

Certificate Course in Surveying Technology (Duration:06 months)

Number of subjects in each semester

1. The Diploma course will be 01 semester duration each covering a period of 6 months.
2. First Semester will have Five (05) theory papers and Two (02) laboratory classes / practical, of six months of duration.
3. Each subject will have theory classes of 60 minutes duration (each class) with a credit of 2.0.
4. Each laboratory class will be of 2:30 hour duration with a credit of 1.0.
5. The total credit for both (01) semesters will be $2 \times 5 = 10$ for theory classes and $01 \times 2 = 02$ for lab classes, i.e. a total of 12 credits in first semester

Marks and Examinations

1. In each Semester there will be 3 class tests(internal examination) of 20 marks, the best score of two class tests marks out of a maximum marks of $20+20=40$ scored by a student will be counted for addition to the end semester theory paper marks of 80. The internal should account for 20 marks only.
2. Students will be required to give a seminar presentation at the end of a semester with a report write up in form of the Third internal examination on any topics assigned to them. The topic will be assigned by the class teacher on the respective theory topic. The maximum marks for this presentation is 20 and is to be substituted by the third internal examination.
3. The total mark for a theory paper will be 100 i.e. 80 for end Semester written examination + 20 for class test.
4. Each laboratory / practical paper will carry maximum marks of 50.
5. The maximum marks for each paper will be 100 for theory and 50 for practical.
6. The marks will be converted in to a 10 point grade as per the following rules.

Sl.No	Marks	Theoretical		Practical	
		Grade Point	Grade	Grade Point	Grade
1	90% and Above	10	Ex	10	Ex
2	80% to 89%	9	A ⁺	9	A ⁺
3	70%-79%	8	A	8	A
4	60%-69%	7	B ⁺	7	B ⁺
5	50%-59%	6	B	6	B
6	40%-49%	5	P	5	P
7	Less than 40%	0	Fail	0	Fail

*****P stands for Pass Division

7. A student has to score a minimum of 5 Semester Grade Point Average (SGPA) and pass in all subjects, both theory and practical in order to qualify for the next semester.
8. A student failing (Grade F) in one or more theory papers in a semester but securing a minimum of 5 SGPA will have to clear the paper in which the student has failed by reappearing in a separate test(s) on payment of additional fees of Rs. 500 per paper failed for which the tests will be carried out by the respective subject teacher.
9. A student has to pass the laboratory classes in one chance and no re-examination will be allowed in laboratory class, failing in laboratory classes will mean semester back.
10. Failure in more than two subjects in a semester or obtaining less than 5 SGPA in a semester even while passing in all subjects (Grade P) will debar a student to continue the course.

Calculation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

$$SGPA = \frac{\sum_{i=1}^{n=4} (\text{no. of credit in theory} \times \text{grade obtained} + \text{no. of credit in lab} \times \text{grade obtained})}{10}$$

$$CGPA = \frac{\sum_{i=1}^{i=4} (\text{SGPA of } i \text{ th. Semester} \times \text{no. of credits of } i \text{ th Semester})}{40}$$

In order to be eligible for the Certificate Course in Surveying Technology a student has to pass in all subjects, both theory and practical as well as project and viva- voce and secure a CGPA of 5.0.

Subjects in Semester

First Semester

Sl.	Code	Subject & Credit
1.	CCST T001	History & Fundamentals of Surveying Technology - (2-0)
2.	CCST T002	Geocomputations (Chain, Tape, Prismatic Compass, Plane Table) – (2-0)
4.	CCST T003	Elementary Mathematics, Calculus, Trigonometry, Matrices – (2-0)
5.	CCST T004	Introduction to ETS, GPS & Auto Level (2-0)
6.	CCST T005	Elements of Business Communication, Project Management & Communicative English(2-0)
7.	CCST P 001	Geocomputations Lab (1-0)
8.	CCST P 002	ETS, GPS & Auto level Lab (1-0)

Sessions & Classes

1. The academic session will start from 2nd week of January/July or as advertised at the time of seeking the applications and will be over in the 2nd. Week of December/ June
2. The theory classes will be from 9-00 AM to 12:30PM (11.00 – 12.00, 12.10 – 01.10, 01.15 – 2.00) and the lab class will be held from 1:30 pm to 4:30pm or as and when opted by the institute administration.
3. If it is required the concerned faculty of a relevant discipline may schedule extra classes as per the requirement for the successful accomplishment of the course with due permission from the concerned authorities.
4. Administrator (AITER) is the only responsible authority to deal up with the internship of the students, placement and allied aspects. Only best candidates will be absorbed by Prantik Care the Earth in its ventures. Principal, AITER is directly responsible to Administrator, AITER and President cum Director, PCTE in submission of weekly reports as well as other proceedings in time with 100 % honesty and accuracy.
5. The details of the classes, time schedule for the examination as well as other pros and cons are to be placed up in the institute notice board on timely fashion with due permission from Principal, AITER.

SYLLABUS

Paper Code: SCST T 001: History & Fundamentals of Land Surveying

Unit-I: Definition, Basic concepts of Survey:

History of Survey, Recent Trends in Surveying Technology, Scope of Survey, Relationship of Survey with Different Disciplines, Uses of Survey, Types and Definition of different surveys, Introduction to different Surveying instruments, Fundamental concepts of Survey: latitude, longitude, altitude, datum, GEOID, Ellipsoid, etc.

Unit II:-Basic concept of Survey Engineering:

General Principles of Surveying, Introduction of scale: types-statement, nominal, comparative RF etc-conversion of scale-theory of light and its implications in surveying, Gravitational pull of the earth and its importance in determining location of a place, tides, Theory of light and its applications in Surveying, Different types of lens.

Unit III:-Knowing the shape of the earth

Earth as oblate spheroid –ellipsoid-GEOID-latitude longitude-definition-concept-characteristic –determining the location of a place- longitude and time zones –calculations-concept of sea level, mean sea level.

Unit IV:-Coordinate and projection

Co-ordinate system –Geodetic coordinates-Earth centered, earth fixed(x,y&z), Geodetic datum-geodetic datum elements-the Everest spheroid –Basic concept of map projection- Mercator's projection-transverse Mercator's projection –UTM-grids, Geographic co-ordinate system transformation method- transformation formulae-offsets-Geocentric translations-Abridged Molodenski transformation-Helmert Transformation

Unit-V:-Advances in surveying technology

A brief introduction into the different survey instruments-Chain, prismatic compass, plane table ,Dumpy level, Aerial photography-procedure-types –uses-Satellite based sensing –platform and sensors-Stage in remote sensing Case studies:-

1. Cadastral survey
2. High Tension Survey
3. Road Survey
4. Bridge Survey
5. Hydrological survey
6. Socio –economic survey

References:

1. Surveying and leveling ,N.N.Das,Tata Macgraw hill education Private Ltd.
2. Elements of Remote sensing and GIS, Lillisand & Schiefer Macgraw hill education Private Ltd.
3. Element of Practical Geography –R.L Singh & R.P.b Sing
4. Practical Geography-Ashis Sarkar
5. Global Positioning System: Principles and Applications:-S.Gopi, Macgraw hill education Private Ltd.

Paper Code: CCST T 002: Geocomputations (Land Survey by Chain, Tape, Prismatic Compass, Plane Table, & Dumpy Level)

Unit-I: Definition & Basic Concepts of land Surveying & Land Surveying by Tape

Definition of land survey-Uses and types of surveying -General principle of surveying – Methods of linear measurement –principle of Chain Surveying –Well conditioned triangles-Reconnaissance survey and index sketch–Basic concepts-Ranging, unfolding and folding of a Chain ,Testing a chain, adjustment of a chain- Degree of accuracy in chaining –leader and

follower –method of chaining on level ground-method of chaining on sloping ground-obstacles in chaining- Equipments for tape survey-procedure-plotting-preparation of field book-Land survey drawings-Case studies- Definition-concepts of traversing –Methods of Traversing-check on closed traverse-check on open traverse- practical examples-case studies

Unit II: Principal of chain surveying & Mathematical Calculations

Selection of stations in chaining-Principal of chain survey-equipments for chain survey - Maintenance of log book and field book preparation – Procedure for field work-conventional symbols-Equipments for plotting -procedure for plotting-Cross-staff and optical square-Mathematical Calculations: a) Area Survey, Property Measurement & Revenue Generation,

Unit-III: Prismatic compass surveying & Its Principles

Introduction a purpose of compass surveying –principles of compass surveying-traversing – Method of traversing- check on closed traverse- check on closed traverse-types of compass-Temporary adjustment of prismatic compass(field procedure of observing bearing) Concept of bearing-Back and fore bearings-Problems on whole circle bearing and quadrantal bearings-Problems on back and fore bearings-problem on magnetic declination-problems on included angle-problems on local attraction-field procedure of compass surveying-plotting of compass traverse-Adjustment of closing error-sources of error in compass-precautions to be taken in compass surveying

Unit IV: Plane Table Survey

Principles of plane table survey-Accessories of plane table-Orientation-Procedure of setting up plane table over station-methods of plane tabling-Spatial methods of resection Errors and precautions-Procedure of plane table traversing-Advantage and disadvantages of plane tabling-pros a cons of plan metric survey-Mathematical Calculations on Pythagorean Theorem.

Unit V: Principles of Levelling:

Definition of leveling, different lines, Bench-marks- (i) GTS ii) Permanent iii) Temporary iv)Arbitrary, Marking on Brass plate, change paint, use of object. Different types of leveling .Application of level in topographical surveying –numerical, concepts, and field examples, principles of leveling, temporary adjustment of leveling, types of leveling operation. Corrections to be applied, reciprocal leveling use and apply of project work, traversing of level, open traversing, closed traversing ,collimation system, Rise and fall system, Sources of error in leveling , Different type of methods, different types of problems, permanent adjustment of level, Detail calculation of level, detail practical and field application., introduction and definition of theodolite, centering and leveling of theodolite, adjustment of Theodolite, scale of Theodolite, ranging and extending a line, Method of traversing, open traverse closes

traversing, detailing, reading of theodolite, angle measurement Horizontal angle, vertical angle, deflection, sources of error in theodolite survey, Balancing of traversing, calculation of traversing area, worked out problems on latitude and departure with incomplete data. Trigonometrically leveling to find heights of object. Detail practical and field apply.

References:

1. Surveying and leveling ,N.N.Basak,Tata Macgraw hill education Private Ltd.
2. Elements of Remote sensing and GIS, Lillisand & Schiefer Macgraw hill education Private Ltd.
3. Element of Practical Geography –R.L Singh & R.P.B Singh
4. Practical Geography-Dr. Ashis Sarkar
5. Global Positioning System: Principles and Applications:-S.Gopi, Macgraw hill education Private Ltd.

CCST T 003: Elementary mathematics & Fundamentals of Calculus, Trigonometry, Calculus & Matrix**Unit-I: Arithmetic**

Delineation of perimeter and area of rectangle, a square, a triangle, area of rectilinear figure, Circumference and area of circle (statement of formulae and their numerical application. Problem related to surface and volume of a rectangular parallopiped and cone, Time and Distance, concept of percentage and its application

Unit II: Co-ordinate geometry (2-d)

Cartesian coordinates, distance between two points, section formulae, shift of origin. Equation of a straight line in various forms, angle between two lines, distance of a point from a line, Lines through the point of intersection of two given lines, equation of the bisector of the angle between two lines, concurrency of lines, Centroid, orthocentre, incentre and circumcentre of a triangle.

Unit III: Trigonometry

Introduction to trigonometrical ratios, Trigonometric ratios of some specific angles, Simple and believable problem of height and distances, Triangle: Angle of elevation (depression shall be 0, 30,45,60,90 degrees.).Trigonometric Identities.

Unit IV: Calculus

Constant of integration, indefinite integral, Rules for integrating standard elementary forms, constant of integration, geometrical significance of constant of integration, Definite integral,

calculation of areas, volumes, integration as a process of summation, ordinary differential equation and solution

Principles of differentiation, derivative as rate of change, derivative of a function of one variable, general rule for differentiation, interpretation of derivative by geometry, rules for differentiation, differentiation of a sum, differentiation of product and function, power rules, differentiation of inverse function, various applications of derivatives, tangent and normal, maximum and minimum values of a function, successive differentiation, curvature of a circle, formula for curvature, rectangular coordinates

Unit V: Matrices & Vectors

Matrices, and determinants, properties of matrices, evaluation of determinants, product, sum and differences of matrices, adjoint and inverse of a matrix, linear homogeneous equations and solutions, eigen values and eigen vectors. Vectors and scalars cross and dot product of vectors, addition and subtraction of vectors

REFERENCE BOOKS:

- SCHAUM series books of calculus, vectors, statistics and matrices
- Alvi, Z 1995, *Statistical Geography-methods and applications*, Rawat Publications, New Delhi
- King,L.J., *Statistical Analysis in Geography*, Prentice –Hall,1969

CCST T004: Introduction to Electronic Total Station, GPS & DGPS.

Unit-I: Definition, Basic concept & Principles of Total station Traversing

Definition of ETS, use and types of ETS .general principles of E.T.S surveying Adjustment of E.T.S, Fixing and leveling of E.T.S. Open traversing, closed traversing, detailing of E.T.S , Definition-concepts of ETS traversing –Methods of Traversing-check on closed traverse-check on open traverse- practical examples-case studies

Unit II: Applications and Numericals on E.TS.

Application of ETS in field survey, apply of project survey, download, and profile background, job set, job deletion, Error calculation, traversing calculation, error check, co-ordinate calculation of different positions of the earth

Unit III: Fundamentals of Geodesy

Basic principles of Geodesy; History of Geodesy; Spherical Earth; Ellipsoidal Earth; Geoidal Earth; Geodetic Survey Systems; Horizontal Positioning – Determination of Astronomic position, Triangulation, Trilateration; Vertical Positioning, Fundamentals of Reference Systems

and Frames: Geodetic and Cartesian coordinate system; principles of coordinate transformation; Datums: Horizontal and vertical datums – national, regional and local datums; Major datums and Indian datum; World Geodetic System (WGS) WGS84; tidal datums;

Unit IV: Satellite Geodesy & GPS

Satellite Geodesy: definition; observational systems: Historical systems; Doppler; laser; radar altimetry; Global Positioning System (GPS): Definition; GPS elements – space segment, user segment and control segment; Observation principles; phase measurement techniques; determining orthometric heights; GPS Error Sources and Error Handling Procedures: Atmospheric effects, clock and orbital errors, multipath, anti-spoofing and selective availability, etc; interference and jamming. Accuracy issues, GPS satellite navigation message; GPS time, fundamental and derived frequencies.

Unit V: Applications of GPS

GPS receivers: Multi-channel, sequential and multiplexing receivers; GPS applications: Defense, civilian, Navigational and Geodetic applications; GPS-GIS integration, GPS applications in surveying, mapping, GIS and land navigation and precision farming; integration with other sensors: GPS in intelligent transportation and fleet management

References:

- i. Surveying and leveling, N.N.Basak Tata Macgraw hill education Private Ltd.
- ii. Elements of Remote sensing and GIS, Lillisand & Schiefer Macgraw hill education Private Ltd.
- iii. Elements of Practical Geography –R.L Singh & R.P.B Sing
- iv. Practical Geography-Ashis Sarkar
- v. Global Positioning System: Principles and Applications:-S.Gopi, Macgraw hill education Private Ltd.
- vi. Physical Geodesy by Weikko A. Heiskanen and Helmet Moritz, W.H.Freeman and Company
- vii. The gravity field of the Earth, International Geophysics Series- Vol-10 by Michele Caputo, Academic Press, New York.
- viii. Global Positioning System – Theory and Practice – Hofmann W.B, Lichtenegger. H, Collins. J – Springer Verlag Wein, New York
- ix. GPS: Theory and Practice, B. Hofmann-Wellenhof, H. Lichtenegger and J.Collins, 5th Revised Edition, Springer, Wien, New York, 2001.
- x. GPS Satellite Surveying, A. Leick, 2nd edition, John Wiley & Sons, 1995.
- xi. GPS: Theory and applications, B. Parkinson, J. Spilker, Jr. (Eds), Vol. I & II, AIAA,370 L'Enfant Promenade SW, Washington, DC20024, 1996.
- xii. GPS for Geodesy, A. Kleusberg and P. Teunnisen (Eds), Springer-Verlag, 1996.

CCST T005 Elements of Business Communication, Project Management & Communicative English (2-0)

UNIT-I: Fundamentals of Business Communications

Communication-Defining communication, Process of communication, Communication Model, Objectives of communication, Principles of communication, Importance of Business communication, Importance Feedback,

UNIT II: Types and Methodology of Business Communication

Channels of communication, Types of communication, Dimensions of communication, Barriers to communication: Verbal, Non-Verbal, Formal, Informal communication.

UNIT III: Business Writing & Preparation of Tender Documents, RFP

Fundamental of Business writing, Format of Business, Types of Business letter, Inquiry letter, complaint letter, Persuasive letter, Proposal, Report Writing, Process of Tenders, Types, Formulation of RFP, Submission of Quotation Paper

UNIT IV: Applications of Business Communication & Verbal Communication

Employment Messages Writing Resume, Application letter, writing the opening paragraph, Writing the closing paragraph, summarizing, Spoken skills Conducting Presentation, Oral presentation, Debates, Speeches, Interview, Group Discussion, English Pronunciation, Building Vocabulary. Barriers to Effective Communication and ways to overcome them, Listening: Importance of Listening, Types of Listening, Barriers to Listening and overcoming them, Listening situations, Developing Listening Skills.

UNIT V: Project Management

Project management: definition & basic concepts, cycles of Project Management, Initiation of Project, Planning of Project, Execution of the project, Monitoring & Control of the Project, Closing the project, Concept of Team game, Some case studies in the sequence of Remote Sensing, GIS based projects

Essential Reading:

- i. Schwalbe, K. (2009). Information Technology Project Management (6th ed.). Course Technology; ISBN-10: 0324786921, ISBN-13: 978-0324786927
- ii. Project Management Institute. (2008). A Guide to the Project Management Body of Knowledge:

(4th ed.). Project Management Institute. ISBN-10: 1933890517, ISBN-13: 978-1933890517

- iii. Cervone, H. F. (2004). How not to run a digital library project. OCLC Systems & Services, OCLC Syst. Serv. (UK), 20(4), 162-6.
- iv. Cervone, H. F. (2005). Making decisions: Methods for digital library project teams. OCLC Systems & Services, 21(1), 30-35.
- v. Cervone, H. F. (2005). MANAGING DIGITAL LIBRARIES: THE VIEW FROM 30,000 FEET: Influencing: a critical skill for managing digital library project teams. OCLC Systems & Services, 21(2), 105-109.

