5TH SEMESTER

DISCIPLINE SPECIFIC ELECTIVES (DSEs)

OPTION - I

ELT516DA: ELTRONICS – ELTRONIC INSTRUMENTATION

(Credits: Theory-4, Practicals-2)

Unit- I Measurements:

Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Electromagnetic Interference. Basic Measuring Instruments, DC measurement-ammeter, voltmeter, ohm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating). Digital Multimeter; Block diagram, principle of measurement of I, V, C. Accuracy and resolution of measurement. **(15 Lectures)**

Unit-II Bridges

Measurement of Impedance (Wheatstone and Kelvin Bridge)- A.C. bridges, Measurement of Self Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge), Measurement of frequency (Wien's bridge) **(15Lectures)**

Unit-III Power supply:

Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators (78XX and 79XX), Line and load regulation, Short circuit protection. Idea of switched mode power supply (SMPS) and uninterrupted power supply (UPS). **(15 Lectures)**

Unit-IV Oscilloscope and Signal Generators

Block Diagram, CRT, Vertical Deflection, Horizontal Deflection. Screens for CRT, Oscilloscope probes, measurement of voltage, frequency and phase by Oscilloscope. Digital Storage Oscilloscopes. LCD display for instruments. Signal Generators: Function generator, Pulse Generator. **(15 Lectures)**

Reference Books:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book - fifth Edition (2003).
3. David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).
4. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).
5. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
6. Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning

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Semester- V

ELE-DSE-1A LAB: ELECTRONIC INSTRUMENTATION LAB

AT LEAST 10 EXPERIMENTS FROM THE FOLLOWING

1. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
2. Measurement of Capacitance by De Sauty's bridge
3. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement ofStrain using half and full bridge.)
4. To determine the Characteristics of LVDT.
5. To determine the Characteristics of Thermistors and RTD.
6. Measurement of temperature by Thermocouples.
7. Design a regulated power supply of given rating (5 V or 9V).
8. To design and study the Sample and Hold Circuit.
9. To plot the frequency response of a microphone.
10. To determine the Characteristics of strain gauge and RTD.

Reference Books:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. David A. Bell, Electronic Instrumentation & Measurements, Prentice Hall (2013)
3. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
4. Basic Electronics:A text lab manual, P.B.Zbar, A.P.Malvino, M.A.Miller, 1990, Mc-Graw Hill

5TH SEMESTER

DISCIPLINE SPECIFIC ELECTIVES (DSEs)

OPTION - II

ELT516DB: ELTRONICS – DIGITAL SIGNAL PROCESSING

(Credits: Theory-4, Practicals-2)

Unit – I Introduction

Classification of Signals, Periodic and Aperiodic Signals, Energy and Power Signals, Even and Odd Signals, Discrete-Time Systems, System Properties. Impulse Response, Commutative; Associative; Distributive; Shift; Sum Property System Response to Periodic Inputs, Relationship Between LTI System Properties and the Impulse Response; Causality; Stability; Unit Step Response. **(15 Lectures)**

Unit-II Z Transform:

The z-Transform: Bilateral (Two-Sided) z-Transform, Inverse z-Transform, Relationship Between z-Transform and Discrete-Time Fourier Transform, z-plane, Region-of- Convergence; Properties of ROC, Properties; Time Reversal; Differentiation in the z-Domain.**(15 Lectures)**

Unit- III Discrete Fourier Transform:

The Discrete Fourier Transform (DFT) and its Inverse, DFT as a Linear transformation, Properties; Periodicity; Linearity; Circular Time Shifting; Circular Frequency Shifting; Circular Time Reversal; Multiplication Property; Parseval's Relation, Linear Convolution Using the DFT (Linear Convolution.Using Circular Convolution), Circular Convolution as Linear Convolution with aliasing. **(15 Lectures)**

Unit- IV Fast Fourier Transform:

Direct Computation of the DFT, Symmetry and Periodicity Properties of the Twiddle factor (W_N), Radix-2 FFT Algorithms; Decimation-In-Time (DIT) FFT Algorithm; Decimation-In-Frequency (DIF) FFT Algorithm, Inverse DFT Using FFT Algorithms. DFT as linear transformation tool **(15 Lectures)**

Reference Book

1. Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India
2. Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
3. Principles of Signal Processing and Linear Systems, B.P. Lathi, 2009, 1st Edn. Oxford University Press.
4. Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L.Harris, 2005, Cengage Learning.

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Semester- V

ELE-DSE-2A LAB: DIGITAL. SIGNAL PROCESSING

AT LEAST 10 EXPERIMENTS FROM THE FOLLOWING

1. Writes program to generate and plot the following sequences! (a) Unit Sample **sequence** δ[n], [b]unit step sequence u(n), (c) ramp sequence *r(n)* {d} real valued exponential sequence xn = 0.8 lu(n) for 0≤ n ≤ 50.
2. Write a program to compute the convolution sum of a rectangle signal (or gate function) with itself for N = 5

$$= (n) = rect(n/2N) = \prod(n/2N) = \begin{cases} 1 - N \le n \le N \\ 0 \quad Otherwise \end{cases}$$

2. An LTI system is specified by the difference equation

1. $$y(n) = 0.8y(n-1) + xn$$

(a) Determine H (e^{jw})

3. Given a casual system

$$y(n) = 0.9y\,(n-1) + x\,(n)$$

Find H(z) and sketch its pole-zero plot

4. Plot the frequency response of $|H(e^{jw}) and \le H(e^{jw})|$
5. Design a digital filter to eliminate the lower frequency sinusoid of x(t) sin 7t + sin 200t. The sampling frequency is $fs = 500\ HZ$Plot its pole zero diagram magnitude response, input and output of the filter.
5. Let x(n) be a 4-point sequence:

$$xn = \underset{\uparrow}{\{1,1,1,1\}} = \begin{cases} 1 & 0 \le n \le 3 \\ 0 & otherwise \end{cases}$$

Compute the DTTT $X\ (e^{jw})$ and plot its magnitude

(a) Compute and plot the 4 point DFT of x (n)

(b) Compute and plot the 8 point DFT of x (n) (by appending *4* zeros)

(c) Compute and plot the 16 point DFT of *x* (n) (by appending 12 *zeros)*

Reference Book

1. Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India
2. Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
3. Principles of Signal Processing and Linear Systems, B.P. Lathi, 2009, 1st Edn. Oxford University Press.
4. Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L.Harris, 2005, Cengage Learning.

5TH SEMESTER

DISCIPLINE SPECIFIC ELECTIVES (DSEs)

OPTION - III

ELT516DC: ELTRONICS – ANTENNA THEORY AND WIRELESS TECHNOLOGY

(Credits: Theory-4, Practicals-2)

Antenna as an element of wireless communication system, Antenna radiation mechanism, Types of Antennas, Fundamentals of EMFT: Maxwell's equations and their applications to antennas. Antenna Parameters: Radiation pattern (polarization patterns, Field and Phase patterns), Field regions around antenna, Radiation intensity, Beam width, Gain, Directivity, Polarization, Bandwidth, Efficiency and Antenna temperature. **(15 Lectures)**

Unit- II Antenna as a Transmitter/Receiver:

Effective Height and Aperture, Power delivered to antenna, Input impedance. Radiation from an infinitesimal small current element, Radiation from an elementary dipole (Hertzian dipole), Reactive, Induction and Radiation fields, Power density and radiation resistance for small current element and half wave dipole antenna. **(15 Lectures)**

UNIT- III Radiating wire Structures (Qualitative idea only):

Monopole, Dipole, Folded dipole, Loop antenna and Biconical broadband Antenna. Basics of Patch Antenna and its design. Examples of Patch antenna like bowtie, sectoral, fractal, Horn Antenna etc. **(15Lectures)**

Unit- IV Propagation of Radio Waves:

Different modes of propagation: Ground waves, Space waves, Space Wave propagation over flat and curved earth, Optical and Radio Horizons, Surface Waves and Troposphere waves, Ionosphere, Wave propagation in the Ionosphere. Critical Frequency, Maximum usable frequency (MUF), Skips distance. Virtual height. Radio noise of terrestrial and extraterrestrial origin. Elementary idea of propagation of waves used in Terrestrial mobile communications. History of wireless communication. **(15 Lectures)**.

Reference Books

1. Ballanis, Antenna Theory, John Wiley & Sons, (2003) 2nd Ed.
2. Jordan and Balmain, E. C., Electro Magnetic Waves and Radiating Systems, PHI
3. Andrea Goldsmith, Wirelerss communications, (2015) Cambridge University Press
4. D. Tse and P. Viswanathan, Fundamentals of Wireless Communication, (2014)

Electronics

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Semester- V

ELE-DSE-3A LAB: ANTENNA THEORY AND WIRELESS NETWORKS LAB

AT LEAST 10 EXPERIMENTS FROM THE FOLLOWING

1. Study Of Microwave Components
2. Mode Characteristics Of Reflex Klystron
3. Impedance Measurement
4. Directional Pattern Of Horn Antenna
5. Characteristics Of Directional Coupler
6. Study Of E Plane, H Plane And Magic Tee
7. Fiber Optic Communication Links
8. Numerical Aperture & Attenuation Measurement In Fibres
9. Charecteristics Of Laser Diode
10. Led & Photo Diode Characteristics
11. Study Of Propagation Loss & Bending Loss

Reference Books:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. David A. Bell, Electronic Instrumentation & Measurements, Prentice Hall (2013)
3. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
4. Basic Electronics:A text lab manual, P.B.Zbar, A.P.Malvino, M.A.Miller, 1990, Mc-Graw Hill

5TH SEMESTER

DISCIPLINE SPECIFIC ELECTIVES (DSEs)

OPTION - IV

ELT516DD: ELTRONICS – PROGRAMMABLE DEVICES AND ASICS

(Credits: Theory-4, Practicals-2)

Review of combinational circuits, Combinational building blocks: multiplexers, demultiplexers, decoders, encoders and adder circuits, Review of sequential circuit elements: flip-flop, latch and register. **(15 Lectures)**

Unit-II: Finite State Machines

Mealy and Moore, Other sequential circuits: shift registers and counters, FSMD (Finite State Machine with Datapath), design and analysis, Microprogrammed control, Memory basics and timing, Programmable Logic devices. **(15 Lectures)**

Unit-III: Programmable logic devices

PAL, PLA and GAL, CPLD and FPG Architectures, Placement and routing, Logic cell structure, Programmable interconnects, Logic blocks and I/O Ports, Clock distribution in FPGA, Timing issues in FPGA design, Boundary scan. **(15 Lectures)**

Unit-IV: Application Specific Integrated Circuits

Introduction to ASICs, Advantages of ASICs, Disadvantages of ASICs, Types of ASICs, ASIC Design Flow. **(15 Lectures)**

Recommended Books:

1. Geoff Bostock, Programmable Logic Handbook, Butterworth-Heinemann Ltd.
2. John W. Carter, Digital Designing with Programmable Logic Devices, Prentice Hall.
3. Ming-BoLin. Digital System Designs and Practices: Using Verilog HDL and FPGAs, Wiley India Pvt Ltd.
4. Wayne Wolf, FPGA Based System Design. Pearson Education.
5. Michael John S. Smith, Application Specific Integrated Circuits, Pearson.

Semester- V

ELE-DSE-4A: PROGRAMMABLE LOGIC DEVICES AND ASICS LAB

AT LEAST 10 EXPERIMENTS FROM THE FOLLOWING TOPICS

1. Study all the basic gates
2. Study all the basic combinational functions using only MUX
3. Study different types of Flip Flops and ICs
4. Study full adder and subtractor circuit
5. Study the different types of ASICs
6. Study the different types of FPGAs
7. Study the Different types of CPLDs
8. Study FPGA and CPLD boards.

Reference Books:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. David A. Bell, Electronic Instrumentation & Measurements, Prentice Hall (2013)
3. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
4. Basic Electronics:A text lab manual, P.B.Zbar, A.P.Malvino, M.A.Miller, 1990, Mc-Graw Hill