to represent the ground topography.
- To establish horizontal and vertical control points.
- To locate the details of topographical features (natural and artificial both) such as rivers, streams, roads, railways, houses, etc.
- Measuring the depth of the water body and velocity and discharge of running water in a river.

Unit	Course Content	Hour/Unit	Marks
Unit 1	<p>1. Topographic Surveying</p> <p>1.1. Introduction of Topographic Surveying. Topographic map: Conventional sign, feature, purpose, and use based on Survey of India (SOI) maps.</p> <p>1.2. General. The scale of the topographic map. Different methods of representing relief. Contour – Characteristics, Necessity, contour interval, factors affecting Contour Interval, Horizontal Equivalent, Valley Line, Ridge Line.</p> <p>1.3. Planning a topographic survey. Establishing horizontal and vertical control points. Instruments for locating details. Methods for locating details by: Controlling point method, Cross profile method, Checkerboard or grid method, Trace contour method. Direct contouring, Indirect contouring.</p> <p>1.4. Use of contour and topographic map. Contour gradient and its use in engineering, alignment of the road on a contour map, inter-visibility between two ground points, calculation of reservoir capacity.</p>	15	30
Unit 2	<p>2. Hydrographic Surveying</p> <p>2.1. Introduction of Hydrographic Surveying, Horizontal Control & Vertical Control in Hydrographic Surveying, Tidal Datum, A brief concept on shore line survey. Theory of tides. Effect of Moon and Sun. Spring Tide and Neap Tide. Different types of tide gauges: Staff Gauge, Float Gauge, Weight Gauge, and Self-registering Tide</p>	15	30

	<p>Gauge.</p> <p>2.2. Sounding: Utility and different methods of Sounding. Echo Sounder: Advantages and limitations. Reducing Sounding to a fixed datum. Locating sounding from shore by: Tacheometer, Range line and one angle from shore line, Two angles from shore line, Boat, Both Shore and Boat. Plotting of location of Sounding. Numerical Problems. Submarine Contours.</p> <p>2.3. Determination of direction and velocity of current by floats. Location of floats with theodolites. Numerical Problems.</p> <p>2.4. Current Meter, Numerical Problems, Velocity-area method of measuring flow, Numerical Problems.</p>		
Total		30	60

Suggested learning resources:

- Surveying and Levelling by N. N. Basak, Tata McGraw-Hill.
- Surveying and Levelling Vol-II by Dr. B. C. Punmia, Laxmi Publication.
- Surveying and Levelling by S. K. Duggal, Tata McGraw-Hill.
- Plane Surveying by Alak De, S. Chand & Company Pvt. Ltd. New Delhi.
- Conventional sign for topographical map by Survey of India.

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

- Prepare topographical maps.
- Use the topographical map for various engineering and other purposes.
- Prepare contour maps by different methods.
- Get a basic idea to generate underwater terrain mapping.
- Use different hydrographic surveying procedures for various needs.

Name of the Course: Diploma in Survey Engineering	
Course Title: Photogrammetry & Remote Sensing	Course Code: SEPC204
Number of Credits: 3	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: 3 hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz: 10 Marks
Total Contact Hours: 45 hrs	End Semester Examination: 60 marks

Pre-requisites : Knowledge of basic surveying with drawing and sketching.
 Course Category : PC

Course Objective –

- To understand the procedures to be followed in Photogrammetry.
- To grow the skill to understand and calculate necessary information from the aerial survey data.
- To understand the principles of Remote Sensing.
- To know about different techniques and applications involved in Remote Sensing.
- To understand various applications of Photogrammetry.

Unit	Course Content	Hour/Unit	Marks
Unit 1	<p>1. Photogrammetry</p> <p>1.1. Scope & importance of photogrammetry surveying. Different types of Photogrammetry. Application, Advantages, and Limitations in Photogrammetry.</p> <p>1.2. Terrestrial photogrammetry: Principle, Graphical method, Analytical method, Stereo photogrammetry, Numerical problems.</p> <p>1.3. Aerial photogrammetry: Scale of aerial photographs, Map versus Aerial Photograph, Procedure of Aerial Survey including Ground controls, Flight Planning, overlapping of photograph, Wind effects (Crab and Drift), Area covered by one photograph, number of photographs to cover a given area, Interval between exposures, Air Base, Numerical problems.</p> <p>1.4. The terminology used in Aerial photogrammetry: i) Exposure Station, ii) Flying Height, iii) Altitude, iv) Tilt, v) Tip, vi) Perspective centre, vii) Plumb points, viii) Principal points, viii) Isocentres, ix) Principal plane, x) Horizontal Trace, xi) Plate parallels, Scales of the vertical photograph, Distortion of the vertical photograph, Distortion due to height or relief, Scale & Distortion of the oblique photograph, Numerical problems.</p> <p>1.5. Photo-interpretation, Basic photo-interpretation equipment: Stereoscope, Basic concept of Parallax and uses of Parallax bar, Fiducial Marks, Mosaic, Digital Elevation Model.</p>	24	30
Unit 2	<p>2. Remote Sensing</p> <p>2.1. Definition and Overview of Remote Sensing, History, and Evolution of Remote Sensing, Advantages of Remote sensing, limitation of Remote sensing.</p>	21	30

	<p>2.2. Electro Magnetic Energy and its characteristics, Electromagnetic Spectrum, Effect of atmosphere on electromagnetic radiation, Interaction of Electro Magnetic Energy with matter and Earth surface features. Idealized Remote Sensing System.</p> <p>2.3. Types of Remote-Sensing Sensor Systems: i) Framing System, ii) Scanning System, iii) Active System, iv) Passive system. Platforms of Remote Sensing. Spatial, Radiometric, Temporal, and, Spectral Resolution in Remote Sensing.</p> <p>2.4. Data acquisition and Interpretation. Elements of Visual interpretation: Tone, Shape, Size, Pattern, Texture, Shadow, Association. Spectral Signatures, False Colour Composite. Introduction to Digital Image Processing.</p> <p>2.5. Application of Remote Sensing in i) Resource Exploration, ii) Environmental Applications, iii) Land use and Land cover analysis, iv) Studying Natural Hazards, v) Geographic Information System.</p>		
Total		45	60

Suggested learning resources:

- Surveying and Levelling Vol.- 2 by S. K. Duggal, TATA McGraw-Hill
- Advanced Surveying by Satheesh Gopi, R. Sathikumar, N. Madhu, Pearson.
- Surveying Vol.- 3 by Dr. K. R. Arora, Standard Book House
- Surveying and Levelling Vol. 3 by Dr. B. C. Punmia, Laxmi Publication.
- Higher Surveying by Dr. A. M. Chandra, New Age International.

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

- Understand the procedure and applications of the Photogrammetric survey.
- Calculate necessary information from aerial survey data.
- Understand the different techniques and applications of Remote Sensing.

Name of the Course: Diploma in Survey Engineering	
Course Title: Mine Surveying	Course Code: SEPC206
Number of Credits: 3	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: 3 hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz: 10 Marks
Total Contact Hours: 45 hrs	End Semester Examination: 60 marks

Pre-requisites : Knowledge of basic surveying, leveling, and engineering drawing.

CourseCategory : PC

Course Objective: Following are the objectives of this course –

- To understand the procedures to be followed in underground surveying.
- To develop the skill to solve dip, strike, and fault related problems.
- To understand the setting out the procedure of underground curves in tunnels and solve the related problems.
- To know about the reserve, the process of correlation, and solve the related problems.
- To understand various mining regulations.

Unit	Course Content	Hour/Unit	Marks
Unit 1	<p>1.1 Dip and Strike Problem. Types of Dip and derivation of the formula used to connect True dip, Apparent dip and included angles. Problems on Dip. Borehole surveying, Borehole problems for determining the dip (amount and direction) of seams. Computation of quantity of coal in certain block (between boreholes). Simple Numerical Problems.</p> <p>1.2 Fault Problem. Different geological disturbances encountered in underground coal seams such as faults, folds, etc. Types of faults, folds. Simple Numerical Problems.</p> <p>1.3 Curve Setting. Designation of the curve. Elements of a simple circular curve. Theoretical concept on setting out of underground simple circular curve by i) Chord and offset method, ii) Chord and angle method. Simple Numerical Problems on curves in mining.</p>	25	35
Unit 2	<p>2.1 Estimation of Reserves (only Metalliferous Deposit). Minerals, mineral resources, reserves. Methods of calculation of reserves- i) Contour lines method, ii) Mean arithmetic method, iii) Polygon method, iv) Section method. Problems on calculation of average width and grade of an ore body. Purpose and scope of Mine sampling. Sampling method and sampling calculations. Simple Numerical Problems.</p> <p>2.2 Coal Mines Regulations, 2017. Practical experience of candidates for surveyor's examination, Appointment of surveyors, Duties, and responsibilities of surveyors, General requirements about mine plans and sections, Types of plans and sections, Preparation and preservations of plans and sections according to safety code under the survey legislation, Management of survey office and its various equipment.</p> <p>2.3 Mine Correlation and Shaft Survey. Definition, Purpose, Different Types of Correlation Survey- 1) Correlation through inclines, 2) Single Shaft Method: Alignment Methods, Weisbach triangle method, 3) Double Shaft Method: Assumed bearing method, 3) Gyroscopic method of correlation – an introduction. Simple Numerical Problems.</p>	20	25

Total	45	60
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Suggested learning resources:

- Mine Surveying and Levelling Vol-1, 2 & 3 by S Ghatak Coalfield Publisher
- Surveying Vol- 2 by Dr. K. R. Arora. Standard Book House.
- Plane Surveying by Alak De. S Chand & Company Ltd.
- Coal Mines Regulations, 2017 and Metalliferous Mines Regulations, 1961.

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

- Understand the procedure of underground survey and solve Dip, Strike and Fault-related problems.
- Understand the procedure of setting out underground curves & tunnels and solving the related problems.
- Understand and estimate the underground reserves.
- Learn the procedure of correlation and solve related problems.
- Learn about Mining Regulations.

Name of the Course: Diploma in Survey Engineering	
Course Title: Geodesy and Astronomy	Course Code: SEPC208
Number of Credits: 2	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: 2 hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz : 10 Marks
Total Contact Hours: 30 hrs	End Semester Examination: 60 marks

Pre-requisites : Knowledge of basic surveying.

Course Category : PC

Course Objective

Following are the objectives of this course:

- Impart primary ideas of Geodesy.
- To understand levelling techniques by use trigonometry out of normal leveling process.
- To know the basics of Astronomy, spherical trigonometry necessary required for a surveyor to calculate true north line and bearing.

Unit	Course Content	Hour/Unit	Marks
Unit 1	<p>1. Geodesy.</p> <p>1.1 Introduction: Terminologies– Ellipsoid, Spheroid, Oblate Spheroid, Geoid, Equipotential Surface, Mean Sea Level, Topographical Surface, Regional Geodetic Datum, Global Geodetic Datum, Different Ellipsoid– Everest 1830, Clarke, WGS84.</p> <p>1.2 Trigonometrical Levelling: Indirect levelling. Levelling on steep ground. Base of an object accessible. Base of an object inaccessible. Two stations not in the same vertical plane. Curvature, Refraction and, Axis-signal correction. The difference of elevation by single and, double observation.</p> <p>1.3 Precise Levelling: Order of precision. Field procedure in geodetic levelling. Correction for collimation, curvature, and refraction. Adjustment of level net.</p>	15	30
Unit 2	<p>2. Astronomy.</p> <p>2.1. Basics of astronomy for a surveyor: Concept of Celestial Sphere, Zenith and Nadir, Celestial Poles, Celestial Equator, Celestial Horizon, Celestial Meridian, Observers Meridian, Declination Circle, Vertical Circle, Prime Vertical. Astronomical Co-ordinate Systems: Right ascension and Declination System, Declination and Hour Angle System, Altitude and Azimuth System, Celestial Longitude and Latitude System, and, Comparison among them. Simple Numerical Problems.</p> <p>2.2. Spherical trigonometry: Great circle, small circle, spherical triangle, Properties of Spherical Triangle, Formula for a spherical triangle, Napier's Rule, Spherical Excess, Terrestrial Longitude, and Latitudes. Horizons: Observers, visible and sensible horizon.</p> <p>2.3. Distance between two points on a parallel of latitude. Determination</p>	15	30

	of Azimuth by Sun and star observation for finding the true bearing of a line, Astronomical Triangle. Simple Numerical Problems.		
Total		30	60

Suggested learning resources:

- Surveying Vol.-2, 3 by Dr. K. R. Arora, Standard Book House
- Surveying and Levelling Part 2 by T. P. Kanetkar & S. V. Kulkarni, Pune Vidhyarthi Griha Prakashan.
- Surveying and Levelling Vol.2, 3 by Dr. B. C. Punmia, Laxmi Publication.
- Surveying and Levelling Vol.2 S. K. Duggal TATA McGraw-Hill.

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

- Understand the basics and procedure of geodetic surveying.
- Use trigonometrical leveling.
- Understand astronomical survey and application of it to find out true bearing of a survey line.

Name of the Course: Diploma in Survey Engineering	
Course Title: Triangulation and Trilateration	Course Code: SEPC210
Number of Credits: 2	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: 2 hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz: 10 Marks
Total Contact Hours: 30 hrs	End Semester Examination: 60 marks

Pre-requisites : Basic knowledge of surveying.

Course Category : PC

Course Objective:

- Know the procedure for reducing error, analyzing and adjustment computation of surveying measured data.
- Understanding the method of triangulation surveying to fix up accurate control points for further surveying.
- To know the method of establishing the accurate horizontal and vertical control point.
- To understand the Great Trigonometrical Survey as the basis of national mapping system.
- Understand the methodologies of Trilateration to fix up accurate control points with modern EDM instruments.

Unit	Course Content	Hour/Unit	Marks
Unit 1	<p>1.1 Theory of errors. Classification of errors. Laws of accidental errors. Most probable values of directly and indirectly observed independent quantities. Weight of observation. Principle of least square. Normal equation. Method of co-relates. Simple Numerical Problems.</p> <p>1.2. Triangulation. A brief history of Great Trigonometrical Survey (GTS) in India. Classification of triangulation system. Triangulation figures. Triangulation system adopted in India. Strength of figure. Selection of station. Observation of horizontal angles. Baseline extension. Baseline measurement. Corrections to the base line. Phase error. Inter-visibility. Satellite station. Simple Numerical Problems. Different types of applications of triangulation survey.</p>	20	40
Unit 2	<p>2.1 Trilateration. Introduction. Use of Trilateration. Advantages and Disadvantages of Trilateration. Comparison of Trilateration with Triangulation. Geometrical figures used in Trilateration. Reconnaissance in Trilateration. Precision in Trilateration. Reduction of slope distance from vertical angles. Reduction of slope distance from elevations. Adjustment in Trilateration (Adjustment of a Braced Quadrilateral). Simple Numerical Problems.</p>	10	20
Total		30	60

Suggested learning resources:

- Surveying Vol. 2, 3 by Dr. K. R. Arora. Standard Book House.
- Surveying and Levelling Vol. 2 & 3 by Dr. B. C. Punmia Laxmi Publication.
- Surveying and Levelling Vol. 2 by S. K. Duggal. TATA McGraw-Hill.
- Higher Surveying by Dr. A. M. Chandra. New Age International Publishers.

Course outcomes:

- Able to use computation techniques to get more precise results.
- Understand the triangulation survey and its application.
- Students will get acquainted with the history of the Great Trigonometrical Survey.
- Established accurate control points by Trilateration survey for use in subsequent precise Engineering surveying and other requirements.

Name of the Course Diploma in Survey Engineering	
Course Title: Estimating, Costing, Specification, and Valuation	Course Code: SEPE202 /E-1
Number of Credits: 3	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: 3 hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz: 10 Marks
Total Contact Hours: 45 hrs	End Semester Examination: 60 marks

Pre-requisites : Concept of building materials and construction, drawing

Course Category : PE

Course Objective

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To learn the procedure of preparation of specification of Civil Engineering works.
- To learn the procedure of contract and valuation for different Civil Engineering works.

Unit	Course Content	Hour/Unit	Marks
Unit 1	1. Estimation Introduction, Different types of estimates, Difference between Supplementary Estimate and Revised Estimate, General items of work for building estimate. Estimating and costing of a single storied building using the centre line method.	14	20
Unit 2	2. Costing Rate Analysis: Introduction to W.B. schedule of rates. Mode of measurements based on IS: 1200. Analysis of rate and how it is prepared. Quantities of material to be analyzed and labor as per labour chart: PCC, RCC, Brick Work, Plastering, Wall finish, White Wash, Colour Wash.	8	10
Unit 3	3. Specification 3.1 Definition, importance, and manner of writing specification. 3.2 Types of specifications. General specification of buildings. The detailed specification of important tax items of a building. Foundation of a typical isolated RCC column footing, brickwork superstructure, RCC work in slab, beam and column, external and internal plastering, I. P. S. flooring. Woodwork in doors and windows. 3.3 Detail specification of important building materials, brick, sand, cement, coarse aggregate, steel reinforcement.	9	10
Unit 4	4. Contracts and Valuation. 4.1 Definition of tender and contract. Different types of Civil Engineering contracts. Contract documents – List of contract documents. Clauses of general condition of contract. Tender Notice. Comparative statement and acceptance of tender. 4.2 Introduction to valuation. Difference between value and cost.	14	20

Survey Engineering 4th Semester

	Purpose of valuation. Gross income, net income, scrap value, salvage value. Comparison between scrap value & salvage value. Comparison between market value and book value. Sinking fund, Capitalized Value, Depreciation, Obsolesce, freehold property, lease hold property, mortgage property. Determination of depreciation by different methods. Simple Numerical Problems.		
Total		45	60

Suggested learning resources:

- Estimating and Costing in Civil engineering by B. N. Dutta, UBS Publishers Distributors Pvt. Ltd.
- Estimating & Costing, Specification and Valuation in Civil Engineering by M. Chakraborti. M. Chakraborti, Calcutta.
- Estimating & costing by S.C. Rangwala. Charotar Publication.
- Civil Engineering contracts and Accounts Vol- I, II by B.S. Patil. Orient Longman.
- Estimating & Costing by G. S. Birdie. Dhanpat Rai and sons.
- Schedule of Rates Volume-I Building Works, Public Works Department Government of West Bengal.

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

- Prepare estimate of a civil engineering works.
- Perform rate analysis of the different items of a civil engineering works.
- Understand the specification of different items involved in Civil Engineering works.
- Prepare the valuation of buildings.

Name of the Course: Diploma in Survey Engineering	
Course Title: Theory of Structures	Course Code: SEPE202 /E-2
Number of Credits: 3	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: 3 hours/ week	Continuous internal Assessment: 20 Marks
Tutorial: Nil	Attendance: 10 Marks
Practical: Nil	Assignment/ Presentation/ Quiz: 10 Marks
Total Contact Hours: 45 hrs	End Semester Examination: 60 marks

Pre-requisites : Basic Knowledge of Engineering Mechanics, Mechanics of materials.
 Course Category : PE

Course Objective

Following are the objectives of this course:

- Understand forces and moments developed in designing of structures.
- To analyze beams using various methods.
- Identify the method of analysis for determinate structures.
- Understand the importance of various methods of slope and deflections for determinate structures
- Understand the methods of analysis for multistoried frames.

Unit	Course Content	Hour/Unit	Marks
Unit 1	<p>1.1 Analysis of Structures. Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of cables with concentrated and continuous loadings, Static determinacy and indeterminacy.</p> <p>1.2 Propped Cantilever and Fixed Beams. Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, subjected to uniformly distributed load - point loads - - Shear force, bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams - Deflection of Propped cantilever and fixed beams.</p> <p>1.3 Continuous Beams: Introduction to Continuous beams- Clapeyron's theorem of three moments, Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed- continuous beams.</p>	23	30
Unit 2	<p>2.1 Principal Stress and Strain. Stress on inclined planes, principal plane and principal stress in elements subjected to direct and shear stress and their combinations. Mohr Circle for calculation of stress on inclined planes and principal strain for above cases.</p> <p>2.2 Strain Energy and Redundant Frames. Introduction- Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces. Deflections for simple statically determinate beams and frames using Castigliano's theorem, Unit Load Method.</p> <p>2.3 Analysis of Multi-Storied Frames. Moment Distribution Method: Basic proposition relative stiffness, continuous beams with and without fixed ends. (simple problem only)</p>	22	30

Total	45	60
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Suggested learning resources:

- Analysis of Structures, Vol- I & II by Ratwani, S.K. Duggal and V.N. Vazirani. Khanna Publishers.
- Theory of Structures by R. S. Khurmi. S. Chand and Co. New Delhi.
- Theory of structures by S. Ramamrutham. Dhanpatrai & Sons.
- Theory of Structures Vol I & II by G S Pandit, S P Gupta and R Gupta. Tata McGraw Hill, New Delhi.
- Basic Structural Analysis by C. S. Reddy. Tata McGraw Hill Education.
- Intermediate Structural Analysis by C. K. Wang. McGraw Hill.
- Theory of Structure by Timoshenko & Young, Tata McGraw Hill.

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

- Analyze slope and Deflection in fixed and continuous beams.
- Analyze continuous beam using Moment Distribution Method under different loading conditions.
- Identify the method of analysis for determinate and indeterminate structures.
- Apply the various methods for finding out slope and deflections for determinate structures.
- Use best-suited methods of analysis for multistoried frames.

Name of the Course: Diploma in Survey Engineering	
Course Title: Computer Aided Drawing and Survey Software	Course Code: SEPC212
Number of Credits: 2	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: Nil	Continuous internal Assessment: 60 Marks
Tutorial: Nil	End Semester Examination: 40 marks
Practical: 4 Hours/Week	

Pre-requisites : Students should have a basic knowledge of computer.

Course Category : PC

Course Objective

- Hand-on learning on basics of CAD, spreadsheet.
- Compute necessary survey data from field observation for preparation of drawing etc.

Unit	Course Content
Unit 1	<p>1. CAD 2D Basics</p> <p>1.1 CAD interface and starting, Drawing commands, Editing commands, Create and modify commands, Drawing aids and tool commands, Scale, Plotting, Working with raster map and image.</p> <p>1.2 Prepare Drawing of Plan, Section, and Elevation of a single storied building using CAD.</p>
Unit 2	<p>2. Spreadsheet:</p> <p>2.1 Practice of traverse plotting using calculated independent coordinates from length and bearing.</p> <p>2.2 Computation of R.L. of ground points from BS. IS and FS etc.</p> <p>2.3 Automated import and export of points, texts, lines, polyline between CAD and Spreadsheet.</p>

Suggested learning resources:

- AutoCAD Instance Reference by George Omura, PBB Publication.
- AutoCAD Command Reference by Autodesk.
- Mastering AutoCAD by George Omura. BPB Publication.

Course outcomes –

- Able to do CAD drawing independently.
- Calculate, modify and arrange survey data in spreadsheet and feed in CAD automate drawing.

Name of the Course : Diploma in Survey Engineering	
Course Title: Field Surveying Practice - II	Course Code : SEPC214
Number of Credits: 2	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory : Nil	Continuous internal Assessment : 60 Marks
Tutorial: Nil	End Semester Examination : 40 marks
Practical : 4 Hours/Week	

Pre-requisites : Drawing and basic knowledge of Surveying.

Course Category : PC

Course Objective

Following are the objectives of this course:

- Learn to use different survey instruments.
- Record surveying data after field observation with the survey instruments.
- Compute necessary survey data from field observation for preparation of drawing etc.
- Prepare report including drawing using survey data collected in the field.

Instructions –

Group size for survey practical work should be formed in such way that each student from a group can handle instruments independently to understand the functions of different components of the instrument.

Drawing and plotting should be considered as part of practical work.

Term work shall consist of record of all practical and projects in field book and drawing of Project work on full/half imperial size drawing sheets.

Unit	Course Content
Unit 1	Theodolite Traverse. Temporary adjustment of Theodolite. Measurement of horizontal angle by repetition method and reiteration method. To traverse by the method of included angles. Individual Traverse: To measure and compute for 5-sided traverse (for each student should prepare a separate drawing sheet).
Unit 2	Trigonometrical Levelling. To determine height of tower by the theodolite and tape.
Unit 3	Setting Out Curves. Setting out of simple curve using any two methods: i. Offsets from long chord, ii. Offsets from chords produced, iii. Deflection angles (Rankine's method) , iv. Two Theodolites method.
Unit 4	Indirect Contouring by Spot Levels.

Suggested learning resources:

- Surveying Vol. I and II by Dr. K. R. Arora. Standard Book House, Delhi.

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

- Perform Theodolite survey
- Measure the height of tower
- Calculate survey data required for curve.
- Draw contour maps.

Name of the Course : Diploma in Survey Engineering	
Course Title: Minor Project	Course Code: PR202
Number of Credits: 2	Semester: Fourth
Teaching Scheme	Examination/Scheme
Duration: 15 weeks	Maximum Marks: 100
Theory: Nil	Continuous internal Assessment: 60 Marks
Tutorial: Nil	End Semester Examination: 40 marks
Practical: 4 Hours/Week	

Pre-requisites : Knowledge of basic surveying with drawing.

Course Category : Project

Course Objective

Following are the objectives of this course:

- Understand the procedures and different techniques to be followed in various field survey jobs and record the observed data.
- Compute necessary survey data from field observation for preparation of plans, drawings, etc.
- Prepare report including drawings using survey data collected in the field.
- Apply knowledge of surveying to read and interpret the basic information from a Topo Sheet.
- Enhance knowledge to represent the surveyed data.

Instructions –

- Group size for survey practical work should be formed in such a way that each student from a group can handle instruments independently to understand the functions of different components of the instrument.
- Drawing and plotting should be considered as part of practical work.
- All practical data along with necessary drawings are to be submitted as the Minor Project Report by each student.

Unit	Course Content/ Assignment or Practical
Unit 1	<p>Layout of the building. Building plans are to be assigned by the teacher to the different groups of students)</p> <p>For Load Bearing Structure: Set out a trench plan of a building. Clearly define the outline of excavation and the center lines of the walls using the Centre Line Method.</p> <p>Assignment 1: Draw the trench plan of the building and prepare a report on the procedure to be followed to perform the job.</p> <p>For Frame Structure: Clearly define the outline of excavation and the center lines of the positions of columns using the Centre Line Method.</p> <p>Assignment 2: Draw the trench plan of the building and prepare a report on the procedure to be followed to perform the job.</p>
Unit 2	<p>Study a Topo Sheet. Educational sheet with Arbitrary Grid of Survey of India.</p> <p>Assignment 3: Prepare a report on the observation of Scales, Map Numbering, Conventional Symbols, and basic features of a Survey of India Topo Sheet. Draw the conventional symbols used in the Topo Sheets of Survey of India.</p>
Unit 3	<p>Study the basic features of a contour map. (contour line diagrams from a topo sheet are to be assigned by the teacher to the different groups of the student)</p> <p>Assignment 4: Draw topographic profiles from contours of a mountain area with the help of</p>

	Cross and Longitudinal Profiles. Write the different processes used for the representation of relief drawing neat sketches of each type.
Unit 4	Assignment 5: Graphical construction of scales: Plain, Comparative, Diagonal, and Vernier. Assignment 6: Learning the procedure of Pie Chart, Bar Chart preparation using MS Excel Software.

Suggested learning resources:

- Surveying and Levelling Vol – I by S. K. Duggal, Tata McGraw-Hill.
- Surveying Vol.- I by Dr. K. R. Arora, Standard Book House
- Surveying and Levelling by N. N. Basak, Tata McGraw-Hill.
- Surveying Vol. I and II by Punmia, B.C.
- Fundamentals of Cartography by R. P. Misra. Concept Publishing.

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

- Set out the layout of a building.
 - Read and interpret a Topo Sheet.
 - Draw different scales used in map.
 - Draw topographic profiles from contour diagrams.
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