

GUJARAT TECHNOLOGICAL UNIVERSITY

Wireless Communications Networks and Systems (EC)

M.E. Semester: II

Subject Name: **Global Positioning System (Major Elective - III)**

Sr. No.	Course Content
1.	Introduction to GPS: history, objectives, applications for 3D positioning; GPS reference system WGS84; basic principles of GPS operations: ranging from space; GPS constellation: its evolution and present state
2.	Space, control and user segments; GPS orbit, fundamentals of orbital dynamics; precise vs. predicted orbit; fundamental and derived frequencies, GPS time and clock characteristics; GPS satellite navigation message; GPS receiver: single vs. dual frequency receivers; navigation vs. geodetic quality; antenna types; primary equipment and software products
3.	Basic types of GPS observable: Pseudoranges (P-code, C/A-code), L1 and L2 phases; pseudoranging with minimum constellation of four satellites; over-determined case; concept of dilution of precision (PDOP, HDOP, VDOP etc.); point positioning and differential mode; velocity determination with Doppler observable
4.	Differential processing of carrier phase measurements: Single, double and triple differences; indifference mode; phase ambiguity and cycle slips
5.	GPS error sources and error handling procedures: Ionospheric and tropospheric effects, clock and orbital errors, multipath, anti-spoofing (AS) and selective availability (SA), inter-channel bias, antenna phase center drift, etc; interference and jamming; using dual frequency signal to eliminate ionosphere errors
6.	GPS applications

Reference Books:

1. GPS: Theory and Practice, B. Hofmann-Wellenhof, H. Lichtenegger and J. Collins, 5th Revised Edition, Springer, Wien, New York, 2001.
2. Understanding GPS: principles and applications - By Elliott D. Kaplan, Christopher J. Hegarty
3. Global Positioning System, Signals, Measurements and Performance, P. Misra and P. Enge, Ganga-Jamuna Press, 2001.
4. GPS: Theory and Applications, B. Parkinson, J. Spilker, Jr. (Eds), Vol. I & II, AIAA, Washington, 1996.
5. GPS Satellite Surveying, A. Leick, 2nd edition, John Wiley & Sons, 1995.
6. GPS for Geodesy, A. Kleusberg and P. Teunissen (Eds), Springer-Verlag, 1996.
7. GPS – Guochang Xu, Springer