MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	VLSI Design	EC- 701	Theory	Practical
			Min "D"	Min "D"

Unit-wise Content distribution

Unit	Objective	Contents
Unit-I	Practical Consideration and Technology in VLSI Design	Introduction, Size and complexity of Integrated Circuits, The Microelectronics Field, IC ProductionProcess, Processing Steps, Packaging and Testing, MOS Processes, NMOS Process, CMOS Process,Bipolar Technology, Hybrid Technology, Design Rules and Process Parameters.
Unit-II	Device Modeling	Dc Models, Small Signal Models, MOS Models, MOSFET Models in High Frequency and small signal,Short channel devices, Sub threshold Operations, Modeling Noise Sources in MOSFET's, Diode Models,Bipolar Models, Passive component Models.
Unit-III	Circuit Simulation	Introduction, Circuit Simulation Using Spice, MOSFET Model, Level 1 Large signal model, Level 2Large Signal Model, High Frequency Model, Noise Model of MOSFET, Large signal Diode Current,High Frequency BJT Model, BJT Noise Model, temperature Dependence of BJT.
Unit-IV	Structured Digital Circuits and Systems	Random Logic and Structured Logic Forms, Register Storage Circuits, Quasi Static Register Cells, AStatic Register Cell, Micro coded Controllers, Microprocessor Design, Systolic Arrays, Bit-SerialProcessing Elements, Algotronix.
Unit-V	CMOS Processing Technology	Basic CMOS Technology, A Basic n-well CMOS Process, Twin Tub Processes, CMOS ProcessEnhancement, Interconnects and Circuit Elements, Layout Design Rules, Latch up, Physical Origin, Latchup Triggering, Latch up Prevention, Internal Latch up Prevention Techniques.

References:

1. Geiger, Allen andStrader: VLSI Design Techniques for Analog and Digital Circuits, TMH.
2. Sorab Gandhi: VLSI Fabrication Principles, Wiley India.
3. Weste and Eshraghian:Principles of CMOS VLSI design, Addison-Wesley
4. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson-Education.
5. Pucknell and Eshraghian: Basic VLSI Design, PHI Learning.
6. Botkar: Integrated Circuits, Khanna Publishers.
7. Sze:VLSI Technology, TMH.

MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	Departmental Elective Microwave Engineering	EC- 702 (A)	Theory	Practical
			Min "D"	Min "D"

Unit-wise Content distribution

Unit	Objective	Contents
Unit-I	Features and applications of microwaves	Features and applications of microwaves, Wave propagation in striplines and microstrip lines, Slot lines, Limitations of conventional vacuum tubes, Microwave tubes like Two cavity klystron and Reflex klystron, Magnetron, TWT, Backward wave oscillator etc.
Unit-II	Solid state microwave sources	Solid state microwave sources, transferred electron devices, Tunnel diode Gunn diode and oscillators, IMPATT diode, TRAPATT diode, Pin diode, Varactor diode, Schottky diode, Parametric amplifiers, Crystal diode, Frequency multipliers, Microwave BJT & FET,
Unit-III	Scattering matrix	Scattering matrix, S-parameters & its applications in Network analysis, Matching Network, Detector diodes, detector mounts, detector output indicator, slotted line, measurement of power, impedance & S-parameter, measurement of frequency & VSWR..
Unit-IV	Impedance transformer	Impedance transformer, Microwave filters, Power dividers and directional couplers, E-plane Tee, H-plane tee, Matched hybrid Tee., Wave propagation in ferrite medium, Isolators, Circulators, YIG resonators, Simulation Techniques for design of Microwave Components.
Unit-V	Analysis and design of Dielectric resonators;	Design of RF and microwavelow noise and power amplifiers & oscillators using S-parameter techniques, Mixer and converter design, diode phase shifters, attenuators, Design of hybrid and monolithic, microwave and millimeter wave integrated circuits.

Text Books Recommended :

1. Liao S., Microwave Devices & Circuits''., 2nd ed. 2001,PHI.
2. Gupta K.C., Microwave Engg., 3rd ed. 2004,Wiley Easter Pub.
3. Watson, Solid State Microwave Devices, 5th ed. 2008,Wiley.
4. David M. Pozar, Microwave Engineering, 3rd edition, 2011 Willey India

MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	Departmental Elective Information Theory And Coding	EC- 702 (B)	Theory	Practical
			Min "D"	Min "D"

Unit-wise Content distribution

Unit	Objective	Contents
Unit-I	Information Theory	Information Theory: Introduction to uncertainty, entropy and its properties, entropy of binary memory less source and its extension to discrete memory-less source, Measure of information, Information content of message, Average Information content of symbols. Self information, Mutual information and its properties,
Unit-II	Coding theorem	Coding theorem: Source coding theorem, prefix coding, Shannon's Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman coding, Extended Huffman coding, Arithmetic Coding, Lempel-Ziv Coding, Run Length Encoding.
Unit-III	Information Channels	Information Channels: Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Discrete memory less channels, Binary symmetric channel and its channel capacity, channel coding theorem, and its application to Binary Erasure Channel, Shannon's theorem on channel capacity, capacity of channel of infinite bandwidth, Continuous Channels.
Unit-IV	Error Control Coding	Error Control Coding: Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Probability of undetected error for linear block code in BSC, hamming Codes and their applications, Cyclic Codes: Cyclic codes and its basic properties, Encoding using an (n-k) Bit Shift register, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation, error detection and correction
Unit-V	Introduction to BCH codes	Introduction to BCH codes, its encoding & decoding, error location & correction. Convolution Codes: Introduction to convolution codes, its construction, Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, Viterbi algorithm: Introduction of theorem for maximum likelihood decoding.

Reference Books

1. Digital Communication -by Haykins Simon Wiley Publ.
2. Error control Coding: Theory and Application, - by Shu Lin and Cosstlello, PHI
3. Digital Communication - by Sklar, Pearson Education
4. Error Correcting Codes - by Peterson W., MIT Press
5. Digital Communication - by Proakis,TMH
6. Information Theory, Coding and Cryptography – By Ranjan Bose, TMH
7. Communication Systems – By Singh and Sapre, TMH

MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	Departmental Elective Nano Electronics	EC-702 (C)	Theory	Practical
			Min "D"	Min "D"

Unit-wise Content distribution

Unit	Objective	Contents
Unit-I	Overview of semiconductor physics	Overview of semiconductor physics. Nanoscale band structure and Electron transport, Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires, quantum dots, super-lattices, band offsets, and electronic density of states, heavily doped semiconductors and low dimensional quantum devices.
Unit-II	Introduction to lithography	Introduction to lithography- Contact, proximity printing and Projection Printing, Resolution Enhancement techniques, overlay-accuracies, Mask-Error enhancement factor (MEEF), Positive and negative photoresists, Electron Lithography, Projection Printing, Direct writing, Electron resists.
Unit-III	Tunnel junction and applications of tunneling	Tunnel junction and applications of tunneling, Tunneling Through a Potential Barrier, Metal—Insulator, Metal-Semiconductor, and Metal-Insulator-Metal Junctions, Coulomb Blockade, Coulomb blockade in nanocapacitor, Tunnel Junctions, Tunnel Junction Excited by a Current Source.
Unit-IV	Field Emission	Field Emission, Gate—Oxide Tunneling and Hot Electron Effects in nano MOSFETs, Theory of Scanning Tunneling Microscope, Double Barrier Tunneling and the Resonant Tunneling Diode. Nanoscale MOSFET, Finfets, charge and energy quantization in Single electron devices.
Unit-V	Scaling of physical systems	Scaling of physical systems – Geometric scaling & Electrical system scaling, Introduction to MEMS and NEMS, working principles, as micro sensors (acoustic wave sensor, biomedical and biosensor, chemical sensor, optical sensor, capacitive sensor, pressure sensor and thermal sensor), micro actuation (thermal actuation, piezoelectric actuation).

Text Book:

1. Nano Terchnology and Nano Electronics – Materials, devices and measurementTechniques by WR Fahrner – Springe.
2. Fundamentals of Nanoelectronics, George W. Hanson, 1/e Pearson Education.
3. Nano: The Essentials – Understanding Nano Scinece and Nanotechnology by T.Pradeep; Tata Mc.Graw Hill.
4. Nanotubes and nanowires by C.N.R. Rao and A. Govindaraj, RSC Publishing

MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	Open Elective Cellular Mobile Communication	EC- 703 (A)	Theory	Practical
			Min "D"	Min "D"

Unit-wise Content distribution

Unit	Objective	Contents
Unit-I	Review of Cellular Networks	Introduction to cellular mobile systemA basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system Elements of cellular radio system designGeneral description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.
Unit-II	LTE systems	Cell coverage for signal and traffic General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point- to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation. Cell site antennas and mobile antennas Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.
Unit-III	Wireless Sensor Networks	Cochannel interference reduction Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference. Types of Noncochannel interference, Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.
Unit-IV	Wireless routing Protocols	Frequency management and Channel Assignment Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers, Handoffs and dropped calls, Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.
Unit-V	Internet of things	Digital Cellular Systems GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple

	(IoT) and GPS systems	access scheme.CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures.Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pears
3. Lee: Mobilecommunications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	Open Elective Internet Of Things	EC- 703 (B)	Theory	Practical
			Min "D"	Min "D"

Unit-wise Content distribution

Unit	Objective	Contents
Unit-I	Introduction	Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.
Unit-II	Machine-to-machine (M2M),	Machine-to-machine (M2M), SDN (software defined networking) and NFV(network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.
Unit-III	Design Principles for Web Connectivity	Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, MQTT, CoAP, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.
Unit-IV	Sensor Technology	Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology.
Unit-V	IOT Design methodology	IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view.IOT Privacy and security solutions, Raspberry Pi &arduino devices.IOT Case studies: smart city streetlights control & monitoring.

Reference Book:

1. Rajkamal,"Internet of Things", Tata McGraw Hill publication
2. Vijay Madisetti and ArshdeepBahga, "Internet of things(A-Hand-on-Approach)" 1st Edition ,Universal Press
3. Charless Bell "MySQL for the Internet of things",Apresspublicatons.
4. Francis dacosta "Rethinking the Internet otthings:A scalable Approach toconnecting everything", 1st edition, Apresspublications .
5. HakimaChaouchi "The Internet of Things: Connecting Objects", Wileypublication.
6. Donald Norris"The Internet of Things: Do-It-Yourself at Home Projects for Arduino,Raspberry Pi and BeagleBone Black", McGraw Hill publication.

MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	Probability Theory and Stochastic processing	EC 703 (C)	Theory	Practical
			Min "D"	Min "D"

Unit-wise Content distribution

Unit	Objective	Contents
Unit-I	Probability and Random Variable	Probability introduced through Sets and Relative Frequency, Experiments andSample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events. Random Variable: Definition of a Random Variable, Conditions for a Function to be aRandom Variable, Discrete, Continuous and Mixed Random Variables
Unit-II	Distribution & Density Functions and Operation on One Random Variable	Expectations Distribution; Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, Properties. Operation on One Random Variable – Expectations: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.
Unit-III	Multiple Random Variables and Operations	Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions. Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random

		Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.
Unit-IV	Stochastic Processes – Temporal Characteristics	The Stochastic Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, Nth Order and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process.
Unit-V	Stochastic Processes – Spectral Characteristics	Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross- Power Spectral Density of Input and Output of a Linear System.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles,4Ed., 2001, TMH.
2. Probability and Random Processes – Scott Miller, Donald Childers, 2 Ed, Elsevier, 2012.REFERENCE BOOKS:
3. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S.Unnikrishna Pillai, 4 Ed., TMH.
4. Theory of Probability and Stochastic Processes- Pradip Kumar Gosh, University Press
5. Probability and Random Processes with Application to Signal Processing – Henry Starkand John W. Woods, 3 Ed., PE
6. Probability Methods of Signal and System Analysis - George R. Cooper, Clave D. MCGillem, 3 Ed., 1999, Oxford.
7. Statistical Theory of Communication - S.P. Eugene Xavier, 1997, New Age Publications.

MADHYANCHAL PROFESSIONAL UNIVERSITY, BHOPAL

Branch	Subject Title	Subject Code	Grade for End Semester	
Electronics & Communication Engineering	IOT LAB	EC 705	Theory	Practical
			Min "D"	Min "D"

L

List of Experiments

LAB INDEX Design, Developed and implement following using Arduino, Raspberry Picompiler and Python language in Linux/Windows environment.

1. Study and Install IDE of Arduino and different types of Arduino.
2. Write program using Arduino IDE for Blink LED.
3. Write Program for RGB LED using Arduino.
4. Study the Temperature sensor and Write Program foe monitor temperature usingArduino.
5. Study and Implement RFID, NFC using Arduino.
6. Study and Configure Raspberry Pi.
7. WAP for LED blink using Raspberry Pi.
8. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.9 .
9. Study and implement MQTT protocol using Arduino.
10. Study and implement CoAP protocol using Arduino.