Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year BE Branch Electronic & Telecommunication					
Subject Code & Name	**Instructions Hours per Week**			**Marks**					
4ET554 **Satellite Communication & Navigation Systems**	**L**	**T**	**P**		**TH**	**CW**	**SW**	**PR**	**Total**
	4	**0**	**2**	**Max**	**100**	**50**	**50**	**50**	**250**
Duration of paper: 3 hrs				**Min**	**35**	**25**	**25**	**25**	**110**

Course Objective: Students should get knowledge about satellites, their various aspects and about satellite communication. Different access techniques used and Navigations aids provided by satellites.

Prerequisite: Digital Communications, Antenna and Wave Propagation.

COURSE OF CONTENTS

Unit I

Introduction to satellites, Kepler's First Law - Kepler's Second Law - Kepler's Third Law ,Satellite orbits- LEO,MEO,HEO,cicular,,elliptical orbits, Definitions of Terms for Earth-orbiting Satellites - Orbital Elements - Apogee and Perigee Heights - Orbital Perturbations - Effects of a Nonspherical Earth - Atmospheric Drag , Calendars - Universal Time - Julian Dates - Sidereal Time , Frequency Allocations for Satellite Services - Intelsat - U.S.Domsats - Polar Orbiting Satellites - Problems

Unit II

Look angle determination ,Launches and launch vehicles, Launching Orbits -, orbital effects in communication system performance, - Limits of Visibility - Near Geostationary Orbits - Earth Eclipse of Satellite - Sun Transit Outage - Problems - , satellite subsystem Attitude and orbit control system, Telemetry , tracking, command and monitoring system, Power system , Communication subsystem , - Antenna Subsystem, Control - Spinning Satellite Stabilization - Momentum Wheel Stabilization - Station Keeping - Thermal Control - - Transponders - Wideband Receiver.

Unit III

Satellite link design- Fixed Atmospheric and Ionospheric Losses - Link Power Budget Equation - System Noise - Antenna Noise - Amplifier Noise Temperature - Amplifiers in Cascade - Noise Factor - Noise Temperature of Absorptive Networks - Overall System Noise Temperature - Carrier-to-Noise Ratio - Uplink - Saturation Flux Density - Input Back Off - The Earth Station HPA - Downlink - Output Back off - Satellite TWTA Output - Effects of Rain - Uplink rain-fade margin - Downlink rain-fade margin - Combined Uplink and Downlink C/N Ratio - Intermodulation Noise.

Unit IV

Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis.TDMA : Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Companion of uplink Power requirements for FDMA & TDMA. On-board signal processing for TDMA / FDMA operation, Satellite switched TDMA. Code-Division Multiple Access - Direct-Sequence spread spectrum - code signal c(t) - autocorrelation function for c(t) - Acquisition and trackling - Spectrum spreading and dispreading - CDMA throughput – Problems, Internet using satellites .

Unit V

Satellites and Navigational aids, Radio and satellite navigation, GPS- Global Positioning Satellite, GPS location GPS receivers and codes, satellite signal acquisition GPS navigation message, GPS signal levels, time accuracy, GPS receiver operation, Differential GPS Mobile Services - VSATs - Radarsat - - Orbcomm. DTH-(direct to home)

References:

[1]. Timothy Pratt - Charles Bostian & Jeremy Allmuti, *Satellite Communications*, John Willy & Sons (Asia) Pvt. Ltd.
[2]. Dennis Roddy, *Satellite Communications*, McGraw-Hill Publication
[3]. Wilbur L. Pritchars Henri G.Suyder Hond Robert A.Nelson, *Satellite Communication Systems Engineering*, 2/e, Pearson Education Ltd., 2003.
[4]. M.Richharia , *Satellite Communication Systems Design Principles, 2/e,* Macmillan Press Ltd.