IV B.Tech – I Semester

(20EC7043) GPS and Navigational Aids
(Honors)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	4

Pre-Requisites: Analog & Digital Communications

Course Objectives:

- Understand the basic concept of Global Position system.
- know various types of estimation procedures.
- Familiarize various methods of processing GPS data.
- Understand navigational methods and their Range and Accuracy.
- Introduce concepts like TACAN and ILS.

UNIT–I:
Coordinate and time systems: Definition of global and local coordinate systems, Relationship between satellite and conventional geodetic systems, Satellite orbital motions: Description of motions, Forces acting on the satellites, Satellite NAV messages, GPS observables: Pseudo ranges, Carrier phases, SA/AS, Format of data (RINEX)

UNIT–II:
Estimation procedures: Stochastic and mathematical models, Propagation of covariance matrices, Sequential estimation, Kalman filtering, Statistics in least-squares estimation, Propagation medium: Troposphere, Ionosphere, Multipath

UNIT–III:
Mathematical model of GPS observables: Basic theory of contributions that need to be included for millimeter level global positioning, Use of differencing, differential position, Wide-lanes and use in kinematic positioning, Methods of processing GPS data: Available software, Available data set, International GPS Service (IGS), Cycle slip fixing/Bias resolution, Kinematic (moving receiver) GPS processing, Relationship between satellite and conventional geodetic systems

UNIT–IV:
Four methods of Navigation, An Aural Null Direction Finder - The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders Radio Ranges - The LF/MF Four course Radio Range - VHF Omni

Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR Hyperbolic Systems of Navigation (Loran and Decca) - Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran-C - The Decca Navigation System - Decca Receivers - Range and Accuracy of Decca - The Omega System

UNIT–V:

DME and TACAN - Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment Aids to Approach and Landing - Instrument Landing System - Ground Controlled Approach System - Microwave Landing System(MLS) Inertial Navigation - Principles of Operation - Navigation Over the Earth - Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems. Satellite Navigation System - The Transit System - Navstar Global Positioning System (GPS)

Course Outcomes:

After successful completion of the course, the students can be able to

S.No	Course Outcome	BTL
1	Explain the basic concepts of Global Position System	L2
2	Explain various estimation procedures	L2
3	Understand various methods of processing GPS data	L2
4	Classify various Navigational methods	L3
5	Explain techniques like TACAN, ILS and MLS	L2

Correlation of Cos with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	-	-	-	-	-	1	-	-	-	-	-	2	-
CO 2	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO 3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO 4	2	-	-	-	-	-	1	-	-	-	-	-	2	-
CO 5	2	-	-	-	-	-	1	-	-	-	-	-	2	-

Text Books:

1. Hofmann-Wellenhof, B., H. Lichtenegger, and J. Collins. GPS Theory and Practice. Springer, 1994. ISBN: 9780387824772.

2. Parkinson, B. W., J. Spilker, et al. Global Positioning System: Theory and Applications. Vol.1 American Institute of Aeronautics & Ast, 1996. ISBN: 9781563471063.

Reference Books:

1. Global Positioning System: Theory and Applications. Vol. 2. American Institute of Aeronautics & Ast, 1996. ISBN: 9781563471070.