INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

GEOMATICS ENGINEERING								
III Semester: CE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACEE03	**Core**	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Linear Algebra and Calculus								

I. COURSE OVERVIEW:

Geomatics Engineering is a multidisciplinary field that integrates surveying, mapping, geodesy, remote sensing, photogrammetry, and Geographic Information Systems (GIS) for the collection, analysis, management, and presentation of spatial and geographic data. This course provides students with theoretical foundations and practical skills required to acquire, process, and interpret geospatial information for engineering and environmental applications. It is the science and technology of gathering, processing, analyzing, managing, and presenting spatially referenced data

II. COURSE OBJECTIVES:

The students will try to learn:

I. Foundational and advanced knowledge of surveying, remote sensing and photogrammetry.
II. Modern surveying techniques for addressing the field measurement problems in real time projects.
III. Coordinate systems, datums, and map projections for accurate representation of spatial data.
IV. Problem-solving skills for applying geospatial technologies in infrastructure planning.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO 1 Explain the principles and methods of surveying, geodesy, remote sensing, photogrammetry, and GIS.
CO 2 Illustrate the various methods of setting out curves in tracing alignment and path at suitable locations.
CO 3 Demonstrate different types of digital instruments used in surveying for accurate measurement and data record keeping.
CO 4 Use theodolite for angle measurements, trigonometric levelling, and traverse computations including adjustments.
CO 5 Explain the practical application on total station using the principle of Electronic Distance Measurement for minimizing local errors.
CO 6 Analyze remote sensing data acquisition on platforms and sensors using satellite images in providing base maps for graphical reference in real time.

IV. COURSE CONTENT:

MODULE - I: INTRODUCTION TO SURVEYING (9)

Introduction: Objectives, classification and principles of surveying, scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Linear distances: Approximate methods, Direct Methods, Chains, Tapes, ranging, Tape corrections, indirect methods, optical methods, E.D.M. method. Prismatic Compass, Bearings, included angles, Local Attraction, Magnetic Declination and dip, Plane table surveying.

MODULE - II: LEVELLING AND CONTOURING LEVELING (9)

Levelling: Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels, HI Method, Rise and Fall method, Effect of Curvature of Earth and Refraction. Contouring: Characteristics and uses of Contours, Direct& Indirect methods of contour surveying, interpolation and sketching of Contours. Computation of Areas and Volumes, Areas: Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter. Volumes: Computation of areas for level section and two, level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

MODULE - III: THEODOLITE AND TACHOMETRIC SURVEYING (10)

Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible. Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

Principles of Tachometry, stadia and tangential methods of Tachometry. Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves.

MODULE - IV: ADVANCED SURVEYING (10)

Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory, electromagnetic distance measuring system, principle of working and EDM instruments, Components of GPS, space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

MODULE - V: REMOTE SENSING AND PHOTOGRAMMETRY (10)

Remote sensing: Introduction, Electromagnetic Spectrum, interaction of electromagnetic radiation, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

Photogrammetry: Introduction, Classification: Terrestrial, Aerial, and Satellite photogrammetry, Geometry of vertical and tilted photographs, Relief displacement, Parallax, definition, measurement, and uses in height determination, Flight Planning and Ground Control, Stereoscopy and Photogrammetric Instruments, Measurement of distances, heights, and coordinates from photographs, Map compilation from aerial photographs.

V. TEXTBOOKS:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, "*Advanced Surveying: Total Station, GIS and Remote Sensing"*, Pearson India, 2nd Edition, 2006.
2. Punmia, B.C, Jain Ashok, K, Jain Arun, K, "*Surveying"*, Laxmi Publications, Vol. I, New Delhi, 2022.
3. Manoj, K. Arora and Badjatia, "*Geomatics Engineering*", Nem Chand & Bros, 2011.
4. Bhavikatti, S.S., "*Surveying and Levelling*", I.K. International, Vol. I &II, 2010.

VI. REFERENCE BOOKS:

1. Chandra, A.M., "*Higher Surveying*", New Age International (P) Limited, 3rd Edition, 2002.
2. Anji Reddy, M., "*Remote sensing and Geographical information system",* B. S. Publications, 2001.
3. Arora, K.R., "*Surveying",* Standard Book House, Vol-I, II and III, 2015.

VII. ELECTRONICS RESOURCES:

1. https://nptel.ac.in/courses/105104100/43

2. https://www.coloradomesa.edu/wccc/programs/land-surveying-geomatics.html
3. https://books.google.co.in/books?id=FaCgAAQBAJ&printsec=frontcover&dq=surveying+and+geomaticg+ONLINE+text+books&hl=en&sa=X&ved=0ahUKEwi1wP3x24HgAhUJ5o8KHS2EDzkQ6AEIMzAB#v=onepage&q&f=false

VIII. MATERIAL ONLINE:

1. Course outline description
2. Tutorial question bank
3. Tech-talk topics
4. Assignments
5. Definition and terminology
6. Open ended experiments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation