DISCIPLINE SPECIFIC ELECTIVES (DSE) COURSES OFFERED BY THE DEPARTMENT

DISCIPLINE SPECIFIC ELECTIVE COURSE: Reliability and Quality Control (INDSE5A)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Reliability and Quality Control (INDSE5A)	04	03	-	01	Class XII passed with Physics + Mathematics/Applied Mathematics/ + Chemistry/Computer Science/Informatics Practices	Statistics & probability

Learning Objectives

The Learning Objectives of this course are as follows:

- To provide the thorough understanding of concepts of reliability
- To clarify the basic knowledge of quality concepts and techniques for quality improvement
- To teach, how to use various control charts for improving the product quality
- To provide the clear understanding of different sampling plans and methods

Learning outcomes

The Learning Outcomes of this course are as follows:

- Acquire the basic knowledge of quality concepts and techniques for quality improvement
- Learn to use various control charts for improving the quality of products
- Describe and compare the different sampling plans and methods
- Understand the concepts of reliability

SYLLABUS OF DSE-3

UNIT – 1 **(12 hours)**

Quality Concepts: Meaning of Quality, Approaches- Deming's Approach, Juran's Approach, Quality of Product, Quality of Service, Cost of Quality, Value of Quality, Difference between Inspection, Quality Control and Quality Assurance, Evaluation of Quality control, Quality Improvement Techniques Pareto Diagrams, Cause-Effect Diagrams Quality Circles, Kaizen, six sigma.

UNIT – 2 **(11 hours)**

Control Charts: Chance and assignable causes, Statistical Basis of the Control Charts (basic principles, choices of control limits, sample size and sampling frequency, rational subgroups, analysis of pattern on control charts, warning limits, ARL, sensitizing rules for control charts, Control Charts for X-bar & R and control chart for attribute (p, np, c).

UNIT – 3 **(11 hours)**

Acceptance Sampling: Meaning, objective, and types of research, approaches, Principle of acceptance sampling, Producer's and consumer's risk. AOQL and LTPD, Sampling plans: single, double, OC curve.

UNIT – 4 **(11 hours)**

Reliability: Different types and modes of failure, causes of failure in electronic components, reliability theory, hazard rate, failure density function, availability, maintainability, mean time to failure and repair system structures: series, parallel, K-type, Fault tree analysis.

Practical component: **(30 hours)**

1. Descriptive statistics
2. Control charts for variable
3. Control charts for attribute
4. OC curve
5. Single sampling and double sampling
6. AOQ curve

Essential/recommended readings

1. D. C. Montgomery , Introduction to Statistical Quality Control, 8th edition, John Wiley and sons (2019).
2. Reliability Engineering by S.Shreenath, 4th Edition, East West Press (2008).
3. Statistical Quality Control by M. S. Mahajan, 1st Edition, Dhanpat Rai Publishing Co Pvt Ltd (2016).

Suggestive readings

1. Reliability Engineering and Quality Management by O.N. Pandey & Bhupesh Aneja, 1st Edition, 2011.
2. Modern Methods for Quality Control and Improvement, by Harrison M. Wadsworth, Kenneth S. Stephens, A. Blanton Godfrey, Second edition (17 May 2008)

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC ELECTIVE COURSE : Communication Systems (INDSE5B)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Communication Systems (INDSE5B)	04	03	-	01	Class XII passed with Physics + Mathematics/ Applied Mathematics+ Chemistry /Computer Science/Informatics	Analog and Digital Electronics

Learning Objectives

The Learning Objectives of this course are as follows:

- Understand basic elements of a communication system.
- Analyze baseband signals in time and frequency domain.
- Understand various analog and digital modulation/demodulation techniques along with their performances in various transmission environments.
- To understand working of radio receivers and transmitters

Learning outcomes

The Learning Outcomes of this course are as follows:

- Learn in detail about the various components of communication systems like transmitter, modulator, channel, and receiver
- Gain in-depth knowledge of analog (amplitude, frequency, and phase) and digital modulation and demodulation techniques
- Understand different multiplexing techniques for efficient utilization of available bandwidth

SYLLABUS

Unit-1 **(10 hours)**

Basic communication system: Block diagram, Noise, Analog and digital communication, Types of communication systems: optical communication, cellular communication and satellite communication, LAN

Unit-2 **(11 hours)**

Amplitude Modulation, Frequency and phase modulation: Definition - AM waveforms - Frequency spectrum and bandwidth - Modulation index - DSB-SC, SSB-SC, Vestigial SB - Comparison and application of various AM schemes, Definition-Relationship between FM & PM - Frequency deviation - Spectrum and transmission BW of FM, comparison of AM and FM systems.

Unit-3 **(12 hours)**

Radio Transmitter and Receiver: AM transmitters-High level and low level transmitters - SSB transmitters - FM transmitters - Block diagram. AM receivers-operation - performance parameters - Communication Transceivers - Block diagram - SSB receiver - FM receivers - Block diagram.

Unit-4 **(12 hours)**

Digital Communication: Pulse Analog Modulation: Sampling theorem, Errors in Sampling. Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM). Pulse Width Modulation (PWM) and Pulse Position Modulation(PPM). Generation and detection of PAM, PWM, PPM, PCM- Need for digital transmission, Quantizing, Uniform and Non-uniform Quantization, Quantization Noise, Companding, Coding, Digital Formats. Decoding, Regeneration, Transmission noise and Bit Error Rate. Differential Pulse Code Modulation, Delta Modulation, Quantization noise, Adaptive Delta Modulation.

Practical component: **(30 hours)**

1. Study of Amplitude Modulation and Demodulation
2. Study of Frequency Modulation and Demodulation
3. Study of Single Side Band Modulation and Demodulation
4. Study of AM Transmitter and Receiver
5. Study FM Transmitter and Receiver
6. Study of Pulse Amplitude Modulation
7. Study of Pulse Width Modulation
8. Study of Pulse Position Modulation
9. Study of Pulse Code Modulation

Essential/recommended readings

1. Electronic communication systems- Kennedy, 3rd edition, McGraw international publications
2. Principles of Electronic communication systems – L. E. Frenzel, 3rd edition, McGraw Hill
3. Modern Digital and Analog Communication Systems, B. P. Lathi (2nd Edition).
4. Communication systems, R.P.Singh and S.D.Sapre 2nd edition TMH 2008
5. Advanced electronic communications systems – Tomasi, 6th edition, PHI
6. L. W. Couch II, Digital and Analog Communication Systems, Pearson Education.
7. T. G. Thomas and S. Chandra Sekhar, Communication Theory, Tata McGraw Hill.

Suggestive readings

1. H. Taub and D. Schilling, Principles of Communication Systems, Tata McGraw Hill
2. W. Tomasi, Electronic Communication Systems: Fundamentals through Advanced, Pearson Education
3. S. Haykin, Communication Systems, Wiley India.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC ELECTIVE COURSE : Computer Aided Design (INDSE5C)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Computer Aided Design (INDSE5C)	04	02	-	02	Class XII passed with Physics + Mathematics/Applied Mathematics+ Chemistry / Computer Science/Informatics	Analog and Digital Electronics

Learning Objectives

The Learning Objectives of this course are as follows:

- To familiarize with MultiSim and PSPICE circuit simulation tools
- To verify response of various analog and digital circuits
- To provide knowledge of Industry standard TCAD simulation tools like Silvaco-ATLAS and and Synopsis-SENTAURUS

Learning outcomes

The Learning Outcomes of this course are as follows:

- Simulate and verify the functionality of diodes and transistor circuits using MultiSim and PSpice software
- Design and verify devices/ circuits using TCAD tools

SYLLABUS OF DSE-3

UNIT – 1 **(6 hours)**

Introduction to Multisim software: MultiSim Environment: Design Process, setting environment preferences, Multisim GUI, Schematic capture of circuits: Placing components, wiring components, Measuring instruments in MultiSim, simulation and result display in MultiSim

UNIT – 2 **(6 hours)**

Electronics circuit design using Multisim: Resistive circuits, Design of Bridge rectifier, Half-Wave rectifier, clippers and clampers using a diode, DC transfer curve analysis, Transient analysis, simulation of digital circuits.

UNIT – 3 **(8 hours)**

Introduction to PSpice software Understanding the SPICE Environment, Schematic Designing Brief Introduction of p spice simulator, Using Model Editor, Understanding the PSPICE Environment, Using Magnetic Parts Editor, Using Stimulus Editor, Drawing a Circuit Preparation for Simulation: Preparing schematic for simulation, Understand the sources for simulation, Understand different markers and errors

UNIT – 4 **(10 hours)**

Introduction to Industry standard TCAD tools, Silvaco- ATLAS device simulation software, Synosis-SENTAURUS. Online Simulation resources-NANOHUB. Simulation of n-channel MOSFET; Silicon on Insulator.

Practical component: **(60 hours)**

1. Designing RC Low pass filter using MULTISIM
2. Designing active RC Low pass filter (OpAmp based) using MULTISIM
3. Half wave rectifier using MULTISIM
4. Wein bridge Oscillator using MULTISIM
5. Simulating high pass filter Circuit using PSPICE
6. Designing active RC High pass filter (OpAmp based) using PSPICE
7. Half wave rectifier using PSPICE
8. Designing and Simulating Full wave rectifier using PSPICE
9. Output characteristics of MOSFET using SILVACO-ATLAS/ Synopsis TCAD
10. Transfer characteristics of MOSFET using SILVACO-ATLAS/ Synopsis TCAD

Essential/recommended readings

1. Introduction To PSpice Using OrCADfor Circuits and Electronics, Muhammad H. Rashid,Paperback – Import,3rd Edition, 2003.
2. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, PHI, 10th Edition, 2009.
3. https:i/nanohub.org/resources/tools
4. https ://www.silvaco. com/contenVkbase/device.pdf

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.