

Lecture Plan -1

Semester:-VIII Class:-ECE Course Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: A

| S. No. | Topic :-Evolution and growth of communication satellite | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction – Satellite is used in many ways in our daily life . e.g. T.V. Broadcasting, mobile comm., ATM,weather forecasting etc.The first ever launched satellite was SPUTNIK-1 by USSR followed by SCORE of USA.Various organizations worldwide related to satellite comm.. are IFRB,CCIR,CCITT,WARC. | 10 Min |
| 2 | Division of the Topic- -Evolution of satellite -Synchronous satellite -International Regulation and frequency co-ordination -Frequency band for satellite communication. -Frequency allocation for fixed satellite service and broadcasting satellites. | 30 Min |
| 3. | Conclusion Satellite in geostationary orbit remain permanently at the same place in sky at an altitude of about 35870 Km. | 5 Min |
| 4 | Question / Answer X-Band is used for which purpose? -Military band Give the full form of ITU? -International telecommunication union. | 5 Min |

Assignment to be given:- To be given after completion of unit No. 1, 2

Reference Readings:-

- (1) Satellite communication by D.C.Aggarwal
- (2) Satellite communication by Pratt & Bostian

Lecture Plan -2

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: A

| S. No. | Topic :-Advantages of satellite communication, Active satellite,Passive satellite | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction- Application of digital satellite communication. in our daily life like STAR T.V.,difference between active and passive satellite,modem and codec. | 10 Min |
| 2 | Division of the Topic- -advantages of satellite communication. -disadvantages of satellite communication. -Various types of satellite like Active satellite, Passive satellite -Modem & Codec | 30 Min |
| 3. | Conclusion- Modem is used for modulation & demodulation.Codec is used for coding & decoding. | 5 Min |
| 4 | Question / Answer What is difference between active and passive satellite? -In active satellite amplification take place,in passive satellite it acts as reflector. What is the difference between modem and codec? - Modem is used for modulation & demodulation.Codec is used for coding & decoding | 5 Min |

Assignment to be given:- To be given after completion of unit No. 1, 2

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan-3

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: A

| S. No. | Topic :-General link design equations | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- Discussion about the factors responsible for design of satellite like Weight of satellite, Cost of launching per Kg., Frequency allocation, Atmospheric Effect. | <u>10 min</u> |
| 2 | Division of the Topic- -Geometry of simple radio link -EIRP -Directivity of antenna -Various losses in system -Derivation of radiated power | <u>30 min</u> |
| 3. | Conclusion- Path loss between a satellite and earth station is 195.6 dB and 199.1 dB at 4 GHz & 6 GHz respectively. | <u>5 min</u> |
| 4 | Question / Answer What is EIRP? -Effective isotropic radiated power What are various path losses? -atmospheric and ionospheric losses | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 1, 2

Reference Readings:-

- 1) Satellite communication by D.C. Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -4

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: A

| S. No. | Topic :-System noise temperature | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction-Variou source of noise in satellite are atmospheric noise and ionospheric losses.Carrier to noise ratio,Gain of antenna to the system noise temperature ratio are important aspects in link design. | <u>10 min</u> |
| 2 | Division of the Topic- -System noise temperature -Noise power at demod. Input -Noise power at output of IF amplifier -C/N ratio -C/N ratio in decibel -G/T ratio. | <u>30 min</u> |
| 3. | Conclusion-G/T ratio is used to specify quality of E.S. { figure of merit }.To reduce noise temperature parametric amplifiers are used. | <u>5min</u> |
| 4 | Question / Answer Why G/T ratio is called figure of merit? -G/T ratio is used to specify quality of earth station. Factors on which G/T ratio depend? -G/T ratio depend on C/N. | <u>5 min</u> |

Assignment to be given:-NIL

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -5

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: A

| S. No. | Topic :-Atmospheric and ionospheric effect on link design | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- Elevation angle, freespace losses, atmospheric losses, ionospheric losses effect the link design in different ways. | <u>10 min</u> |
| 2 | Division of the Topic- -Effect of rain attenuation at higher & lower frequency -Effect of lower layer e.g. absorption, diffusion -Effect of rain on 6/4 GHz & above 10 GHz -Effective path length | <u>30 min</u> |
| 3. | Conclusion- Atmosphere have less effect on link quality at frequencies between 2 GHz & 10 GHz and for high elevation angle at 6/4 GHz rain attenuation is negligible | <u>5 min</u> |
| 4 | Question / Answer Which layer cause refraction & depolarization? -Upper layer of atmosphere Factors on which rain attenuation depend ? -Frequency, Rainfall rate, diameter and distribution of rainrate. | <u>5 min</u> |

Assignment to be given:-NIL

Reference Readings: -

- (1) Satellite communication by D.C. Aggarwal
- (2) Satellite communication by Pratt & Bostian

LECTURE PLAN-6

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: A

| S. No. | Topic :-Complete link design,Earth station parameter | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction- A single complete link consists of two earth stations and a satellite.radio relay is done by satellite.Thus the complete link is made up of uplink & downlink. | <u>10 min</u> |
| 2 | Division of the Topic- -(C/N) _u --(C/N) _d -(C/N _o) _r . (S/N) _{out} -Earth station parameter | <u>30 min</u> |
| 3. | Conclusion- .(S/N) _{out} =C*FM improvement/N _{IN} | <u>5 min</u> |
| 4 | Question / Answer What is condition for noise dominant? -C/I >C/N What is condition for interference dominant? -C/I <C/N | <u>5 min</u> |

Assignment to be given:-

- 1.derive the general link design equation.
- 2.how the system become complete downlink limited?
- 3.draw the block diagram of earth station.
- 4.what is diff. between active and passive satellite

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan-8

Semester:-VIII Class:-ECE Course Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-S/N ratio with multiplexed telephone signal,SCPC system | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- S/N ratio & C/N ratio in frequency modulation in satellite link,threshold value in FM detector,noise performance in telephone channel. | <u>10 min</u> |
| 2 | Division of the Topic- -Derivation of equation of FM modulated signal -Bessel function representation of FM -Improvement in S/N with BW compression -Threshold value of $[C/N]_i$ -psophometric weighting factor -loading factor -SCPC system | <u>30 min</u> |
| 3. | Conclusion- SCPC link is active for only half the time under fully loaded condition. | <u>5 min</u> |
| 4 | Question / Answer What is threshold in full improvement? -12.5dB Explain SCPC? -Single channel per carrier | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -9

Semester:-VIII Class:-ECE Course Code:-ECE-403-F
 Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-CSSB system,analog FM/FDM techniques,TV satellite link | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction-Advantages of companding in FM/FDM is to increase the average power & S/N ratio is improved by 17dB. | <u>10 min</u> |
| 2 | Division of the Topic- -CSSB system -Individual voice channels stacked in frequency -Peak to peak luminance S/N ratio for a FM/FDM TV signal | <u>30 min</u> |
| 3. | Conclusion-[S/N] _{pp} reduces to $[S/N]_{pp} = 40.24 + [C/N]_i(\text{Db})$ -----FSS $[S/N]_{pp} = 33.53 + [C/N]_i(\text{Db})$ -----DBS | <u>5 min</u> |
| 4 | Question / Answer What is companding ? Compression at transmit site followed by expansion in received site What are advantages of companding? It improves 16-17 dB overall S/N ratio | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

- 1) Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -10

Semester:-VIII Class:-ECE Course Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-Intermodulation products,Energy Dispersal | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- TWTA operating at saturation point give amplitude as well as amplitude as well as phase nonlinearities in FM/FDM signal.This generate intermodulation products. | <u>10 min</u> |
| 2 | Division of the Topic- -Operation characteristics of TWTA -intermodulation ratio -power loss due to intermodulation products -backoff power -energy dispersal | <u>30 min</u> |
| 3. | Conclusion- intermodulation products fall with in the transponder bandwidth and interfere with each other. Energy dispersal signal is triangular waveform. | <u>5 min</u> |
| 4 | Question / Answer What is energy dispersal? -Controlling of radiated spectral density is known as energy dispersal. What is full loading? -Minimum power spectral density with maximum modulation amplitude. | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

1)Satellite communication by D.C.Aggarwal

2) Satellite communication by Pratt & Bostian

Lecture Plan -11

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-Advantages of digital comm.,elements of digital comm.. | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction-:-Advantages of digital comm. Are compatibility,flexibility,high degree of reliability,operating speed,miniaturization,precision in data handling. | <u>10 min</u> |
| 2 | Division of the Topic -Advantages of digital comm.. -Byte -Baud -Source encoder & decoder -digital baseband signal | <u>30 min</u> |
| 3. | Conclusion- Digital comm.. is better than analog comm.in error handling.maintainence and operation of digital system is simpler. | <u>5 min</u> |
| 4 | Question / Answer What is byte? -One byte represents 8 bits. Explain baud. -A baud is the unit of signalling speed. | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -12

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-Techniques used for digital modulation, satellite link design | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction- Discussion about the digital modulation techniques, Bit error, symbol error, channel capacity. | <u>10 min</u> |
| 2 | Division of the Topic -ASK -QASK -PSK -QPSK -BFSK -Satellite Digital Link Design | <u>30 min</u> |
| 3. | Conclusion- Variation of rate R as a function of C/No has been studied for the digital satellite link- $C/N=(E_b/N_o)(R_b/B)$. | <u>5 min</u> |
| 4 | Question / Answer What is bandwidth of BPSK. -2fp. What are the two components of QASK? -inphase component, quadrature component. | <u>5 min</u> |

Assignment to be given:-

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Reference Readings:-

- 1) Satellite communication by D.C. Aggarwal
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Lecture Plan -13

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-Time division multiplexing | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- In TDM, different channels are assigned different time slots in a specified time interval for transmission. | <u>10 min</u> |
| 2 | Division of the Topic -Principle of TDM -Information sources -Channel -Commutation | <u>30 min</u> |
| 3. | Conclusion- Intermodulation effects are not present in TDM.it requires perfect synchronism between the multiplexing and demultiplexing commutators. | <u>5 min</u> |
| 4 | Question / Answer What is commutation? -process in which M information channels to be interleaved on to a single transmission channel. What is full form of BER? -bit error rate | <u>5 min</u> |

Assignment to be given:-

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Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
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Lecture Plan -14

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-Multiple access techniques | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction-This chapter introduces the concept of multiple access techniques TDMA Frame structure &burst structure,frame efficiency | <u>10 min</u> |
| 2 | Division of the Topic -FDMA -TDMA -TDMA Frame structure -Reference BURST STRUCTURE -traffic burst -TDMA Frame efficiency | <u>30 min</u> |
| 3. | Conclusion TDMA Burst structure consists of a reference burst & traffic bursts.reference burst is composed of preamble[header] | <u>5 min</u> |
| 4 | Question / Answer What is multiple access? -It allows interconnection among large no. of earth station terminals simultaneously via satellite. What is role of reference burst? -It is used to synchronize & identify the frame | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -15

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-TDMA Superframe | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- Discussion about TDMA superframe,frame acquisition & synchronization,the various timing involved at the transmitting & received sides in TDMA | <u>10 min</u> |
| 2 | Division of the Topic -TDMA Superframe -TDMA Frame acquisition -TDMA Frame synchronization -RFA -TFA | <u>30 min</u> |
| 3. | Conclusion- Superframe combination reduces overheads considerably,increasing the TDMA Frame efficiency.the acquisition process is required when traffic station enters or reenters operation. | <u>5 min</u> |
| 4 | Question / Answer What is TDMA Superframe ? -To increase TDMA frame efficiency frames are combined in sequential manner called superframe. What is equation of delay? - $D_n(I+1) = D_n(i) - E_n(i)$ | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -16

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :-TDMA compared to FDMA | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- Discussion about TDMA & FDMA transponder capacity vs no. of accesses,transmission as well as reception of burst according to time plan | <u>10 min</u> |
| 2 | Division of the Topic -Intermodulation product in FDMA -Traffic capacities for FDMA & TDMA -Transmit burst time plan -received burst time plan | <u>30 min</u> |
| 3. | Conclusion- FDMA is not suitable for increased system traffic due to intermodulation products. TDMA burst time plan is simply the traffic assignment with in a product. | <u>5 min</u> |
| 4 | Question / Answer What is burst time plan? -Burst time plan avoid overlapping of bursts at the satellite transponder. What is traffic planning process? Adjustment of burst time plan according to traffic change. | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -17

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :- Satellite switched TDMA | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- Multiple beam TDMA satellite switched TDMA is used in INTELSAT 6. It provides interconnection of UBS and DBS in the satellite comm. system and their interconnectivity. | <u>10 min</u> |
| 2 | Division of the Topic -Frame slots of earth station -SS-TDMA -SSTDMSA -Zone beam antenna -spot beam antenna | <u>30 min</u> |
| 3. | Conclusion- Efficiency of SSTDMA is defined as ratio of actually used capacity to the total capacity from transponder. | <u>5 min</u> |
| 4 | Question / Answer What is zone beam antenna? -it can receive from transmitter anywhere within the coverage zone. What is number of UBS and DBS in INTELSAT 6.0? Six upbeams & six downbeams. | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 3,4,5

Reference Readings:-

- 1) Satellite communication by D.C. Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -18

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: B

| S. No. | Topic :- Beam hopping TDMA,CDMA & hybrid access technique | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- IN Beam hopping TDMA switching is achieved by each station hopping from one frequency to another according to destination of transmitted burst. | <u>10 min</u> |
| 2 | Division of the Topic -Fixed assignment -Demand assignment -SPDA system -DASS network | <u>30 min</u> |
| 3. | Conclusion- Beam hopping TDMA helps in avoiding the interburst interference a`ssociated with conventional TDMA. | <u>5 min</u> |
| 4 | Question / Answer Mention full form of CDMA. -code division multiple access What is SPADE system? -single channel per carrier access on demand equipment | <u>5 min</u> |

Assignment to be given:-

- 1.what is difference between multiplexing and multiple access techniques.
- 2.what are advantages of digital comm..
- 3.Explain SCPC.

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -19

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: C

| S. No. | Topic :-INTRODUCTION ,SYNCHRONOUS ORBIT | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- satellite orbit has special significance and it has to be maintained geostationary at all cost. There are two problems- Launching and putting satellite in geostationary orbit Maintaining it. | <u>10 min</u> |
| 2 | Division of the Topic- -Kepler's Law -Newton's gravitational law -Derivation of equation putting satellite in geostationary orbit | <u>30 min</u> |
| 3. | Conclusion-Centripetal force should be equal to the gravitational force to keep satellite in geostationary orbit | <u>5 min</u> |
| 4 | Question / Answer What are main problems in satellite comm..? - Launching and putting satellite in geostationary orbit -Station keeping. What is Kepler's first law? -the orbit of a satellite is an ellipse with the center of the earth at one focus. | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

1) Satellite communication by D.C. Aggarwal

Pratt & Bostian

Lecture Plan-20

| S. No. | Topic :- ORBITAL PARAMETERS,LOOK ANGLE | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction- The look angles are the angles to which an earth station antenna must be pointed to communicate with the geostationary satellite. | <u>10 min</u> |
| 2 | Division of the Topic- -Eccentricity -Apogee distance -Perigee distance -Locus parameters -eccentric anomaly -azimuth angle,elevation angle | <u>30 min</u> |
| 3. | Conclusion -Angles M,E are related by the equation $M=E-e \sin E$ | <u>5 min</u> |
| 4 | Question / Answer Mention six orbital quantities. -eccentricity -semi major axis -time of perigee -right ascension of ascending node -inclination -argument of perigee | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

1)Satellite communication by D.C.Aggarwal

2) Satellite communication by Pratt & Bostian

Lecture Plan -21

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: C

| S. No. | Topic :- Earth Coverage, slant range | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction- Coverage of earth by satellite over the country should be maximum. Slant range is calculated in terms of elevation angle. | <u>10 min</u> |
| 2 | Division of the Topic- -Co-ordinate of earth station -Slant range -Apex angle -maximum slant range | <u>30 min</u> |
| 3. | Conclusion -Maximum coverage is given by portion of earth within a cone with the satellite at its apex and tangent to the earth's surface. | <u>5 min</u> |
| 4 | Question / Answer What is value of maximum apex angle? -17.4 What is value of central angle for maximum apex angle? -81.3 | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

1) Satellite communication by D.C. Aggarwal

2) Satellite communication by Pratt & Bostian

Lecture Plan -22

Semester:-VIII Class:-ECE Course Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: C

| S. No. | Topic :- Ecilpse effects, satellite placement | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction- Solar eclipses caused by the earth and moon affect the working of satellite and in particularly energy generated by solar cells | <u>10 min</u> |
| 2 | Division of the Topic- -Inclination angle of earth's equatorial plane -Movement of sun relative to earth -Eclipse due to earth when sun is at equinox -Satellite placement | <u>30 min</u> |
| 3. | Conclusion Velocity increment changes the satellite's lower circular orbit into elliptical orbit with the perigee at initial altitude and with apogee at the altitude of final circular orbit. | <u>5 min</u> |
| 4 | Question / Answer What is the maximum shadow angle at equinoxes? 17.4 deg What is angle of inclination for maximum shadow angle? 8.7 deg | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

- 1) Satellite communication by D.C. Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -23

Semester:-VIII Class:-ECE Course Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: C

| S. No. | Topic :- Station keeping | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction- Station keeping is required to keep the satellite in geostationary orbit. | <u>10 min</u> |
| 2 | Division of the Topic- -N-S station keeping -E-W station keeping -velocity increment and correction | <u>30 min</u> |
| 3. | Conclusion A typical value for long lived satellite is $\Delta v = 0.86$ deg which corresponds to velocity increment correction for $v = 460$ m/s. | <u>5 min</u> |
| 4 | Question / Answer What is north south station keeping? -It requires a thrust impulse perpendicular to orbital plane. What is accuracy for station keeping? -0.1 deg | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

1) Satellite communication by D.C. Aggarwal

2) Satellite communication by Pratt & Bostian

Lecture Plan -24

Semester:-VIII Class:-ECE Course Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: C

| S. No. | Topic :- Satellite stabilization | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction- Disbalancing of satellite is due to gravitational force,sun,moon,and planets solar pressure acting on antennas,earth's magnetic field.the control of these activities is done by satellite stabilization. | <u>10 min</u> |
| 2 | Division of the Topic- -Attitude control -three axis body stabilization. -spin stabilization. | <u>30 min</u> |
| 3. | Conclusion Spin stabilization is achieved by rotation of satellite body between 30 and 120 rpm creating an initial stiffness which maintains the satellite spin axis perpendicular to equatorial plane. | <u>5 min</u> |
| 4 | Question / Answer What do you mean by three axis? -yaw -roll -pitch axes What is disadvantage of spin stabilization? Use of de spun antenna | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

- 1) Satellite communication by D.C. Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -25

Semester:-VIIIClass:-ECECourse Code:-ECE-403-F
Subject:SATELLITE COMMUNICATION ENGINEERING

Section: D

| S. No. | Topic :-BDS,INMARSAT,INTELSAT | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction-Discussion about the special purpose communication satellite used at international level like INMARSAT,INTELSAT.Reconnaissance satellite used for military purpose. | <u>10 MIN</u> |
| 2 | Division of the Topic -Direct broadcast satellite -link component of DBS system -INMARSAT -Areas of working of INMARSAT -INTELSAT -Configuration of various intelsat system | <u>30 MIN</u> |
| 3. | Conclusion- DBS also called as broadcast sat. system is meant for individual reception & community reception.in this reception of TV signal is direct.INMARSAT is used to indicate no. of ships & lives lost. | <u>5 MIN</u> |
| 4 | Question / Answer What is DBS? -Direct broadcast satellite e.g. TV What is INMARSAT? -INTERNATIONAL MARITIME SATELLITE ORGANISATION | <u>5 MIN</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

1)Satellite communication by D.C.Aggarwal

2) Satellite communication by Pratt & Bostian

Lecture Plan-26

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: D

| S. No. | Topic :-VSAT,MSAT ,LEO s | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction-satellite are also used in ATM centers, mobile communication. MSAT is the marriage between satellite & mobile phones. | <u>10 MIN</u> |
| 2 | Division of the Topic -Very small aperture terminals -value added network -mobile satellite communication system -lower earth orbit satellite | <u>30 MIN</u> |
| 3. | Conclusion- For MSAT satellite must provide sufficient power in the direction of coverage area. SRSAT is used for receiving passengers & crew members of sinking ships or crash airplanes. | <u>5 MIN</u> |
| 4 | Question / Answer What is VSAT/VAN? -it is for providing network management services that are expensive or difficult to obtain from conventional data network what is use of LEO? -store and forward satellite communication | <u>5 MIN</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

- 1) Satellite communication by D.C. Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -27

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: D

| S. No. | Topic :-SATELLITE Vs FIBRE OPTICS,LADSAT,DEFENSE SATELLITE | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction-satellite is for point to multipoint & for very long distance.optical fibre is for point to point & transmission needed high security. | <u>10 min</u> |
| 2 | Division of the Topic Satellite comm.. w.r.t. optical fibre -LANDSAT -defense satellites | <u>30 min</u> |
| 3. | Conclusion- It is concluded that neither the technologies can replace each other.Both have its own application.LANDSAT provides worldwide high resolution multispectral data of earth surface. | <u>5 min</u> |
| 4 | Question / Answer What is LANDSAT? -It is one of the earth exploration satellite services (EESSS) What is use of reconnaissance satellite ? -These are used to monitor objects& their movements on ground | <u>5 min</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -28

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: D

| S. No. | Topic :-LINK ANALYSIS,OPTICAL SATELLITE LINK TRANSMISSION | Time Allotted:- |
|--------|---|-----------------|
| 1. | Introduction-laser satellite comm. at optical range provides three main advantages like greater BW,small beam divergence angle and smaller antennas. | <u>10 MIN</u> |
| 2 | Division of the Topic -link analysis -atmospheric effect -complete link analysis -C/N for transponder | <u>30 MIN</u> |
| 3. | Conclusion- Optical computer solves the problem of slowness & heat build up associated with electronics computer. | <u>5 MIN</u> |
| 4 | Question / Answer Why laser can not be used for communication between earth station & satellite/ -Because it is atmospheric dependent. What is C/N for transponder? -C/N ratio refers to the uplink satellite carrier bandwidth | <u>5 MIN</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -29

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: D

| S. No. | Topic :-optical link receiver, beam acquisition | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction-receiver consist of antannas,filter,photodetectors & conventional received electronics system. | <u>10 MIN</u> |
| 2 | Division of the Topic -Principle of direct detection system - Principle of heterodyne detection system - Photodetector noise model - Beam acquisition - | <u>30 MIN</u> |
| 3. | Conclusion- Polarization,amplitude distribution & phase of local oscillator are matched to signal beam | <u>5 MIN</u> |
| 4 | Question / Answer What is photodetector? -device in which conductivity is due to photon of light. What is optical BW? Range of wavelength around the laser wavelength allowed by optical filter. | <u>5 MIN</u> |

Assignment to be given:-

To be given after completion of unit No. 6,7,8.

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian

Lecture Plan -30

Semester:-VIII Class:-ECE Course Code:-ECE-403-F

Subject:SATELLITE COMMUNICATION ENGINEERING

Section: D

| S. No. | Topic :-tracking & pointing, deep space optical comm.. link | Time Allotted:- |
|--------|--|-----------------|
| 1. | Introduction-The angle of drifting of receiving satellite is point ahead angle.Main spacecraft comm.. instrument is the optical Tran receiver package called optranspac. | <u>10 MIN</u> |
| 2 | Division of the Topic -point ahead angle -pointing error -block diagram of optical satellite crosslink -deep space optical comm.. link - | <u>30 MIN</u> |
| 3. | Conclusion- Before optical data transmission transmitting antennas must acquire beacon from the receiver .in case point ahead is needed the transmitter must point ahead by proper angle & direction. | <u>5 MIN</u> |
| 4 | Question / Answer What is optical beacon? -unmodulated light source transmitted by receiving satellite back to the transmitting satellite what is optranspac? -optical transmitter & receiver package. | <u>5 MIN</u> |

Assignment to be given:-

- 1.What do you understand by optical beacon?
- 2.Explain LEO,SARSAT,MSAT,VSAT.
- 3.What do you mean by satellite stabilization.?

Reference Readings:-

- 1)Satellite communication by D.C.Aggarwal
- 2) Satellite communication by Pratt & Bostian