B.Tech. III Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3140320 / 3200320	DC	Analog Communication	50	10	20	20	40	30	30	200	2	1	2	4

Analog Communication (3140320/ 3200320)

Course objective: To understand the concept of modulation, various types of modulation, application, standards, analysis of modulation and demodulation process, probability theory and probability function, and concept of noise.

Unit I: Spectral Analysis: Introduction to signals and classifications, Introduction to Fourier series, Introduction to Fourier Transforms and its properties, Fourier transform of important functions, Autocorrelation, Cross correlation and their properties.

Unit II: Amplitude Modulation: Needs of modulation, Amplitude modulation, SSB, DSB,VSB suppressed carrier modulation, Modulation techniques their generation, detection and spectral analysis, square law modulators, switching modulator, envelope and square law detector, balanced modulator, Power calculation for AM, DSB-SC & SSB-SC.

Unit II Angle Modulation: Relationship between Frequency and phase modulation, frequency and phase deviation, types of FM, comparison between NBFM & AM signal., Carson's rule, spectrum of FM signal, comparison of narrow band and wide band FM, generation of FM.

Unit IV Probability and random variables: Random variable, sample space and events, probability and its properties, cumulative distribution function, probability density function, statistical average, variance, moment, Distributions: Binomial, Poisson, Gaussian and Rayleigh probability density function.

Unit V Noise Analysis: Various sources of noise, types of noise with their characteristics, Mathematical representation of noise figure, Noise bandwidth, Noise temperature and noise figure of amplifiers in cascades, Figure of merit of modulation techniques, comparison of modulation scheme for noise.

Text Books:

1. Communication System: Simon Haykins, Wiley & Sons.
2. Communication Systems - B. P. Lathi, BSP Publication

Reference Books:

1. Electronic Communication System: Kennedy-Devis, Tata McGraw-Hill Education.
2. Modern Digital & Analog Communication System: B.P. Lathi ,Oxford University Press.
3. Principles of Communication System: Taub and Schilling McGraw-Hill Education.

Course Outcomes

After the completion of this course students will be able to:

- **CO1.** **Analyze** the frequency domain representation of various signals.
- **CO2.** **Describe** amplitude modulation, their generation & detection methods.
- **CO3.** **Explain** the generation and detection techniques for angle modulated signal.
- **CO4.** **Evaluate** the statistical parameters for general PDF/CDF.
- **CO5.** **Evaluate** the effects of noise on modulation techniques

B.Tech. III Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3140322/3200322	DC	Analog Integrated Circuits	50	10	20	20	40	30	30	200	2	1	2	4

Analog Integrated Circuits (3140322/3200322)

Course objective: Students will be able to learn the concepts of power amplifier and operational amplifiers. Further, they will learn to design multi-vibrators using IC 555 and active filter design using Opamp.

Unit I Differential Amplifiers: Introduction to differential amplifier, Differential gain, Common Mode Rejection Ratio (CMRR), Types of differential amplifier: Dual input unbalanced output, Single input balanced output, Dual input balanced output.

Unit II Operational Amplifier: Introduction of op-amp, Block diagram, characteristics and equivalent circuits of an op-amp, Power supply rejection ratio for op-amp(PSRR), common-mode rejection ratio (CMRR), Slew rate and its Effect, Input and output offset voltages. Open and Closed loop configuration of Op-amp, Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Schmitt Trigger, Logarithmic and anti-logarithmic amplifier etc.

Unit III Active Filter Design: Characteristics of filters, Classification of filters, Magnitude and frequency response, 1st and 2nd order Low pass and High pass ,Band pass filters and Band reject filters.

Unit IV Oscillators using OPAMP: Phase shift oscillator, Clapp oscillator, Wien bridge oscillator, Hartley Oscillator, Colpitt's oscillator, crystal oscillator.

Unit V Multivibrator Design using 555 IC: The 555 IC Circuit, 555 IC block diagram, Using the 555 IC as Astable , Monostable and Bistable Multivibrator Circuits and its applications.

Text Books:

1. Electronics Devices and Circuits: Boylested & Nashelsky,11th Edition**,** Pearson Education India
2. Op-Amp and Linear Integrated Circuit: R. A. Gayakwad, 4th Edition, Prentice Hall of India.

Reference Books:

1. Integrated Electronics: Millman & Halkias, 2nd Edition, McGraw Hill Education
2. Electronics Devices and Circuits: Shalivanan, 2nd Edition, Tata Mcgraw Hill Education.
3. Microelectronic Circuits- Theory and Application: Sedra & Smith, 7th Edition**,** Oxford Press.

Course Outcomes

After the completion of this course students will be able to:

- **CO1.** **Design** the circuits of differential amplifiers.
- **CO2.** **Design** the applications using Operational amplifier IC.
- **CO3.** **Implement** the active filters based on given specifications.
- **CO4.** **Design** Oscillator using OPAMP.
- **CO5.** **Design** Multivibrator circuits using IC 555.

B.Tech. III Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Marks	Lab work & Sessional Marks	Skill based mini project		L	T	P	
3140323/ 3200323	DC	Communication Networks	50	10	20	20	-	-	-	100	2	1	_	3

Communication Networks (3140323/ 3200323)

Course objective: To make the students capable of analyzing electrical network and how to synthesize an electrical network from a given impedance/admittance function.

Unit I Basic Parameters of Networks: Characteristic impedance, iterative impedance, Propagation constant, analysis of symmetrical T, π, Lattice and Bridged-T networks, image impedance, attenuators and their design.

Unit II-Network Synthesis: Positive real function, LC, RL, RC and RLC network synthesis, Foster and Cauer form realization , Minimum positive real function, Brune's method, Bott-Duffin method, Insertion Loss Synthesis, and Coefficient matching technique.

Unit III- Passive Filters: Constant K prototype Filters: Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, frequency transformation.

Unit IV-.Transmission Line: Voltage and current on a transmission line; characteristic impedance and propagation constant of a transmission line, Lossless & Distortion less line, reflection on a line, Standing wave ratio, and Transient analysis of terminated transmission line.

Unit V- Lines at radio frequency: Dispersion less line, Input impedance of open circuit and short circuit line, power and impedance measurement, λ/8, λ/4, λ/2 lines, Smith chart and application, Single stub matching.

Text Books:

1. Introduction to Modern Network Synthesis: Van Valkenberg, 1st Edition, John Wiley & Sons.
2. Communication Network and Transmission Lines by Bakshi & Bakshi, Technical Publication

Reference Books:

1. Principles of Active Network Synthesis and Design: G. Daryanani,1st Edition, John Wiley & Sons.
2. Network Analysis and Synthesis - F.F. Kuo,2nd Edition, John Wiley & Sons.
3. Networks, Lines, & Fields: J.D. Ryder, 2nd Edition, Prentice Hall of India.
4. Elements of Electromagnetics: Mathew N. O.Sadiku, 3rd Edition, Oxford Publication Press.

Course Outcomes

After the completion of this course students will be able to:

CO1. **Design** the symmetrical and asymmetrical attenuators.
CO2. **Synthesize** the network for a given positive and minimum positive real function.
CO3. **Design** passive filters for the given specifications.
CO4. **Analyze** the characteristics of various transmission lines.
CO5. **Calculate** the impedance and SWR graphically /analytically.

B.Tech. III Semester (Electronics Engineering/Electronics & Telecommunication Engineering)

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot			Total Marks	Contact Hr/week			Total Credits
			End Sem Marks	Proficiency	Mid Sem Marks	Quiz/ Assignment Marks	End Sem Mark	Lab work & Sessional Mark	Skill based mini project		L	T	P	
3140324/ 3200324	DC	Data Communication	50	10	20	20	-	-	-	100	2	1	_	3

Data Communication (3140324/ 3200324)

Course objectives: To provide an introduction to fundamental computer network architecture concepts and their applications.

Unit I Introduction to Switching Techniques: Circuit switching, Message switching, Packet switching, Protocols, Layered network architecture and architecture OSI & TCP/IP reference model, Physical layer transmission medium, RS 232 C, Modem, Topologies.

Unit II Data Link Layer: Framing BSC, HDLC. ARQ: Stop and wait, Sliding window, Efficiency, Error detection and Error correction, Hamming codes, Parity checks – CRC, Checksum, HARQ.

Unit III MAC Layer: MAC sub layer – LAN protocols, ALOHA, Slotted and pure ALOHA, CSMA, CSMA/CD, Token bus, Token Ring, TDMA, CDMA, FDMA, Ethernet, Bridge, Router, Gateway, Switch.

Unit IV Network Layer: Routing – Data gram and Virtual Circuit, Distance vector and Link state Routing, Dijkstra's Algorithms, Congestion Control: Leaky bucket algorithm, Slow start, ATM model and ATM traffic management – AAL, X.25, IP layer, IP addressing.

Unit V Transport Layer: Connection oriented transport protocol mechanism, TCP, Transport flow regulation, UDP Segmentation & Reassemble, Session and Transport Interaction, Synchronization, Session protocols, FTP, Remote login.

Text Books:

1. Data Communication & Networking – B.A. Forouzan, Tata Mc-Graw Hill
2. Data and Computer Communication – W. Stallings, Pearson

Reference Books:

1. LANs – Keiser, Tata Mc-Graw Hill
2. Internetworking with TCP/IP – VOL-I – D.E. Comer, PHI
3. ISDN and Broad band ISDN with Frame Relay & ATM – W. Stalling, Pearson

Course Outcome:

After successful completion of the course, students will be able to:

- **CO1.** **Analyze** the error and flow control in communication network.
- **CO2.** **Explain** the concepts of MAC layer.
- **CO3.** **Identify** the different types of routing used in IP.
- **CO4.** **Classify** the transport mechanism in TCP/UDP.
- **CO5.** **Explore** the different application protocol used in internetworking.

Annexure XIV

Item 15

To review and recommend the list of experiments and skill-based mini projects of ***B.Tech. III semester*** (for **batch admitted in 2023-24) .**

S. No	Category	Subject Code	Subject Name
1	DC	3140320/ 3200320	Analog Communication
2		3140322/ 3200322	Analog Integrated Circuits
3		3140321/3200321	Hardware Lab

B.Tech. III Semester (Electronics Engineering)

L	T	P	C
-	-	2	1

Subject Name: Analog Communication
Subject Code: 3140320 /3200320

Analog Communication - To enable students to understand the fundamental techniques for the transmission, reception, and processing of continuous analog signals using MATLAB.

List of Experiments

1. Perform Fourier transform of continuous time signals.
2. Perform Amplitude modulation and demodulation using MATLAB Software.
3. Perform Amplitude demodulation using MATLAB Software.
4. Perform DSB-SC Modulator using MATLAB Software.
5. Perform DSB-SC Detector using MATLAB Software.
6. Perform SSB-SC Modulator & Detector using MATLAB Software.
7. Perform Frequency modulation using MATLAB Software.
8. Analysis of AM & FM Spectrum using MATLAB Software.

Course Outcomes

After performing experiments students will able to:

CO1. **Execute** modulation and demodulation using MATLAB.
CO2. **Analyze** the waveform of various modulation techniques.
CO3. **Express** the working of DSB and SSB modulator and demodulator.

Skill Based Mini Project

1. Design of Envelope detector
2. Design of Switching modulator
3. Design of Balance modulator
4. Design of Amplitude modulator
5. Design of Amplitude demodulator
6. Design of Sinusoidal signal generator
7. Design of Square wave generator

8. Design of Signal multiplier
9. Design of Frequency modulator
10. Design of Frequency demodulator

B.Tech. III Semester (Electronics Engineering)

L	T	P	C
-	-	2	1

Subject Name: Analog Integrated Circuits
Subject Code: 3140322/3200322

Course Objective: This course gives the ability to the students to design various Analog Integrated Circuits using OPAMP and 555 timer.

List of Experiments

1. Design of the circuit using IC 741 Op-amp.
   (a) Summer and Subtractor
   (b) Inverting and Non Inverting Amplifier
   (c) Voltage Follower
   (d) Comparator and Schmitt trigger
   (e) Integrator and Differentiator

2. To Design the Multivibrator circuit using 555 timers IC.
   (a) Astable Multivibrator
   (b) Bistable Multivibrator
   (c) Monostable Multivibrator

3. To design RC low pass and high pass filter.

Course Outcomes

After performing experiments students will able to:

CO1. **Design** various applications using Op-amp.
CO2. **Troubleshoot** fabricated circuit individually and in a team.
CO3. **Design** various amplifier circuits.

Skill Based mini project

1. **Design** an Oscillator using 555 timer IC.
2. **Design** pulse generator using 555 timer IC.
3. **Design** one bit memory storage element using 555 timer IC.
4. **Design** frequency divider circuit using 555 timer IC.
5. **Design** phase lock loop using 555 timer IC.
6. **Design** logarithmic and antilog operator using 741 IC.
7. **Design** a DC Volt Polarity Indicator Using IC 741.
8. **Design** an Active low pass filter using IC 741.
9. **Design** a 741 IC Tester.
10. **Design** an automatic Light Operated Switch Using LDR and 741.

B.Tech. III Semester (Electronics Engineering)

L	T	P	C
-	-	2	1

Subject Name: Hardware Lab
Subject Code: 3140321/3200321

Course Objective: The lab aims to provide hands-on experience in designing and creating printed circuit boards. Students learn about schematic capture, component selection, layout design, and the use of PCB design software tools.

Lab Experiments

1. Introduction to PCB Design software.
2. Design of Low Pass Filter using PCB Design software.
3. Design of High Pass Filter using PCB Design software.
4. Design of Band Pass Filter using PCB Design software.
5. Fabrication of the Regulated Power Supply circuit on PCB.
6. Fabrication of the Half wave Rectifier circuit on PCB.
7. Fabrication of the Full wave Rectifier circuit on PCB.
8. Design hardware model for Half Wave and Full Wave Rectifier without Filter.
9. Design hardware model for Half Wave and Full Wave Rectifier with Filter.
10. Design hardware model for Electronic EYE.

Course Outcomes
After completing the experiments students will be able to

- **CO1. Design** various applications using electronics Components.
- **CO2. Learn** use of sensors, filters and 555 Timers.
- **CO3. Troubleshoot** fabricated circuit individually and in a team.

Skill Based mini project

1. **Design** hardware model for Simple Rain Water Alarm System.
2. **Design** hardware model for Flashing Lamps Using 555 Timer.
3. **Design** hardware model for Night Sensing Light.
4. **Design** hardware model for Simple Light Sensitivity Metronome Using Transistors.
5. **Design** hardware model for Simple Temperature Monitor.
6. **Design** hardware model for Invisible Burglar Alarm.
7. **Design** hardware model for Automatic Door Bell Ringer.
8. **Design** hardware model for electronic fuse.
9. **Design** hardware model for Geyser timer circuit
10. **Design** hardware model for water sensor alarm.

Annexure XVI

Courses where revision was carried out

(Course/subject name)	Course Code	Year/Date of introduction	Year/Date of revision	Percentage of content added or replaced
Digital Signal Processing	2140520/2200520	2023	24-05-2024	15%

Digital Signal Processing (2140520/2200520)

Course Objectives: Understanding of the fundamental concepts of digital signal processing, designing of digital filters, and brief knowledge about the Multirate digital signal processing.

Unit I Review of Transform Domain Techniques: Review of discrete time signals and systems, Properties and applications of discrete time Fourier transform, Review of Z transform, Analysis of minimum phase, maximum phase and inverse system.

Unit II Discrete Fourier Transform (DFT): Introduction and properties of DFT, Computation of circular convolution using DFT, Decimation in time FFT algorithm, Decimation of frequency FFT algorithm with radix-2, and radix-4.

Unit III Digital Filters (Part-I): Characteristics of practical frequency selective filters, various **s**ignal flow graph structure of IIR filters. **IIR Filter design:** Overview of Butterworth, Chebyshev and Elliptic approximations, Design of discrete time IIR filters using Impulse invariant, and Bilinear transformation methods,

Unit IV Digital Filters (Part-II): Introduction and Signal flow graph structure of FIR Filter.

FIR Filter design: Symmetric, and Asymmetric FIR filters, Design of linear phase FIR filters using windows, and Frequency sampling method.

Unit V Multirate Digital Signal Processing: Introduction, Decimation and Interpolation, Sampling rate conversion by a Rational factor.

Implementation of Sampling rate Conversion: Sampling rate conversion with Cascaded integrator, Comb filters , Polyphase structures for decimation, and interpolation filters, Application of multirate signal processing.

Text Books:

3. John. G. Proakis, "Digital Signal Processing", 4th Edition, Pearson Education.
4. Oppenheim and Schafer, "Digital Signal Processing", 2nd Edition, PHI Learning.

Reference Books:

4. Johnny R. Johnson, "Introduction to Digital Signal Processing", 1st Edition, PHI Learning.
5. Rabiner and Gold, "Theory and Application of Digital Signal Processing",3rd Edition, PHI Learning.
6. Ingle and Proakis, "Digital Signal Processing- A MATLAB based Approach", 3rd Edition, Thompson, Cengage Learning.

Course Outcomes:

After successful completion of the course, students will be able to:

- **CO1.** **Analyze** discrete time system using transform methods.
- **CO2.** **Compute** DFT using FFT algorithms.
- **CO3.** **Design** IIR Filters.
- **CO4.** **Design** FIR Filters.
- **CO5.** **Apply** the concept of multi-rate signal processing in practical applications.