

UNIVERSITY OF MUMBAI



Syllabus for Sem V & VI
Program: B.Sc.
Course: Radio and Telecommunication
(Applied Component)

(Credit Based Semester and Grading System with
effect from the academic year 2013–2014)

SEMESTER V**Theory**

USACRC501	Principles of radio communication		No of Credits	Lectures/Week
Units	I	Communication system and Noise	2	4
	II	Amplitude modulation and SSB technique		
	III	Frequency modulation and pulse modulation		
	IV	Demodulation and digital communication		

Practical

USACRC5P1	RCP-1	2	4
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SEMESTER VI**Theory**

USACRC601	Telecommunication systems		No of Credits	Lectures/Week
Units	I	Transmission lines and antenna	2	4
	II	Transmitter receivers and facsimile		
	III	Television and satellite communication		
	IV	Fibre optics		

Practical

USACSE6P1	RCP-II	2	4
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The revised syllabus under the credit based grading system in the subject of **Radio and Telecommunication** (Applied Component) for Third Year B.Sc. Physics (Single/Twin major subject) will be implemented from the academic Year 2013-14.

The scheme of examination in the subject of **Radio and Telecommunication** (Applied Component) will be as follows:

Semester V & VI : Theory

Course Code: USACRC501 & USACRC601

(A) Internal Examination: 40 marks

Sr. No	Particulars	Marks
1	One Class Test/case study/online examination to be conducted in the given semester	20
2	One assignment based on the curriculum to be assessed by the teacher concerned	10
3	Active Participation in routine class instructional deliveries.	05
4	Overall conduct as a responsible learner, communication and leadership qualities in organizing related academic activities	05

(B) External Examination : 60 marks

- Duration of each Theory paper will be of two and half hours.
- Each theory paper shall consist of five questions, one from each unit and the fifth question will be from all the units. All questions are compulsory and will have internal choice.

Semester V & VI: Practical

Course Code: USACRC5P1 & USACRC6P1

There will not be any internal examination for practical. The External examination will be conducted as per the following scheme by the respective colleges and the marks will be forwarded to the University:

Sr. No	Particulars of External Practical Examination	Marks
1	Laboratory Work	Eighty
2	Journal	10
3	Viva	10
	TOTAL	100

Total Marks in each semester:

- Duration of each Practical paper will be of 3 Hours per semester.
- A certified Journal of **Radio and Telecommunication** must contain a minimum of **EIGHT** Experiments in each semester
- Every candidate will be required to perform **ONE** experiment at the semester end practical examination.
- A candidate will be allowed to appear for the Practical Examination only if the candidate submits his/her certified Journal or a certificate from the Head of the Department of Physics stating that the candidate has completed the practical Course of **Radio and Telecommunication** of the respective semester as per requirements.

Note:

- The problems related to the Units should be solved as illustrations of the concern topics.

Semester V

Course Code: USACRC501

Title: Principles of radio communication

Unit 1:

(15 Lectures)

Communication system: information transmitter, channel-noise, receiver.

Modulation: description, need for modulation, bandwidth requirement, frequency spectra.

Ref: 1. Ch.1: 1.1, 1.2, 1.3, 1.4

Noise: definition, external noise: atmospheric noise, extra terrestrial noise, industrial noise,

Internal noise: thermal agitation noise, shot noise, transit time noise, noise calculation, noise in receiver circuits: noise figure definition, s/n ratio, calculation of noise figure.

Ref.1. ch2: 2.1.1 to 2.1.3, 2.2.1 to 2.2.3, 2.3.1, 2.4.1, 2.4.2, 2.4.3

Unit -II

(L-15)

Amplitude modulation: definition, frequency spectrum of AM waves, representation of AM, power relations in AM., generation of AM. AM transmitter block diagram only

Ref.1 ch3: 3.1.1, 3.1.2, 3.1.1, 3.2.1

Transistor modulators ref 2. Ch 3.7

SSB techniques: evolution and description of SSB. Suppression of carrier effect of nonlinear resistance on added signals, balanced modulator, suppression of unwanted side band: filter system, phase shift method, vestigial side band transmission.

Ref.1 ch.4: 4.1, 4.2.1, 3.3.1, 4.3.2, 4.4.4

Unit- III

(L-15)

Frequency modulation: Theory of frequency and phase modulator. Description of systems, mathematical representation of FM, Frequency spectrum of the FM wave, Bandwidth requirements, phase modulation

Generation of FM: Direct methods-basic reactance modulator, varactor diode modulator

Ref: 1 Ch. 5.1.1 to 5.1.4, 5.3.1, 5.3.2

Pulse modulation: Introduction, PAM, PTM, sampling theorem, PWM, Generation of PWM, PPM,

PCM: Principles, quantizing noise and advantages and applications of PCM.

Ref: 1 Ch13: 13.2.1 to 13.2.4

Unit-IV

(L-15)

Demodulation AM, FM, Pulse modulation;

AM demodulation, Diode as detector, phase discriminator, Ratio discriminator, amplitude limiting, Composition of FM demodulators, Generation and demodulation of PCM.

Fundamentals of Data Communication Systems:

Characteristics of data transmission, circuits-band width requirements, data transmission, speed, noise, cross talk, echo suppression, distortions, equalizers.

Digital codes- Baudot code, binary code, ASCII code, Parity check code.

Modem classification, modes of data transmission, modem interconnection, modem data transmission speed, modem modulation methods,

Ref: 1 Ch 14.2.2 to 14.2.4 (parity check only) 14.3.1

References:

Ref:1: Electronic Communication Systems, 3rd edition by George Kennedy, (TMH)

Ref.2: Communication Electronics by N D Deshpande, D A Deshpande and P K Rangole (TMH)

PRACTICALS (Semester V)

Course Code: USACRC5P1

1. Passive low pass and high pass filters.
2. Passive band pass and band stop filters.
3. Active first order low pass and high pass filters.
4. Active first order band pass and band stop filters.
5. AM modulator using transistor,
6. AM Demodulator using diodes.
7. AM modulator using IC MC 1496 or MC 1596 or N-596.
8. FM modulator using varactor diode.
9. FM modulator using IC 566
10. FM demodulator using ratio detector/ Foster sector discriminator.
11. FM demodulator using IC 565.
12. PWM using IC 555

Main References

1. Electronic Communication Systems By George Kennedy (TMH) Third edition
2. Communication Electronics by N D Deshpande, D A Deshpande and P K Rangole (TMH)

Semester VI

Course Code: USACRC601

Title: Telecommunication systems

Unit-I

(L-15)

Transmission lines:

Fundamentals of Transmission lines, equivalent circuit representation. Characteristics impedance, Losses in transmission lines. Standing waves SWR. Quarter wave and half wavelength lines, Impedance matching, open and short circuited lines used as tuned circuits.

Antenna:

Radiation mechanism, Elementary doublet current and voltage distributions, resonant and non-resonant antennas, antenna gain, directivity and power gain, antenna resistance, radiation resistance, antenna losses, band width, beam width and polarization, defects of ground on antenna, antenna radiation patterns, directional antenna, folded dipole and Yagi-Uda antenna.

Ref. 1: Ch 9.1.1, 9.1.2, 9.2.1 to 9.2.3, 9.3.1 to 9.3.3, 9.4.1to 9.4.3, 9.6.1, 9.6.2, 9.7.

Unit-II

(L-15)

AM and FM transmitters:

AM transmitter, master oscillator, buffer amplifier, frequency multiplier stages, power amplifier, modulator amplifier, antenna matching network, Low level modulation, AM broadcast transmitters, SSB transmitter, Direct FM transmitter, Armstrong FM systems, Mobile communication, Frequency Synthesizers, Transmitter specification and measurements.

Radio receivers:

TRF receiver. Super heterodyne receiver, AM receiver, RF section and characteristic. Selectivity, Image frequency and its rejection, Double spotting, Frequency changing and tracking, mixer stage, local oscillator, IF amplifier, Diode detector, AC study of PLL, FM receivers, RF amplifiers, Frequency changer, IF amplifiers, amplitude limiting, AGC, FM modulation

FASCIMILE:

Fax transmission, cylindrical scanning, tape scanning spot, FAX receiver, synchronization phase, index of cooperation, Photographic reception, Direct recording reception, Transmission of fax, telegraph signals, radio transmission.

Ref:3: Ch 18.1, 18.2.1 to 18.2.3

Unit -III

(L-15)

T.V.:

Television,, TV Camera, image orthicon, Vidicon, picture tube, interlace scanning and scan reception rate, (ICCR std) picture definition, Horizontal Sync frequency, video, band width, composite video signal, vestigial side band, television signal, TV receivers block diagram and explanation of BW and colour TV receiver.

Ref: 3 Ch: 18.3.1 to 18.3.6, 18.4, 18.5

Satellite communication:

What is a communication satellite, satellite orbits, station keeping, satellite altitude, transmission path, path loss,

Ref: 3 Ch: 19.1 to 19.6

Unit- IV

(L-15)

Fibre optics:

Fibre optics communication, Principles of transmission of light in a fibre, propagation within fibre, Acceptance angle, numerical aperture, effect of index profile on propagation, Step index and graded index fibre, Losses in fibre, Raleigh scattering losses, absorption losses, bending losses, light sources for fibre optics, LED and laser photo detectors, PN photo diode, Avalanche photodiode, fibre optic communication link transmitter, channel receiver.

Ref: 3 Ch: 20.1, 20.2.1, 20.2.2, 20.3.1, 20.3.2, 20.3.5, 20.5.1 to 20.5.3, 20.6.1 to 20.6.4, 20.8.

Main References

- i) Electronic Communication systems. By George Kennedy TMH Third edition
- ii) Communication electronics by MD Deshpande, D R Deshpande, and P K Rangole (TMH)
- iii) Electronic communications third edition by Roddy and Coolen-PHI-EEE)

PRACTICALS (Semester VI)

Course Code: USACRC6P1

1. Measurement of receiver parameters-selectivity, sensitivity and fidelity.
2. Frequency mixer circuit using transistor
3. Basic AGC circuit using FET
4. Phase lock loop IC565- free running VCO, Lock ranges and capture Range
5. Frequency shift keying using IC- 565/566

6. Double side band suppressed carrier modulator using IC- MC 1496 or 1596 or N5596
7. Frequency multiplication using IC 565
8. Standing wave ratio measurement- forward power and reflected power.
9. Signal strength measurement using a micro ammeter, whip antenna and parallel tuned circuit
10. Design construction and working of a simple dipole or quarter wave antenna and study of radiation pattern.(Ref: Antenna Handbook)
11. Optical fibre communication.