PRINCIPLES OF ELECTRONIC COMMUNICATION

Course Code	EL-3001 (Same as EF 3001)
Course Title	Principles of Electronic Communication
Number of Credits	4 (L-4,T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE OUTCOMES:

- Use of different modulation and demodulation techniques
- used in analog communication.
- Identify and solve basic communication problems.
- Analyse transmitter and receiver circuits.
- Compare and contrast design issues, advantages, disadvantages and limitations of analog communication systems.

COURSE CONTENTS:

UNIT-1 ANALOG MODULATION:

1.1 Concept of frequency translation.
1.2 Amplitude Modulation:
1.3 Description of full AM, DSBSC, SSB and VSB in time and frequency domains
1.4 Methods of generation & demodulation
1.5 Descriptions of FM signal in time and frequency domains

UNIT-2 PULSE ANALOG MODULATION:

2.1 Ideal sampling,
2.2 Sampling theorem, aliasing, interpolation
2.3 Natural and flat top sampling in time and frequency domains

UNIT-3 PCM & DELTA MODULATION SYSTEMS:

3.1 Uniform and Non-uniform quantization
3.2 PCM and delta modulation
3.3 Signal to quantization noise ratio in PCM and delta modulation

UNIT-4 DIGITAL MODULATION:

4.1 Baseband transmission: Line coding (RZ, NRZ), inter symbol interference (ISI), pulse shaping
4.2 Nyquist criterion for distortion free base band transmission, raised cosine spectrum.
4.3 Pass band transmission: Geometric interpretation of signals, orthogonalization

UNIT-5 SPREAD-SPECTRUM MODULATION:

5.1 Introduction
5.2 Pseudo-Noise sequences
5.3 Direct sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error,
5.4 Frequency-hop spread spectrum (FHSS)
5.5 Application of spread spectrum:
5.6 CDMA

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Principles of communication systems By Taub Schilling, T.M.H.
2. Fundamentals of communication systems By Proakis & Salehi, Pearson education
3. Communication Systems by Simon Haykin, John Wiley
4. Communication Systems (Analog and Digital) By R.P. Singh, S.D. Sapre, T.M.H.
5. Modern Digital & Analog Communication By B.P. Lathi, Oxford Publications
6. Digital & Analog Communication Systems By K.S. Shanmugam, John Wiley

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ELECTRONICS DEVICES AND CIRCUITS

Course Code	EL 3002(Same as EF 3002)
Course Title	Electronic Devices And Circuits
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:

UNIT 1 – SEMICONDUCTOR AND DIODES

1.1 Definition, Extrinsic/Intrinsic, N-type & p-type
1.2 PN Junction Diode – Forward and Reverse Bias Characteristics
1.3 Zener Diode – Principle, characteristics, construction, working
1.4 Diode Rectifiers – Half Wave and Full Wave
1.5 Filters – C, LC and PI Filters

UNIT 2 – BIPOLAR JUNCTION TRANSISTOR (BJT)

2.1 NPN and PNP Transistor – Operation and characteristics
2.2 Common Base Configuration – characteristics and working
2.3 Common Emitter Configuration – characteristics and working
2.4 Common Collector Configuration – characteristics and working
2.5 High frequency model of BJT
2.6 Classification of amplifiers
2.7 negative feedback

UNIT 3 – FIELD EFFECT TRANSISTORS

3.1 FET – Working Principle, Classification
3.2 MOSFET Small Signal model
3.3 N-Channel/ P-Channel MOSFETs – characteristics
3.4 Enhancement and depletion mode
3.5 MOS- FET as a Switch
3.6 Common Source Amplifiers
3.7 Uni-Junction Transistor – equivalent circuit and operation

UNIT 4 – SCR DIAC & TRIAC

4.1 SCR – Construction, operation, working, characteristics
4.2 DIAC - Construction, operation, working, characteristics
4.3 TRIAC - Construction, operation, working
4.4 characteristics SCR and MOSFET as a Switch
4.5 DIAC as bidirectional switch
4.6 Comparison of SCR, DIAC, TRIAC, MOSFET

UNIT 5 – AMPLIFIERS AND OSCILLATORS

5.1 Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters
5.2 Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt Current Series, Current Shunt
5.3 Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Analog Circuits By AK Maini Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)
1. Electronic Devices and Circuits S. Salivahanan and N. Suresh Kumar McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
2. Electronics Devices and circuit theory Boyestad & Nashelsky Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
3. Electronic Principles Albert Malvino & David Bates Tata McGraw Hill Publication 2010 ISBN: 978-0070634244
4. Electronics Devices & Circuits Jacob Millman McGraw Hill Education; 4 edition (2015) ISBN: 978-9339219543

SUGGESTED SOFTWARE/LEARNING WEBSITES:

1. https://www.electronics-tutorials.ws/
2. https://www.youtube.com/watch?v=Rx43l-QpeWQ
3. https://electronicsforu.com/resources/electronic-devices-and-circuit-theory

DIGITAL ELECTRONICS

Course Code	EL 3003(Same as EF 3003)
Course Title	Digital Electronics
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:

UNIT 1 – NUMBER SYSTEMS & BOOLEAN ALGEBRA

1.1 Introduction to different number systems – Binary, Octal, Decimal, Hexadecimal
1.2 Conversion from one number system to another.
1.3 Boolean variables – Rules and laws of Boolean algebra
1.4 De-Morgan's Theorem
1.5 Karnaugh Maps and their use for simplification of Boolean expressions

UNIT 2 – LOGIC GATES

2.1 Logic Gates – AND, OR, NOT, NAND, NOR, XOR, XNOR: Symbolic representation and truth table
2.2 Implementation of Boolean expressions and Logic Functions using gates
2.3 Simplification of expressions

UNIT 3 – COMBINATIONAL LOGIC CIRCUITS

3.1 Arithmetic Circuits – Addition, Subtraction, 1's 2's Complement, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel and Series Adders
3.2 Encoder, Decoder
3.3 Multiplexer – 2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX. Applications
3.4 Demultiplexer – 1 to 2 DEMUX, 1- 4 DEMUX, 1- 8 DEMUX

UNIT 4 – SEQUENTIAL LOGIC CIRCUITS

4.1 Flip Flops – SR, JK, T, D, FF, JK-MS, Triggering
4.2 Counters – 4 bit Up – Down Counters, Asynchronous/ Ripple Counter, Decade Counter- Mod 3, Mod 7 Counter, Johnson Counter, Ring Counter
4.3 Registers – 4bit Shift Register: Serial in Serial Out, Serial in Parallel Out, Parallel in Serial Out, and Parallel in Parallel Out

UNIT 5 – MEMORY DEVICES

5.1 Classification of Memories – RAM Organization, Address Lines and Memory Sixe,
5.2 Static RAM, Bipolar RAM, cell Dynamic RAM, D RAM, DDR RAM
5.3 Read only memory – ROM organization, Expanding memory, PROM, EPROM, EEPROM, Flash memory
5.4 Data Converters – Digital to Analog converters, Analog to Digital Converters

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Digital principles & Applications Albert Paul Malvino & Donald P. Leach McGraw Hill Education; Eighth edition ISBN: 978-9339203405
2. Digital Electronics Roger L. Tokheim Macmillian McGraw-Hill Education (ISE Editions); International 2 Revised edition ISBN: 978-0071167963
3. Digital Electronics – an introduction to theory and practice William H. Gothmann Prentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485
4. Fundamentals of Logic Design Charles H. Roth Jr. Jaico Publishing House; First edition ISBN: 978-8172247744
5. Digital Electronics R. Anand Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93-82609445

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Code	EL 3004
Course Title	Electronic Measurements and Instrumentation
Number of Credits	3 (L-3, T-0, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:

UNIT – I BASICS OF MEASUREMENTS AND BRIDGES

1.1 Accuracy & precision, Resolution
1.2 Types of Errors
1.3 DC Bridges – Wheatstone and Kelvin Double Bridge
1.4 AC Bridges - Maxwell's Bridge, Hay's Bridge, Anderson Bridge, De-Sauty's Bridge

UNIT- II POTENTIOMETER

2.1 Basic DC slide wire Potentiometer
2.2 Crompton's DC Potentiometer
2.3 Applications of DC Potentiometer
2.4 AC Potentiometers
2.5 Applications of AC Potentiometers

UNIT– III MEASURING INSTRUMENTS

3.1 Permanent Magnet Moving Coil Instruments (PMMC)
3.2 Moving Iron type Instruments (MI)
3.3 Electro Dynamo Type
3.4 Instruments Single Phase Energy Meter

UNIT– IV ELECTRONIC INSTRUMENTS

4.1 Electronic Voltmeter and Digital Voltmeter
4.2 Electronic Multimeters
4.3 Q – Meter
4.4 Vector Impedance Meter

UNIT– V OSCILLOSCOPES

5.1 Cathode ray tube: construction, operation, screens, graticules
5.2 Vertical deflection system, Horizontal deflection system, Delay line,
5.3 Measurement of frequency, time delay, phase angle and modulation index (trapezoidal method)
5.4 Oscilloscope probe: Structure of 1:1 and 10:1 probe
5.5 MultipleTraceCRO

UNIT- VI TRANSDUCERS

Classification, Selection Criteria, Characteristics, Construction, Working Principles and Application of following Transducers:

6.1 RTD, Thermocouple, Thermistor
6.2 LVDT, Strain Gauge
6.3 Load Cell
6.4 Piezoelectric Transducers

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Electrical & Electronic Measurement & Instruments A.K. Sawhney Dhanpat Rai & Sons, India
2. Electronic Instrument and Measurement Technique W.D. Cooper Prentice Hall International, India.
3. Electronic Measurement & Instrumentation J.G. Joshi Khanna Publishing House, Delhi
4. Measurement systems application and design E.O. Doebelin and D. N. Manik the Mcgraw-Hill
5. Electronic Measurements and Instrumentation Oliver and Cage the Mcgraw-Hill
6. Basic Electrical Measurement M.B. Stout Prentice hall of India, India
7. Electronic Instrumentation H. S. Kalsi the Mcgraw-Hill
8. Electrical and Electronics Measurement and Instrumentation Prithwiraj Pukrait, Budhaditya Biswas, Santanu Das, Chiranjib Koley The Mcgraw-Hill

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ELECTRIC CIRCUITS & NETWORK

Course Code	EL 3005(Same as EF 3005)
Course Title	Electric Circuits & Network
Number of Credits	3 (L-2, T-1, P-0)
Prerequisites	NIL
Course Category	PC

COURSE CONTENTS:

UNIT – 1 BASIC OF NETWORK AND NETWORK THEOREM

1.1 Node and Mesh
1.2 Analysis Superposition Theorem
1.3 Thevenin Theorem
1.4 Norton Theorem
1.5 Maximum Power transfer theorem
1.6 Reciprocity Theorem

UNIT– 2 GRAPH THEORY

2.1 Graph of network, tree, and incidence matrix
2.2 F- Tie Set Analysis
2.3 F-Cut Set Analysis
2.4 Analysis of resistive network using cut-set and tie-set Duality

UNIT– 3 TIME DOMAIN AND FREQUENCY DOMAIN ANALYSIS

3.1 Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits
3.2 Initial and Final conditions in network elements
3.3 Forced and Free response, time constants Steady State and Transient State Response
3.4 Analysis of electrical circuits using Laplace Transform for standard inputs (unit, Ramp, Step)

UNIT– 4 TRIGONOMETRIC AND EXPONENTIAL FOURIER SERIES

4.1 Discrete spectra and symmetry of waveform
4.2 Steady state response of a network to non-sinusoidal periodic inputs
4.3 power factor, effective values
4.4 Fourier transform and continuous spectra

UNIT- 5 TWO PORT NETWORK

5.1 Two Port Network
5.2 Open Circuit Impedance Parameters
5.3 Short Circuit Admittance Parameters
5.4 Transmission Parameters
5.5 Hybrid Parameters
5.6 Interrelationship of Two Port Network
5.7 Inter Connection of Two Port Network

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Networks and Systems Ashfaq Husain Khanna Publishing House
2. Network Analysis M. E. Van Valkenburg Prentice Hall of India
3. Engineering Circuit Analysis W. H. Hayt, J. E. Kemmerly and S. M. Durbin McGraw Hill
4. Electrical Circuits Joseph Edminister Schaum's Outline, Tata McGraw Hill
5. Basic Circuit Theory Lawrence P. Huelsma Prentice Hall of India
6. Network & Systems D. Roy Choudhury Wiley Eastern Ltd
7. Linear Circuit Analysis De Carlo and Lin Oxford Press

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PRINCIPLES OF ELECTRONIC COMMUNICATIONS LAB

Course Code	EL 3006(Same as EF 3006)
Course Title	Principles of Electronic Communications Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

1. Understanding the different techniques of signal modulation and demodulation.
2. Understanding the variation in amplitude of controllers.

PRACTICALS:

1. Harmonic analysis of a square wave of modulated waveform: measures modulation index.
2. To modulate a high frequency carrier with sinusoidal signal to obtain FM signal.
3. To study and observe the operation of a super heterodyne receiver
4. To modulate a pulse carrier with sinusoidal signal to obtain PWM signal and demodulate it.
5. To modulate a pulse carrier with sinusoidal signal to obtain PPM signal and demodulate it.
6. To observe pulse amplitude modulated waveform and its demodulation.
7. To observe the operation of a PCM encoder and decoder. To consider reason for using digital signal x-missions of analog signals.
8. To study & observe the amplitude response of automatic gain controller (AGC).

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ELECTRONIC DEVICES AND CIRCUITS LAB

Course Code	EL 3007(Same as EF 3007)
Course Title	Electronic Devices and Circuits Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:

1. Construct the circuit and plot the VI characteristics of the PN Junction Diode ,find the cut in voltage
2. Construct the circuit and plot the characteristics of a Zener Diode. Find the breakdown voltage
3. Construct a Half Wave Rectifier and obtain regulation characteristics –Without Filters and with Filters Compare the results
4. Construct a Full Wave Rectifier and obtain regulation characteristics –Without Filters and with Filters Compare the results
5. Construct a Bridge Rectifier and obtain regulation characteristics – Without Filters and with Filters
6. Obtain the characteristics of DIAC and TRIAC
7. Simulate half wave, full wave and bridge rectifier using simulation tool like PSpice/ Orcad/ Multisim.
8. Develop a simulation model for Voltage Series and Voltage Shunt Feedback Amplifiers
9. Develop circuits for Voltage Series and Voltage Shunt Feedback Amplifiers and Obtain output plots. Compare the results with the simulation model.
10. Develop a simulation model for Current Series and Current Shunt Feedback Amplifiers
11. Develop circuits for Current Series and Current Shunt Feedback Amplifiers and Obtain output plots. Compare the results with the simulation model

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Analog Circuits By AK Maini Khanna Publishing House Ed. 2018 (ISBN: 978-93-86173-584)
2. Electronic Devices and Circuits S. Salivahanan and N. Suresh Kumar McGraw Hill Education; Fourth edition (1 July 2017) ISBN: 978-9339219505
3. Electronics Devices and circuit theory Boyestad & Nashelsky Pearson Education India; 11 edition (2015) ISBN: 978-9332542600
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5. Electronics Devices & Circuits Jacob Millman McGraw Hill Education; 4 edition (2015) ISBN: 978-9339219543

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DIGITAL ELECTRONICS LAB

Course Code	EL 3008(Same as EF 3008)
Course Title	Digital Electronics Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:

1. To verify the truth tables for all logic fates – NOT OR AND NAND NOR XOR XNOR using CMOS Logic gates and TTL Logic Gates
2. Implement and realize Boolean Expressions with Logic Gates
3. Implement Half Adder, Full Adder, Half Subtractor, Full subtractor using ICs
4. Implement parallel and serial full-adder using ICs
5. Design and development of Multiplexer and De-multiplexer using multiplexer ICs
6. Verification of the function of SR,D, JK and T Flip Flops
7. Design controlled shift registers
8. Construct a Single digit Decade Counter (0-9) with 7 segment display
9. To design a programmable Up-Down Counter with a 7 segment display
10. Study of different memory ICs
11. Study Digital- to – Analog and Analog to Digital Converters
12. Simulate in Software (such as PSpice) an Analog to Digital Converter
13. Simulate in Software (such as PSpice) an Analog to Digital Converter

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Digital principles & Applications Albert Paul Malvino & Donald P. Leach McGraw Hill Education; Eighth edition ISBN: 978-9339203405
2. Digital Electronics Roger L. Tokheim Macmillian McGraw-Hill Education (ISE Editions); International 2 Revised edition ISBN: 978-0071167963
3. Digital Electronics – an introduction to theory and practice William H. Gothmann Prentice Hall India Learning Private Limited; 2 edition ISBN: 978-8120303485
4. Fundamentals of Logic Design Charles H. Roth Jr. Jaico Publishing House; First edition ISBN: 978-8172247744
5. Digital Electronics R. Anand Khanna Publications, New Delhi (Edition 2018) ISBN: 978-93-82609445

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION LAB

Course Code	EL 3009
Course Title	Digital Electronics Lab
Number of Credits	1 (L-0, T-0, P-2)
Prerequisites	NIL
Course Category	PC

PRACTICAL OUTCOMES (PROs)

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

PRACTICALS:

1. Measure unknown inductance using following bridges (a) Anderson Bridge (b) Maxwell Bridge
2. Measure Low resistance by Kelvin's Double Bridge
3. Calibrate an ammeter using DC slide wire potentiometer
4. Calibrate a voltmeter using Crompton potentiometer
5. Measure low resistance by Crompton potentiometer
6. Calibrate a single-phase energy meter by phantom loading
7. Study the working of Q-meter and measure Q of coils
8. Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes
9. Measurement of displacement with the help of LVDT
10. Draw the characteristics of the following temperature transducers (a) RTD (Pt-100) (b) Thermistor
11. Measurement of strain/force with the help of strain gauge load cell

REFERENCES /SUGGESTED LEARNING RESOURCES:

1. Electrical & Electronic Measurement & Instruments A.K. Sawhney Dhanpat Rai & Sons, India
2. Electronic Instrument and Measurement Technique W.D. Cooper Prentice Hall International, India.
3. Electronic Measurement & Instrumentation J.G. Joshi Khanna Publishing House, Delhi
4. Measurement systems application and design E.O. Doebelin and D. N. Manik the Mcgraw-Hill
5. Electronic Measurements and Instrumentation Oliver and Cage the Mcgraw-Hill
6. Basic Electrical Measurement M.B. Stout Prentice hall of India, India
7. Electronic Instrumentation H. S. Kalsi the Mcgraw-Hill
8. Electrical and Electronics Measurement and Instrumentation Prithwiraj Pukrait, Budhaditya Biswas, Santanu Das, Chiranjib Koley The Mcgraw-Hill

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