

B. Tech. Semester IV

Subject Name: Advance Surveying

Subject Code: BTCL13401

Type of course: PCC-IV

Prerequisite: Surveying

Rationale: A Civil Engineer has to be well conversant with all the measurement techniques to know the ground topography and he should also be able to use the modern survey equipments and be able to use different software applications in surveying.

Teaching and Examination Scheme:

| TEACHING SCHEME | | | | Theory Marks | | | Practical Marks | | Total |
|-----------------|---|---|---|--------------|-----|-----|-----------------|-----|-------|
| L | T | P | C | TEE | CA1 | CA2 | TEP | CA3 | 150 |
| 2 | 0 | 2 | 3 | 60 | 25 | 15 | 30 | 20 | |

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

| Sr. No. | Topics | Teaching Hrs. | Module Weightage |
|---------|--|---------------|------------------|
| 1. | Tacheometric Surveying : Introduction, purpose, principle, instruments, stadia constants, methods of tacheometry, anallatic lens, subtense bar, field work in tacheometry, reduction of readings, errors and precisions. | 6 | 20 |
| 2. | Geodetic Surveying and Theory of Errors : Geodetic Surveying: Principle and Classification of triangulation system, Selection of base line and stations, Orders of triangulation, Triangulation figures, Reduction to Centre, Selection and marking of stations Theory of errors: Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities. | 10 | 34 |
| 3. | Introduction to Field Astronomy: Introduction, Astronomical terminology, celestial sphere, earth and celestial coordinate systems, spherical triangle, astronomical triangle | 4 | 13 |
| 4. | Fundamentals of Aerial Photogrammetry Introduction, Uses, Aerial photographs, Definitions, Scale of vertical and tilted photograph (simple problems), Ground Co-ordinates (simple problems), Relief Displacements (Derivation), Ground control, Procedure of aerial survey, overlaps and mosaics, | 4 | 13 |

PCC-IV: Professional Core Course

| | | | |
|----|--|---|----|
| | Stereoscopes, Derivation Parallax | | |
| 5. | Modern Surveying Instruments Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, digital self levelling levels, scanners for topographical survey. Remote Sensing: Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation. Digital image processing, Global Positioning system Geographical Information System: Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, spatial information system Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering. | 6 | 20 |

Suggested Specification table with Marks (Theory/Practical):

| % Distribution of Marks | | | | | |
|-------------------------|---------|---------|---------|---------|---------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 30 | 20 | 20 | 20 | 10 | 0 |

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom's Taxonomy**)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

| Sr. No. | Title of book /article | Author(s) | Publisher and details like ISBN | Year of publication | Publication Edition |
|---------|------------------------|---|--|---------------------|---------------------|
| 1 | Surveying Vol. I | B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain | Laxmi Publishers. New Delhi ISBN-10 9788170088530 ISBN-13 978-8170088530 | 2016 | 1 st |
| 2 | Surveying Vol. II | B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain | Laxmi Publishers. New Delhi ISBN-10 8170088836 | 2016 | 1 st |

| | | | | | |
|---|--|---|---|------|-----------------|
| | | | ISBN-13 978-8170088837 | | |
| 3 | Surveying Vol. III | B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain | Laxmi Publishers. New Delhi ISBN-10 8170088259 ISBN-13 978-8170088257 | 2016 | 1 st |
| 4 | Surveying and Levelling Vol.I | T.P Kanetkar and S.V Kulkarni, | Pune VidhyarthiGruh ISBN-10 8185825114 ISBN-13 978-8185825113 | 2006 | 1 st |
| 5 | Surveying and Levelling Vol.II | T.P Kanetkar and S.V Kulkarni, | Pune VidhyarthiGruh ISBN: 9788185825007 | 2010 | 1 st |
| 6 | Remote Sensing and GIS by | BasudebBhatta | Oxford University Press, New Delhi. ISBN: 9780199496648 | 2021 | 3 rd |
| 7 | Remote sensing and Image interpretation by | T.M Lillesand,. R.W Kiefer,. and J.W Chipman, | John Wiley and Sons India ISBN: 978-1-118-34328-9 | 2015 | 7 th |
| 8 | Advanced Surveying by | R. Agor, | Khanna Publishers, New Delh ISBN-13 9788174092687 | 1991 | 5 th |

Course Outcome:

| Sr. No. | CO Statement After learning this subject, students will be able to | Marks % weightage |
|---------|---|----------------------|
| CO-1 | Conduct tachometric surveys in hilly areas (U-A cognitive level) | 20 |
| CO-2 | Understand Geodetic surveying and apply principles of theory of error for correction of measurements (R-U cognitive level) | 34 |
| CO-3 | Understand the fundamentals of field astronomy(R-U cognitive level) | 13 |
| CO-4 | Understand the fundamentals of Areal Photogrammetry (R-U cognitive level) | 13 |
| CO-5 | Utilize the modern tools such as Digital Level, Total station and also apply GIS in solving Engineering problems(U-A cognitive level) | 20 |

Mapping with POs:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|-------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| CO-1 | 2 | 1 | 1 | - | - | - | - | 1 | 1 | 1 | 1 | 2 | 1 | - | 2 |
| CO-2 | 2 | 1 | - | - | - | - | - | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO-3 | 2 | 1 | - | 2 | - | 1 | - | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO-4 | 2 | 1 | - | 2 | - | 1 | - | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO-5 | 2 | 1 | - | 1 | - | - | - | 1 | 1 | 1 | 1 | 2 | 1 | - | |
| Rationale* | 10 | 5 | 1 | 5 | - | 2 | - | 5 | 5 | 8 | 7 | 10 | 8 | 5 | 10 |

Rationale: Majority of the COs are satisfying the well-defined POs and PSOs up to certain extent. Various techniques of measurements and use the modern survey equipments will be helpful to know the ground topography.

LIST OF PRACTICALS:

1. Use of Tacheometer, for determination of reduced levels and Horizontal distances of various points in the field.
2. Tacheometric Survey Project.
3. Use of Total Station for determination of reduced levels and Horizontal distances of various points in the field.
4. Examples on triangulations adjustments
5. Examples solving on theory of errors
6. Learning of GIS Software and their application in surveying.

Major Equipments:

1. Theodolite
2. Tacheometer
3. Total Station
4. Digital self leveling level
5. Stereoscope

List of Open Source/learning website:

- <https://nptel.ac.in/courses/105/103/105103176/>
 - Introduction to Field Astronomy
 - Fundamentals of Aerial Photogrammetry
- <https://nptel.ac.in/courses/105/104/105104100/>
 - Modern surveying instruments