ETM306N PRINCIPLES OF ANALOG AND DIGITAL COMMUNICATION (MDM Course)

Teaching Scheme	**:** 04L, Total: 04 hours/week	**Credits :**	04
Evaluation Scheme	**:** 10 ISA +30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course introduces fundamental concepts of analog and digital communication systems in a simplified and application-oriented manner for students from non-electronics engineering disciplines. It covers essential communication techniques such as amplitude and frequency modulation, pulse and digital modulation, receiver design, and practical applications in broadcasting and wireless communication. Emphasis is placed on conceptual clarity, industry relevance, and the use of virtual labs or simple simulation tools to enhance understanding without requiring deep mathematical background.

DESIRABLE AWARENESS/SKILLS

Knowledge of signals , basic electronics and electrical engineering

COURSE OUTCOMES

On the successful completion of this course; student shall be able to -

1. describe the basic components and working of analog and digital communication systems.
2. explain the need and applications of various modulation techniques including AM, FM, and PM.
3. compare the functioning of different communication receivers and modulation methods.
4. illustrate the basic concepts of pulse modulation and digital data transmission techniques.
5. relate communication concepts to real-life applications in areas such as radio, TV, mobile networks, and the internet.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	3											
2	3					2						
3	3	2			2							
4	2	2			3							
5	2				2	3						

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Communication Systems and Noise **[6 Hrs]**

Overview of communication systems, types of communication such as analog and digital, need for modulation, concept of electromagnetic spectrum, introduction to noise, sources and effects of noise in communication, relevance of noise in everyday communication systems.

Amplitude Modulation and Applications **[8 Hrs]**

Concept of amplitude modulation, basic features such as carrier, modulating signal and modulated signal, modulation index and its effect, applications of AM in broadcasting, introduction to AM demodulation, concept of single sideband (SSB) and vestigial sideband (VSB) modulation, case study of television transmission.

Frequency and Phase Modulation **[7 Hrs]**

Concept of frequency and phase modulation, difference between AM and FM, applications of FM in radio transmission, importance of FM in reducing noise, concept of pre-emphasis and de-emphasis, simple understanding of FM and PM waveforms and their detection methods, case study on FM broadcasting systems.

Communication Receivers **[7 Hrs]**

Functions of communication receivers, block diagram of superheterodyne receivers, stages of receiver including RF amplifier, mixer, IF amplifier and detector, concept of automatic gain control (AGC), comparison between AM and FM receivers, real-life examples of receivers in mobile and radio communication

Pulse Modulation and Line Coding **[5 Hrs]**

Need for converting analog signals into digital form, sampling theorem in simple terms, types of pulse modulation such as PAM, PWM, and PPM, concept and use of line coding techniques in digital transmission, application of pulse modulation in telephony and data transmission

Digital Communication Techniques **[8 Hrs]**

Concept of digital communication and its advantages, working principle of pulse code modulation (PCM), quantization and signal-to-noise ratio (conceptual), basic idea of delta modulation and adaptive delta modulation, introduction to digital modulation techniques such as ASK, FSK, and PSK, use of constellation diagrams for understanding digital signal transmission, application of digital modulation in Wi-Fi, satellite, and mobile networks

Applications and Case Studies **[7 Hrs]**

Case studies on communication systems used in radio, television, mobile networks, satellite communication and internet-based services, simplified overview of 3G, 4G, and 5G systems, future trends in communication technologies, demonstration using virtual labs or simple simulation tools.

Text Books

1. Electronic Communication Systems, George D. Kennedy, 4th edition, Tata McGraw-Hill, 1999
2. Principles of Communication Systems, T. Schilling and G. Saha, 3rd edition, McGraw-Hill, 1995

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Reference Books

1. Communication Systems, A. B. Carlson, 4th edition, McGraw-Hill, 2006
2. Electronic Communication, D. Roddy and J. Coolen, 4th edition, Prentice Hall of India

ETM 354N LINEAR INTEGRATED CIRCUITS AND APPLICATIONS
(MDM Course)

Teaching Scheme	**:** 02L, Total: 02 hours/week	**Credits :**	02
Evaluation Scheme	**:** 10 ISA +30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course is designed to introduce students to the basic concepts of operational amplifier (Op-amp), linear and nonlinear application of op-amp. It covers design and analysis of frequency selective and tuning circuits like oscillators, active filters, and regulated power supply. Course content finds a due scope to learn Integrated Circuit (IC) based design of switching applications like comparators.

DESIRABLE AWARENESS/SKILLS

Knowledge of electronic components/devices and their applications in analog electronics

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. discuss the operation and characteristics/parameters of op amp.
2. predict the component values of the linear and non-linear circuits of op-amp.
3. compute the component values of frequency selective circuits and oscillators.
4. design the power supply using op-amp.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	2	2	2	1								
2	3	3	3	1								
3	3	3	3	1								
4	3	3	3	1								
5	3	3	3	1								

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Operational Amplifier (Op-amp) [5 Hrs]

Introduction, block schematic, ac and dc op-amp parameters, offset null techniques of op-amp, data sheet interpretation of IC 741, frequency response and stability, frequency and phase compensation techniques.

Applications of Op-amp [10 Hrs]

Linear applications: Inverting and non-inverting amplifier, voltage follower, peak amplifier, analog adder, differential/instrumentation amplifier, bridge amplifier, integrator and differentiator, log/antilog amplifiers.

Non-linear Applications: Comparators – basic configurations and characteristics, comparator IC 710, comparator applications – peak detectors, window detector, multi-vibrators and Schmitt's trigger. Timer IC 555 – block schematic, pin diagram, operation, applications – timer circuit, multi-vibrators and Schmitt's trigger.

Oscillators and Active Filters [8 Hrs]

Oscillators: Square-triangle wave oscillators, relaxation oscillators. Sine wave oscillators - R- C phase shift and Wien bridge oscillators; voltage controlled oscillator IC 566.

Active Filter: Introduction, types and orders, second order Butterworth's filters.

Voltage Regulators [5 Hrs]

Basics of Voltage Regulator, Linear Voltage Regulators using Op-amp, IC Regulators (78xx, 79xx, LM 317, LM 337, 723), Switching Regulators.

Text Books

1. Op-amps and Linear Integrated Circuits, Ramakant. A. Gayakwad Contributor: Rekha S., revised 4th edition, Pearson, 2021

2. Linear Integrated Circuits, D. Roy Choudhari, Shail Bala Jain, 6th edition, New Age International (P) limited, 2021

Reference Books

1. Design with Operational Amplifiers and Analog Integrated Circuits, S. Franco, 4th edition, Tata McGraw Hill, 2014

2. Operational Amplifiers & Linear Integrated Circuits: Theory and Application, James M. Fiore, 3rd edition, Version 3.2.6, ISBN13: 978-1796856897, 2021