Academic Course Description

SRM University
Faculty of Engineering and Technology
Department of Electronics and Communication Engineering

EC0012 Satellite Communication And Broadcasting
Seventh Semester, 2015-16 (odd semester)

Course (catalog) description
The course introduces the students to the basic concept in the field of satellite communication. This will enable the students to know how to place a satellite in an orbit and about the earth & space segment. The satellite services like broadcasting are also studied thoroughly .

Compulsory/Elective course: Compulsory for ECE students
Credit hours: 3 credits
Course coordinator(s): **Mrs.A.Vinnarasi**

Instructor(s)

Sec.	Name	Office	Class Hour	Email id @ktr.srmuniv.ac.in	Consulation Hours
A	Mr. E. Sivakumar	TP12S6	Day1:3 Day2:8 Day5:2	Sivakumar.e	Day 4:AN
B	Mr. S. Nivash	1206	Day1:3 Day2:8 Day5:2	Nivash.s	Day 5:AN
C	Mr.S. Praveen Kumar	TP10S4	Day1:3 Day2:8 Day5:2	Praveen Kumar.s	Day 4:AN
D	Dr.S.Dhanalakshmi	1003A	Day1:3 Day2:8 Day5:2	.Dhanalakshmi.s	Day 5:AN
E	Mrs. A. Vinnarasi	1003A	Day1:3 Day2:4 Day5:2	Vinnarasi.a	Day 1:AN
F	Mr.E.Elamaran	TP10S4	Day1:3 Day2:4 Day5:2	Elamaran.e	Day 5:AN
G	Mr.M.Mohanasundaram	1206	Day1:3 Day2:4 Day5:2	Mohanasundaram.m	Day 4:AN
H	Mrs.S.Diana Emerald Asha	1006	Day1:3 Day2:4 Day5:2	Diana Emerald Asha.s	Day 5:AN

Relationship to other courses

Pre-requisites : EC0307 Digital communication
Assumed knowledge : Basic knowledge in Orbits, Modulation & Multiple Access
Following courses : -

Syllabus Contents

UNIT 1 SATELLITE ORBIT (9 hours)

Satellite orbits: Kepler's laws- Earth satellite orbiting satellite terms-Orbital elements – Orbital perturbations – Inclined Orbits- Sun synchronous orbit. Constellation: Geo stationary satellites-Non geostationary constellation- Launching of Geostationary satellites.

UNIT 2 LINK DESIGN (9 hours)

EIRP- Transmission Losses –Power Budget equation- System Noise Carrier to noise ratio – Uplink- Downlink – Effects of rain –Inter modulation Noise

UNIT 3 SPACE AND EARTH SEGMENT (9 hours)

Space Segment: Power Supply – Altitude control- Station keeping – Thermal Control- TT&C-Subsystems – Antenna subsystem –Transponders- Wideband Receiver. Earth Segment: receive only home TV system- Community antenna TV system.

UNIT 4 SATELLITE ACCESS (9 hours)

Single Access- Pre assigned FDMA – Demand Assigned FDMA- SPADE system- TWT amplifier operationDownlink analysis –TDMA- reference bursts-Preamble- Postamble- Carrier recovery-Network synchronizationPre assigned TDMA –Assigned –CDMA introduction

UNIT 5 BROADCAST AND SERVICES (9 hours)

Broadcast: DBS - Orbital Spacings- Power ratings- Frequency and Polarization- Transponder Capacity- Bit rate-MPEG- Forward Error Correction. ODU-IDU-Downlink Analysis –Uplink – Satellite Mobile services: VSAT-GPS..

Text book(s) and/or required materials

1. Dennis Roddy, "Satellite Communication" McGraw Hill Publications,3rd Edition, 2001.
2. M. Richaria , "Satellite Communication Systems Design Principles", Pearson Publications 2nd edition,1999.

References

1. WilburL.Prichard, HenryG.Suyerhood, Ropert A.Nelson, Satellite Communication System Engineering,Pearsin education,2nd Edition
2. Pratt,Timothy, CharlesW. Bostian, Satellite Communication, John Wiley and Sons, New York,1986

Computer usage: --------
Class schedule: Four 50 minutes lecture sessions per week

Section	Class Hour
A,B,C,D	Day 1-3rd Hr, Day 2-8th Hr, Day 5-2st Hr
E,F,G,H	Day 1-3rd Hr, Day 2-4th Hr, Day 5-2st Hr

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area: Communication | Signal Processing | Electronics | VLSI | Embedded

Test Schedule

S.No.	Month	Test	Portions	Duration
1	Jul2015	Cycle Test-1	Session 1 to 14	2 Periods
2	Aug 2015	Cycle Test-2	Session 15 to 27	2 Periods
3	Oct 2014	Model Exam	Session 1 to 45	3 Hrs

Mapping of Instructional Objectives with Program Outcome

The main objective of this course is to make the students understand the basic concept in the field of satellite communication. This subject gives the students an opportunity to know how to place a satellite in an orbit. The students are taught about the earth and space subsystems. The satellite services like broadcasting are dealt thoroughly. This will help the student to understand and appreciate the subject.	**Correlates to program outcome**		
	H	**M**	**L**
1. Orbital aspects involved in satellite communication	a,b	c,e	j
2. Power budget calculation	a	e	
3. Satellite system and services provided.	b	c	j

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session	Topics	Problem Solving (Yes/No)	Text / Chapter
UNIT 1 SATELLITE ORBIT			
1	Kepler's law- Problems	Yes	[T1], Chapter - 2
2	Earth satellite orbiting terms	No	[T1], Chapter
3	Orbital elements	No	[T1], Chapter
4	Orbital perturbations	No	[T1], Chapter
5	Inclined Orbits-Sun Synchronous Orbit	No	[T1], Chapter
6	Geo stationary satellite	No	[T1] Chapter – 3
7	Non geostationary constellation	No	
8	Launching of Geostationary satellites	No	
9	Antenna Look angles- problems, Sun transit outage	Yes	
UNIT 2 LINK DESIGN			
10	EIRP	No	[T1], Chapter - 12
11	Transmission Losses	No	
12	Power Budget calculations Problems	Yes	
13	System Noise-Problems	Yes	
14	Carrier to Noise ratio-Problems	Yes	
15	Uplink power-C\No,G\T	No	
16	Downlink power-C\No,G\T	No	
17	Intermodulation noise	No	
18	Effects of Noise	No	

UNIT 3 SPACE AND EARTH SEGMENT			
19	Power supply	No	[T1], Chapter - 7
20	Attitude control	No	
21	Station keeping –Thermal Control	No	
22	Telemetry Tracking and command TT&C -Antenna subsystem	No	
23	Transponders	No	
24	Wide Band Receiver	No	[T1], Chapter - 8
25	Earth Segment	No	
26	Receive only home TV System	No	
27	Community Antenna TV	No	
UNIT 4 SATELLITE ACCESS			
28	Single Access	No	[T1], Chapter - 14
29	Pre assigned FDMA	No	
30	Demand Assigned FDMA	No	
31	SPADE system, Problems	Yes	
32	TWT amplifier operation	No	
33	Downlink analysis	No	
34	TDMA	No	
35	Reference bursts-Preamble- Postamble	No	
36	Carrier recovery-Network Synchronization	No	
37	Preassigned TDMA, Problems	Yes	
38	CDMA-Introduction	No	

UNIT 5 BROADCAST AND SERVICES			
39	Broadcast:DBS	No	[T1], Chapter - 16
40	Orbital Spacings-Power ratings-Frequency and Polarization-Transponder Capacity-Bit rate	No	
41	MPEG-FEC	No	
42	ODU-IDU	No	
43	Downlink Analysis-Uplink,Problems	Yes	
44	Satellite Mobile Services-VSAT	No	
45	Mobile Satellite Services- GPS	No	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	10%
Cycle Test – II	-	10%
Model Test	-	20%
Surprise Test	-	5%
Attendance	-	5%
Final exam	-	50%

Prepared by : Mrs.A.Vinnarasi, Assistant Professor (O. G), Department of ECE

Dated: 02/06/15

Revised by:-- **Revision No.:** NA **Date of revision:** --

Addendum

ABET Outcomes expected of graduates of B.Tech / ECE / program by the time that they graduate:

a. an ability to apply knowledge of mathematics, science, and engineering
b. an ability to design and conduct experiments, as well as to analyze and interpret data
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multidisciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context
i. a recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

1. Graduates will perform as a successful professional engineer in related fields of Electronics and Communication Engineering.

2. Graduates will pursue higher education and/or engage themselves in continuous professional development to meet global standards.

3. PEO3: Graduates will work as a team in diverse fields and gradually move into leadership positions.

4. PEO4: Graduates will understand current professional issues, apply latest technologies and come out with innovative solutions for the betterment of the nation and society.

Sec.	Course Teachers	Signature
A	Mr. E. Sivakumar	
B	Mr. S. Nivash	
C	Mr.S. Praveen Kumar	
D	Dr.S.Dhanalakshmi	
E	Mrs. A. Vinnarasi	
F	Mr.E.Elamaran	
G	Mr.M.Mohanasundaram	
H	Mrs.S.Diana Emerald Asha	

Academic Coordinator (Mrs.M.Sangeetha) **IV Year Coordinator** (Mr.B.Viswanathan) **Professor In-Charge** (Dr.R.Kumar) **HOD** (Dr.S.Malarvizhi)