



COURSE PLAN

1. Course Title	SATELLITE COMMUNICATION	5. Semester	VIII "A & C" Sec
2. Course Code	EC 409	6. Academic Year	2015-2016
3. Course Faculty	S.SADHISH PRABHU	7. Department	ECE
4. Theory / Practical	THEORY	8. No. of Credits	3

9. Course Learning Objectives:

To study

- The satellite systems, orbits and launching.
- The earth segment and space segment components
- The satellite access by various users.
- The DTH and compression standards.

10. Course pre-requisites:

Students should have knowledge on the basic of course like

- ✓ Basic knowledge of orbits and multiple assess techniques.
- ✓ Exposure to satellites applications and services. .

11. Schedule of teaching and learning

[As per Annexure 1]

12. Course material and References :

The course material and references are available in the website www.ec409.weebly.com.

Assessment Scheme :

The following shall be the assessment method for this course.

i) Periodical tests.

Sl.no	Details	Marks
1	CAT 1 (90 min) : Module 1 and 2	40
2	CAT 2 (90 min) : Module 3 and half of 4 th module	40
3	CAT 3 (90 min) : Module 5 and half of 4 th module	40

ii) Seminar

Sl.no	Details	Marks
1	Problems in Module 1 and Module 2	10
2	Seminar on various topics of Satellite communication	10
3	Surprise test on module 4 and 5	10

Sl.no	Details	Marks
1	Internals will be awarded by taking the average of the three assessment including the problems, seminars and test.	50
2	End semester examination	50
Total		100

14. Course outcomes

On completion of this course the student can possess knowledge on

CO 1: Basic definition of satellites and solving problems related to satellite orbits

CO 2: Predicting a satellite in space

CO 3: Working of satellite systems and different types of satellite service

15. Mapping of course outcomes with learning activities and assessments

The learning activities include

LA 1: Problems in Module 1 and Module 2

LA 2: Seminar on various topics of Satellite communication

LA 3: Surprise test on module 4 and 5

Course outcomes	Learning activities	Assessments	CAT I %	CAT II %	CAT III %	End sem %
CO1 and CO2,	LA 1	CAT 1 and assignment	50	-	-	100
CO 2 and CO 3	LA 2	CAT 2 and seminars	-	50	-	
CO 3	LA 3	CAT 3 and surprise test	-	-	50	

Date :

Course faculty:

Head of the Department

ANNEXURE (vide item 11)

Schedule of Teaching and Learning

S.NO	PERIOD	TOPIC	MODE OF DELIVERY	TEACHING AIDS	REFERNCE/SOURCE
UNIT 1: OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHINGMETHODS [9]					
1.	1	Introduction – Frequency Allocations for Satellite Services	Lecture	PPT	T1- Ch No: 1
2.	1	Intelsat – U.S.Domsats – Polar Orbiting Satellites –	Lecture	PPT	T1- Ch No: 1
3.	1	Kepler’s First Law – Kepler’s Second Law – Kepler’s Third Law – Definitions of Terms for Earth-orbiting Satellites – Orbital Elements – Apogee and Perigee Heights	Lecture	PPT	T1- Ch No: 2
4.	1	Orbital Perturbations – Effects of a Nonspherical Earth – Atmospheric Drag –Inclined Orbits –	Lecture	Chalk Board	T1- Ch No: 2
5.	1	Calendars – Universal Time – Julian Dates – Sidereal Time	Lecture	PPT	T1- Ch No: 2
6.	1	The Orbital Plane– The Geocentric-Equatorial Coordinate System	Lecture	Chalk Board	T1- Ch No: 2
7.	1	Earth Station Referred to the IJK Frame – The Top centric-Horizon Co-ordinate System.	Lecture	Chalk Board	T1- Ch No: 2
8.	1	The Sub-satellite Point – Predicting Satellite Position.	Lecture	Chalk Board	T1- Ch No: 2
9.	1	Problems	Lecture	Chalk Board	T1- Ch No: 2

UNIT 2: GEOSTATIONARY ORBIT & SPACE SEGMENT [9]					
10.	1	Introduction – Antenna Look Angels	Lecture	Chalk board	T1- Ch No: 3
11.	1	The Polar Mount Antenna – Limits of Visibility – Near Geostationary Orbits – Earth Eclipse of Satellite – Sun Transit Outage	Lecture	PPT	T1- Ch No: 3
12.	1	Launching Orbits –Problems –	Lecture	PPT &Chalk Board	T1- Ch No: 3
13.	1	Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization	Lecture	PPT	T1- Ch No: 7
14.	1	Station Keeping – Thermal Control – TT&C Subsystem	Lecture	PPT	T1- Ch No: 7
15.	1	Transponders –Wideband Receiver – Input Demultiplexer –	Lecture	PPT	T1- Ch No: 7
16.	1	Power Amplifier , Antenna Subsystem	Lecture	PPT & Chalk Board	T1- Ch No: 7
17.	1	Morelos –Anik-E – Advanced Tiros-N Spacecraft	Lecture	PPT &Chalk Board	T1- Ch No: 7
18.	1	Problems	Lecture	Chalk Board	T1- Ch No: 7
UNIT 3: EARTH SEGMENT & SPACE LINK [9]					
19.	1	Introduction – Receive-Only Home TV Systems – Outdoor Unit – Indoor Unit for Analog (FM) TV	Lecture	PPT	T1- Ch No: 8
20.	1	Master Antenna TV System – Community Antenna TV System – Transmit-Receive Earth Stations –	Lecture	PPT	T1- Ch No: 8
21.	1	Equivalent Isotropic Radiated Power – Transmission Losses – Free-Space Transmission – Feeder Losses – Antenna Misalignment Losses – Fixed Atmospheric and Ionospheric Losses - Link Power Budget Equation	Lecture	Chalk Board & PPT	T1- Ch No: 12

22.	1	System Noise – Antenna Noise – Amplifier Noise Temperature – Amplifiers in Cascade – Noise Factor – Noise Temperature of Absorptive Networks – Overall System Noise Temperature	Lecture	Chalk Board & PPT	T1- Ch No: 12
23.	1	Carrier-to-Noise Ratio – Uplink – Saturation Flux Density – Input Back Off – The Earth Station HPA –.	Lecture	PPT	T1- Ch No: 12
24.	1	Downlink – Output Back off – Satellite TWTA Output	Lecture	Chalk Board& PPT	T1- Ch No: 12
25.	1	Effects of Rain – Uplink rain-fade margin – Downlink rain-fade margin	Lecture	PPT	T1- Ch No: 12
26.	1	Combined Uplink and Downlink C/N Ratio – Intermodulation Noise	Lecture	PPT	T1- Ch No: 12
27.	1	Problems	Lecture	Chalk Board	T1- Ch No: 12
UNIT 4: SATELLITE ACCESS [9]					
28.	1	Single Access – Pre assigned FDMA, Demand- Assigned FDMA, SPADE System. Band width limited and Power-limited TWT amplifier operation, FDMA downlink analysis.	Lecture	PPT	T1- Ch No: 14
29.	1	TDMA : Reference Burst; Preamble and Post-amble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, pre-assigned TDMA	Lecture	Chalk Board& PPT	T1- Ch No: 14
30.	1	Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission.	Lecture	Chalk Board& PPT	T1- Ch No: 14

31.	1	Comparison of uplink Power requirements for FDMA & TDMA. On-board signal processing for TDMA / FDMA operation, Satellite switched TDMA.	Lecture	Chalk Board & PPT	T1- Ch No: 14
32.	1	Code-Division Multiple Access – Direct-Sequence spread spectrum – code signal $c(t)$ – autocorrelation function for $c(t)$ – Acquisition and tracking – Spectrum spreading and despreading. CDMA throughput	Lecture	Chalk Board & PPT	T1- Ch No: 14
33.	1	Network Layers – TCP Link – Satellite Links and TCP	Lecture	Chalk Board & PPT	T1- Ch No: 15
34.	1	Enhancing TCP Over Satellite Channels Using Standard Mechanisms (RFC-2488) – Requests for comments	Lecture	Chalk Board & PPT	T1- Ch No: 15
35.	1	Split TCP connections – Asymmetric Channels – Proposed Systems	Lecture	PPT	T1- Ch No: 15
36.	1	Problems	Lecture	Chalk Board	T1- Ch No: 15
UNIT 5: DIRECT BROADCAST SATELLITE SERVICES [9]					
37.	2	Introduction – Orbital Spacing – Power Rating and Number of Transponders – Frequencies and Polarization – Transponder Capacity – Bit Rates for Digital Television –	Lecture	PPT	T1- Ch No: 16
38.	1	MPEG Compression Standards – Forward Error Correction	Lecture	PPT	T1- Ch No: 16
39.	1	Home Receiver Outdoor Unit (ODU) – Home Receiver Indoor Unit (IDU)	Lecture	PPT	T1- Ch No: 16

40.	1	Downlink Analysis – Uplink -Problems	Lecture	PPT	T1- Ch No: 16
41.	1	Satellite Mobile Services : VSATs	Lecture	PPT	T1- Ch No: 17
42.	1	RADARSAT	Lecture	PPT	T1- Ch No: 17
43.	1	Global Positioning Satellite System.	Lecture	PPT	T1- Ch No: 17
44.	1	ORBCOMM	Lecture	PPT	T1- Ch No: 17

REFERENCES:

TEXT BOOK

1. Dennis Roddy, Satellite Communications, McGraw-Hill Publication, 3rd edition 2001

REFERENCES

1. Timothy Pratt, Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons (Asia) Pvt. Ltd. 2004
2. Wilbur L. Pritchard, Henri G. Snyder Hond Robert A.Nelson, Satellite Communication Systems Engineering, Pearson Education Ltd., Second edition 2003.
3. M.Richharia : Satellite Communication Systems (Design Principles), Macmillan Press Ltd. Second Edition, 2003

