**RG3001** **GEODESY AND APPLICATIONS** **L T P C**
**3 0 0 3**

**UNIT I INTRODUCTION** **9**

Definition, history, and importance of geodesy - Geodesy in various disciplines and applications - Earth's shape and size - Geoid, ellipsoid, and Earth's figure - Geodetic datums and their relationship to the Earth's shape - Classification of geodesy - Distance measurement techniques - Angle measurements and orientation - Height determination methods.

**UNIT II GEOMETRIC GEODESY** **9**

Definition, history, and importance of geometric geodesy - Overview of coordinate systems and geodetic datums - Mathematical foundations of geodesy - Geometry of the Earth and celestial reference systems - Spherical trigonometry and its applications in geodesy - Geodetic coordinate systems, cartesian, geocentric, geodetic, and local coordinate systems - Transformation between different coordinate systems - Geodetic datums - Definition and characteristics of geodetic datums - Datum transformations and datum shifts - Geometric geodetic measurements - Horizontal angle and azimuth measurements.

**UNIT III GEODETIC ASTRONOMY** **9**

Definition, history, and importance of geodetic astronomy - Celestial sphere and celestial coordinate systems - Equatorial, ecliptic, and galactic coordinate systems -Transformation between celestial and terrestrial coordinate systems - Celestial observations: Measurement of astronomical angles and azimuths - Astrometry and the reduction of observational data - Time determination - Universal Time (UT) and Coordinated Universal Time (UTC) - Earth's rotation and its variations.

**UNIT IV PHYSICAL GEODESY** **9**

Definition, history, and importance of physical geodesy - Geopotential theory - Mathematical representation of the Earth's gravitational potential - Earth's gravity field - Gravity anomaly and its interpretation - Determination of gravity anomalies using terrestrial and satellite measurements - Geoid determination - Methods for geoid determination (e.g., satellite altimetry, terrestrial gravity data) - Geoid modeling and its applications in geodesy - Satellite missions: GRACE, Jason, Cryosat missions.

**UNIT V APPLICATIONS OF GEODETIC MEASUREMENTS** **9**

Geodetic control networks and their use in surveying and mapping - Geodesy in geophysics, geodynamics, and plate tectonics - Geodetic applications of astronomical observations - Applications of satellite data in geodetic studies - Monitoring and modeling of crustal deformation and plate motion - Geodesy in navigation and positioning systems - Geodetic applications in climate change monitoring and environmental studies - Geodetic software and tools - Emerging topics in Geodesy.

**TOTAL:45 PERIODS**

**COURSE OUTCOMES:**

- On completion of the course the student is expected to be able to

**CO1:** Understand the fundamental concepts, history, and importance of geodesy and its applications in various disciplines.

**CO2:** Apply mathematical foundations and concepts of coordinate systems and geodetic datums to solve geodetic problems and perform coordinate transformations.

**CO3:** Apply celestial coordinate systems, perform transformations between celestial and terrestrial coordinate systems, and utilize astronomical observations for geodetic purposes.

**CO4:** Analyze and interpret gravitational potential, gravity anomalies, and geoid models using terrestrial and satellite measurements.

**CO5:** Utilize geodetic measurements for surveying, mapping, geophysics, and environmental studies.

**REFERENCES:**


1. Petr Vanicek and Edward J. Krakiwsky, "Geodesy: The Concepts", De Gruyter, 2nd edition, 2006, ISBN: 978-3110195884.
2. Thomas H. Meyer and Wolfgang Torge, "Physical Geodesy", De Gruyter, 2nd edition, 2018, ISBN: 978-3110468359.
3. David J. Getling, "Geodesy for Geomatics and GIS Professionals", CRC Press, 2018, ISBN: 978-1138393325.


**CO-PO MAPPING**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 2 | 3 | 3 | 2 | 3 | 3 |
| **Avg** | **3** | **3** | **3** | **3** | **3** | **3** |

1-Low, 2-Medium, 3-High