

Junior Certificate Course in Surveying Technology (Duration 1 years)

Number of subjects in each semester

1. The Diploma course will be 4 Semester duration each covering a period of 6 months.
2. First Three Semester will have 4 theory papers and 2 laboratory classes / practical, while the final semester will have three (03) theory papers, one practical/lab and one project work of three (03) months duration.
3. Each subject will be of theory classes of 60 minutes duration 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 first three (03) semester will be $2 \times 4 = 8$ for theory classes and $01 \times 2 = 02$ for lab classes, i.e. a total of 10 credits.
6. The forth Semester will be of 10 credits. The student will have to carry out Project work of 4 credits in this Semester and have to submit a project report at the end of the Semester. A student has also to appear for a Grand Viva-voce at the end of 4th. Semester based on the project work.

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 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.

Theory paper			Practical		
Marks	Grade	Grade point	Marks	Grade	Grade point
90% and above	O	10	90% and above	O	10
80% to 89%	A	9	80% to 89%	A	9
70% to 79%	B	8	70% to 79%	B	8
60% to 69%	C	7	60% to 69%	C	7
50% to 59%	D	6	50% to 59%	D	6
35% to 49%	P	5	35% to 49%	P	5
Below 35%	F	0	Below 35%	F	0

P stands for pass

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 reexamination will be allowed in laboratory class.
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.
11. The grading system of project and viva-voce will be as that of the practical.

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

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

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

In order to be eligible for the Diploma in Geographical Information Systems, Remote Sensing & Geocomputations 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 each Semester

First Semester

- | Sl. | Code | Subject & Credit |
|-----|------------|--|
| 1. | SCST T001 | History & Fundamentals of Survey Engineering - (2-0) |
| 2. | SCST T002 | Land Survey by Chain & Tape – (2-0) |
| 4. | SCST T003 | Plane-table & Prismatic Compass Survey – (2-0) |
| 5. | SCST T004 | <i>Introduction to Calculus, Vectors, Matrices</i> (2-0) |
| 6. | SCST P 001 | Land Survey by Chain & Tape Lab(1-0) |
| 7. | SCST P 002 | Plane table & Prismatic Compass Survey Lab(1-0) |

Second Semester

- | Sl. | Code | Subject & Credit |
|-----|------------|---|
| 1. | SCST T 005 | Dumpy Level, Auto Level & Theodolite Surveying (2-0) |
| 2. | SCST T 006 | Fundamentals of Geology & Geomorphology – (2-0) |
| 3. | SCST T 007 | Elements of Business Communication, Project Management, Communicative English – (2-0) |
| 4. | SCST T 008 | Elementary Statistics & Cartographic Modelling – (2-0) |
| 5. | SCST P 003 | Dumpy Level, Auto Level & Theodolite Lab(2-0) |
| 6. | SCST P 004 | Elements of Map making & Landform profiling Lab (2-0) |

Sessions & Classes

- The academic session will start from 2nd week of July/January or as advertised at the time of seeking the applications and will be over in the 2nd. Week of following June/December.
- The theory classes will be from 9-30 AM to 1:30PM (11.00 – 12.00, 12.10 – 01.10, 01.15 – 2.00) and the lab class will be held from 2:15 pm to 4:30 pm.
- 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.
- Principal (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.
- 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.

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SYLLABUS

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

Unit-I: Definition, Basic concepts of Survey:

Geoid, datum, ellipsoid, instrument, cad, Level, Topography, Unit of Measurement, co-ordinates, Projection, Geodesy, Geo technical etc, objectives of Surveying, Uses of Survey, development of surveying technology, Types of Survey.

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.

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.

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Paper Code: SCST T 002: Land Survey by Chain & Tape

Unit-I: Definition & Basic Concepts of land Surveying.

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

Unit II: Principal of chain surveying

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

Unit III: Mathematical calculation of chain survey and case studies.

- A) Amin survey
- B) Property measurement and revenue generation

Unit IV: Land survey by type

Equipments for tape survey-procedure-plotting-preparation of field book-Land survey drawings-Case studies.

Unit V: Principles of Traversing:-

Definition-concepts of traversing –Methods of Traversing-check on closed traverse-check on open traverse-practical examples-case studies

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.

SCST T 003: Plane Table & Prismatic Compass Surveying (2-0)

Unit-I: Introduction to Prismatic compass surveying

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)

Unit II: Principles of prismatic compass survey

Concept of bearing-Black and fore bearings-Problems on whole circle bearing and quadrennial 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

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Unit III: Plane table survey and plan metric 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.

Unit IV: Case studies

A) Plane table survey

B) Prismatic compass survey

C Pythagorean Theorem

SCST T 004: Elementary mathematics & Fundamentals of Calculus, Trigonometry & Algebra

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

REFERENCE BOOKS:

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

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SCST P 001: Land Survey by Chain & Tape lab – (0-1)

Exercise 1: Operation of Chain & Tape

Exercise 2: Installation of Check line, Tieline and Base line

Exercise 3: Chain Line and object

Exercise 4: Open and Closed Road Traversing

Exercise 5: Open Traverse of River

Exercise 6: Field measurement

Exercise 7: Detailed Topographical Survey of Field & Road

SCST P 002: Plane Table & Prismatic Compass Lab – (0-1)

Exercise 1: Types of Compass & Introduction to Compass Survey

Exercise 2: Open Traverse by Prismatic Compass

Exercise 3: Closed Traverse by Prismatic Compass

Exercise 4: Calculation of whole circle & quadrennial bearings

Exercise 5: Calculation of back & Fore bearings using Prismatic Compass

Exercise 6: Detailed Topographical Survey using Prismatic Compass

SCST T 005 : Dumpy Level, Auto Level & Theodolite Surveying

Unit-I: Definition, Object and use of Leveling

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.

Unit II:-Principals of Leveling

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.

Unit III:-Methods of calculation of level

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.

Unit IV:-Theodalite Survey

Introduction and definition, centering and leveling of theodolite, adjustment of Theodolite, scale of Theodolite, ranging and extending a line

Unit-V:-Some methods of angular measurement

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Method of traversing, open traverse closes traversing, detailing, reading of theodolite, angle measurement Horizontal angle, vertical angle, deflection, sources of error in theodolite survey.

Unit-VI:-Some calculations on Theodolite

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 Sing
4. Practical Geography-Ashis Sarkar
5. Global Positioning System: Principles and Applications:-S.Gopi, Macgraw hill education Private Ltd.

SCST T 006: Fundamentals of Geology & Geomorphology (2-0)

Unit I: General Geology & Petro Geology

Branches of geology – Origin of the Earth, Age of the Earth, Interior of the Earth, Isostasy, Elementary knowledge on continental drift and plate tectonics with evidences, Earthquakes, Volcanoes, Groundwater

Classification of rocks – Distinction between Igneous, Sedimentary and Metamorphic rocks, Description occurrence, distribution of following rocks. **Igneous rocks** – Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt **Sedimentary rocks sandstone**, Limestone, shale, Conglomerate and breccia. **Metamorphic rocks**. Quartzite, Marble, Slate, Phyllite, Gniess and Schist, Khondalite, Charnockite

Unit II: Structural Geology

Strike, Dip, Plunge, Brunton compass, clinometre compass, - Description and classification of folds, faults, Joints and Unconformities

Principles of Stratigraphy, Geological time scale, -Major geological formation of India, Archaeans group, Cuddapahs system, Vindhyan formations, Gondwana system, Deccan traps. Geology and Mineral Resources of Andhra Pradesh.

Unit III: General Geomorphology

Definition and scope of geomorphology; Fundamental concepts in geomorphology; Endogenetic processes: volcanism and tectonism; Exogenetic processes: weathering, Mass-wasting and erosion; geomorphic agents

Unit IV: Landforms

Fluvial processes and landforms: valleys and valley forming processes - associated features; Alluvium – active and relict alluvium; Floodplain morphology; Types of streams - Genetic classification of streams; Alluvial fans and deltas

Shore Zone processes and landforms: shore line, shore zone and coast; Wind waves, tides, littoral currents, storm surges and tsunamis; Erosional and depositional landforms

Glacial processes and landforms: ice and glaciers; types of glaciers; glacial motion; Regimen of glaciers – nourishment and wastage of glaciers; active, passive and dead glaciers; erosional and depositional landforms.

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Eolian processes and landforms; dominance of wind processes in arid and semi-arid regions; erosional and depositional landforms

Unit V: Pedology

Scope and significance of soil studies; soil and regolith; soil forming factors – geological, climatic, topographical, biological and time factors; Soil components – mineral matter, organic matter, soil water and soil air; Soil Properties – colour, texture, structure, acidity and alkalinity; soil profile; Pedogenic regimes – laterisation, gleisation, podzologisation, calcification and salinisation; soil classifications – zonal system, and Seventh approximation system.

Suggested Readings:

- J Principles of Geomorphology by W.D. Thornbury, Wiley Eastern, 1984
- J Landscape Systems by T.L. McKnight, Prentice-Hall International, 1987
- J Fundamentals of Geomorphology by R. Huggett, Routledge, 2007
- J Parbin Singh, “Engineering and General Geology”, Katson Publication House, 1987.
- J K.M. Bangar “Principles of Engineering Geology. Standard publishers Distributors.
- J Krynine and Judd, “Engineering Geology and Geotechniques”, McGraw Hill Book Company, 1970.

SCST T 007: Elements of Business Communication, Project Management, Communicative English (2-0)

UNIT-I

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

UNIT II

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

UNIT III

Fundamental of Business writing, Format of Business, Types of Business letter, Inquiry letter, complaint letter Persuasive letter, Proposal, Report Writing.

UNIT IV

Employment Messages Writing Resume, Application letter, writing the opening paragraph, Writing the closing paragraph, summarizing

UNIT V

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.

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UNIT VI

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:

Schwalbe, K. (2009). Information Technology Project Management (6th ed.). Course Technology; ISBN-10: 0324786921, ISBN-13: 978-0324786927

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

Cervone, H. F. (2004). How not to run a digital library project. OCLC Systems & Services, OCLC Syst. Serv. (UK), 20(4), 162-6.

Cervone, H. F. (2005). Making decisions: Methods for digital library project teams. OCLC Systems & Services, 21(1), 30-35.

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.

SCST T 008: Elementary Statistics & Cartographic Modelling (2-0)

Unit I:

Basic Concept of cartography, Categories of maps, Interpretation of topographic maps, Cartographic databases, data measurement, cartographic design issues, colour and pattern, map lettering, map compilation, map scale, Generalization, symbolization, dot, isopleth and choropleth mapping, multivariate and dynamic mapping, map production, methods of map composing and printing,

Unit II:

Basic Assumptions of projection system, Map Projections, Grouping of map projections: conic projection, cylindrical projection, Zenithal, Projection Types: Mercator, Transverse Mercator, Polyconic, Lambert, Orthomorphic, UTM Projections and their comparison, choosing a Map Projection, Map Projection transformation, Analysis and visualization of distortion

Unit III:

Visualization of geospatial data: Design aspects, Multiscale and geometric aspects scale, dissemination of (visualized) geospatial data, data products, use and users of products, Various issues in map visualization., Computer Cartography, the nature of Data, Database and Data structures, Data Input: Method of data capture, digitization and scanning method, Techniques and procedure for digitizing, Vector and Raster; Data output: Screen display system, file organization and formats, rectification of digital maps, software for digital mapping.

Unit IV:

Statistics: Basic Concepts; Graphical representation of Statistical Data., Measures of central tendency & Dispersion (mean, median, mode, standard deviation), kurtosis & Skeweness, Regression analysis (multiple, logistic), trend surface analysis, spatial auto correlation, quadrant analysis, weighted mean, sampling (random, systematic and stratified), standard error measurement, Probability, correlation coefficient, variance, covariance, Basic Matrix algebra, Kriging; Trend Analysis.

REFERENCE BOOKS

1. Keates, J.S. (1973): Cartographic Design and production, London, Longman

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2. Ramesh, P. A. (2000): Fundamentals of Cartography, Concept Publishing Co., New Delhi.
3. Rampal, K.K. (1993): Mapping and Compilation, Concept Publishing Co., New Delhi.
4. Anson, R.W. & Ormeling, F.J. (1993), Basic Cartography, Vol. 1, 2nd ed., Elsevier Applied Science, Publishers, London.
5. Robinson A.H. & Morrison J.L, (1995) Elements of Cartography, John Wiley & Sons
6. Gregory, S. (1978): Statistical Methods for Geographers, Longman
7. Singh, R.L & Dutt. P.K, “Elements of Practical geography”, Students Friends Allahabad

8. Peterson, M.P. (1995) “Interactive and Animated Cartography” Upper Sadde River, NJ: Prentice Hall.

SCST P 003: Dumpy Level, Auto Level & Theodolite lab (0-1)

Exercise 1: Temporary Adjustment of Level

Exercise 2: Types of Leveling: A brief Introduction

Exercise 3: Permanent Adjustment of Level

Exercise 4: Road Traversing using Auto Level

Exercise 5: Open & Closed Traversing using Auto Level

Exercise 6: Computation of Volume of earthworks

Exercise 7: Leveling across a River

Exercise 8: Leveling across a steep slope

Exercise 9: Error Corrections using Auto Level formula

Exercise 10: Level Correction/Check Survey

SCST P 004: Cartography & Landform Profiling Lab (0-1)

Exercise 1 Scale: construction, types of scales; basic problems & Constructions, Scale Conversion

Exercise 2 Projections: Simple Conical with One & two Standard parallels, Polyconic, Bonne’s, Mecerator’s, lambert’s, Polar stereographic, Polar Gnomonic

Exercise 3 Construction of UTM Grid

Exercise 4 Digitization using vector data formats & Map Com position

Exercise 5 Cartographic Generalization & Generalization of layouts

Exercise 6 Topographical Sheet Interpretations

Exercise 7 Profiles: Representative, Superimposed, Composite, etc.

Exercise 8 Long & Cross profiles

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References:

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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.