4213 - APPLIED ELECTRONICS

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
Lectures	Practical	Credits			Theory		Practical Ex.	Total
3	4	7	25	25	3 Hrs	100	50	200

Pre-requisite	Source
4212	INC

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	25	50	175

Rationale: This subject is follows up of Basic Electronics. It deals with circuits built using devices studied in Basic Electronics and some more devices used for signal conditioning in Instrumentation systems.

COURSE CONTENTS	Hrs	Mks
1. HYBRID EQUIVALENT CIRCUIT OF A TRANSISTOR	4	10
Two port model of a transistor; Definitions of hybrid parameters; Obtaining the hybrid parameters from the characteristics; Hybrid equivalent circuit of CE amplifier; Expression for voltage gain, current gain and power gain; Expressions for input and output impedance (No derivations); Comparison of h-parameter values of all the three types of amplifiers CE, CB, and CC.		
2. COUPLED AMPLIFIERS	4	10
Concept of cascading amplifier stages, expression for overall gain as a ratio and in dbs; RC Coupled Amplifier; Transformer Coupled Amplifiers; Direct Coupled Amplifiers; A typical circuit and operation using BJT for each of the above types of amplifiers; Comparison of frequency response of the above types , advantages and disadvantages		
3. POWER AMPLIFIERS	4	8
Definition and need for power amplifiers; Types of power amplifiers; Concept of class A, class B push pull and class C amplifiers with the help of waveforms; A typical circuit using BJT for each of the above; Comparison of the three types give above with respects to efficiency and distortion.		
4. FEED BACK AMPLIFIERS AND OSCILLATORS	8	18
General theory of feedback; Concept of positive and negative feedback; Advantages of negative feedback and expression for gain with feedback (simple numerical problems); Types of negative feedback used in amplifiers: voltage series, voltage shunt, current series, current shunt (a typical circuit and operation using BJT for each of the above types). Use of positive feedback in oscillators; Requirements for oscillations; Barkhausen's criteria; A typical circuit using BJT and operation of a RC phase shift oscillator, Wein bridge oscillator and Hartley oscillator.		
5. DIFFERENTIAL AMPLIFIERS	4	6
Concept, a typical circuit using BJT and operation; Expression and meaning of CMRR (No derivation); Laboratory method of determining CMRR; Differential amplifier with constant current source.		
6. MODULATION AND DEMODULATION	10	18
Description of modulation; Need for modulation; Theory of amplitude modulation; Frequency spectrum of the AM wave; Representation of AM; Power relations in the AM wave; Concept of generation of AM and operation of collector modulated circuit; Meaning and description of single side-band and advantage of using the SSB technique; Theory of FM and PM; Mathematical representation and frequency spectrum of the FM wave; Comparison of AM and FM; Generation of FM using the basic reactance modulator; Simple diode detector for AM demodulation; FM demodulation using a balanced slope detector.		

		14	30
7. OPERATIONAL AMPLIFIERS			
Block diagram and description; Characteristics of an ideal opamp; Concept of virtual ground; Advantages of opamps; Electrical parameters and specifications of a typical opamp 741; Applications of opamps like active filters (single order Butterworth high pass, low-pass, band pass and band stop), inverting amplifier, differential amplifier, non-inverting amplifier, buffer, summing amplifier, Logarithmic amplifier, voltage to current converter, current to voltage converter, charge amplifier, chopper amplifier, chopper stabilised amplifier, chopper carrier amplifier(AM and FM), voltage to frequency converter, frequency to voltage converter, Integrator, differentiator.			
	Total	48	100

LIST OF PRACTICALS:

Any 12 to 15 experiments of the following:-

1. Determination of the hybrid parameters of a given transistor using CE characteristics.
2. To calculate the gain and plot the frequency response of a RC coupled amplifier.
3. To calculate the gain and plot the frequency response of a transformer coupled amplifier.
4. To calculate the gain and plot the frequency response of a direct coupled amplifier.
5. To study the operation of a class A power amplifier and calculate its efficiency.
6. To study the operation of a class B push-pull amplifier and calculate its efficiency.
7. To study the voltage series type of negative feedback amplifier and calculate its gain with and without feedback.
8. To study the operation of a RC phase shift oscillator using BJT.
9. To study the Wein bridge oscillator using BJT/Opamp.
10. To study the operation of the differential amplifier and calculate its CMRR.
11. To build and test the following circuits using opamps: a) Inverting and non-inverting amplifier b) Buffer c) Differential amplifier d) Summing amplifier e) Integrator and differentiator
12. To plot the frequency response of active filters like: Low pass filter, High pass filter, Band pass filter.

REFERENCE BOOKS:

1. Electronic Devices and Circuits by Allen Mottershead.
2. Electronic Principles by Malvino.
3. Integrated Circuits by Botkar.
4. Electronic Devices and Circuits Theory by Robert Boylestead and Louis Nashelsky.
5. Electronic Communication Systems by George Kennedy.
6. Opamps and Linear Integrated Circuits by R.Gayakwad.