	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3BS03	Mathematics-III	3	1	0	4

UNIT I GRAPH THEORY-I

Basic definitions of Graphs, Isomorphism, Walk, Path, Circuit, connectivity of a graph, cut points, cycles, Hamiltonian graphs, sub graphs, spanning sub graphs, isomorphic graphs, Digraphs(basic definitions of digraphs),Matrix Representation of Graphs (Adjacency, Incidence Matrices andCircuit Matrix).

UNIT II GRAPH THEORY-II

Weighted graph,Shortest Path in a weighted graph: Dijkstra's Algorithm, Tree, Properties of Tree, Binary Tree, Fundamental Circuit, Minimal Spanning Tree: Kruskal's Algorithm, Prim's Algorithm,Ford-Fulkerson Algorithm for Maximum Flow; Max Flow – Min Cut Theorem. Cut Set, Fundamental Cut Set and Cut Vertices, Application of graphs in network flows.

UNIT III SPECIAL FUNCTIONS:

Series solutions ordinary differential equations, Solution of Bessel and Legendre differential equation, Bessel functions, Legendre functions, recurrence relations, orthogonality properties, Ber and Bei functions.

UNIT IV FUNCTIONS OF RANDOM VARIABLE:

Expectation, Variance, Moments, Characteristic functions Problems, joint moments, joint characteristic functions, conditional distributions, conditional expected values, Random Process concept, Stationarity and independence. Distribution and density of a sum of random variables, Central limit theorem. The random process concept, Stationarity and independence,ergodicity.

UNIT V STATISTICS

Correlation, Karl Pearson's Coefficient of Correlation,Spearman's Rank Correlation Coefficient , Linear Regression, Regression coefficients ,Curve fitting (Method of Least Square),Testing of Hypothesis , Student's t-test, Fisher's z-test, Chi-Square test**.**

TEXT BOOKS:

1. Davenport, "Probability and Random Processes for Scientist and Engineers", McGraw-Hill.
2. Kishor S Trivedi, "Probability and Statistics with Reliability, Queuing and Computer Applications", Prentics Hall of India.
3. Rathor, Choudhari,: Descrete Structure And Graph Theory.
4. Advanced Engineering Mathematics: by Erwin Kreyszig, John Wiley and Sons.
5. Martin Vetterli, Jelena Kovacevic, "Wavelets and Subband Coding", Prentice Hall Inc.

REFERENCE BOOKS:

1. Hwei P. Hsu, "Theory and Problems of Probability, Random Variables, and Random Processes", Schaum series., TMH.
2. Murray R. Spiegel, "Probability and Statistics", McGrawHll, Schaum's Outline Series.
3. A. Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes, McGrawHill, 4th Edition.
4. Richard A Johnson, "Probability and Statistics for Engineers", Prentice hall, India.
5. Stephen G. Mallat, "A Wavelet Tour of Signal Processing," 2nd Edition, Academic Press.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO01	Signal and System	3	0	0	3

UNIT ISIGNALS:
Basic definition of signals, Classification of Signals, Signal operations & properties, Analogy between Vectors and Signals, Orthogonal Signals, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function, Case study of different signals from communication field.

UNIT II ANALYSIS OF SIGNALS: -
Fourier Series Analysis of CT signals, Fourier Transform, properties of Fourier Transform, Laplace transform in signal analysis, Sampling of CT signals & aliasing.
Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal. Discrete Fourier series and its properties, DTFT and its properties.

UNIT III SYSTEMS:
Basic of systems, system properties: Linearity, Static and dynamic, stability and causality, time invariant and variant system, invertible and non-invertible, representation of continuous systems. Continuous Time LTI System:- Differential Equation, Block Diagram representation, Impulse response and convolution integral, properties of convolution, signal responses to Continuous LTI system,

UNIT IV DISCRETE TIME SYSTEM:
Introduction, Properties of discrete time systems, Impulse response characterization and convolution sum, Properties of convolution summ, Discrete systems described by difference equation, solution of difference equation, Impulse response of DT-LTI system.

UNIT V Z-TRANSFORM:
Concept of Z- Transform of a Discrete Sequence, Two sided and single sided Z-transform, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms. Solution of difference equation using Z-transform, Relationship between Z-transform and DTFT, Relation between Z-transform and Laplace Transform.

TEXT BOOKS:

1. Alan V. Oppenheim, Alan S. Wilsky and Nawab, Signal & system, Pearson Education.
2. Simon Haykin and Bary Van Veen, Signal & System, Wiley- India Publications

3. B.P.Lathi, Linear Signal & System, Oxford University Press
4. Anand Kumar, "Signal & System", PHI Learning.

REFERENCES:

1. H P Hsu, Rakesh Ranjan, Signal and System, Schaum's Outlines, Tata McGraw Hill, Indian Reprint.
2. Michel J. Robert, "Fundamentals of Signals and Systems" MGH International Edition.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO03	Electronic Devices and Circuits	4	0	2	5

UNIT-I SEMI-CONDUCTORS AND DIODES:

Introduction, Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors, Charge Densities, Hall Effect, Drift and diffusion current Continuity equation.

PN junction diode- Construction of PN junction diode, space charge region, barrier potential and energy hill in PN junction diode. Forward and reverse biasing, V-I characteristics of PN junction, diode resistance and diode junction capacitance, temperature dependency.

Types of diodes- Zener, Photodiodes, LED, Varactor diode, Tunnel diode, Schottky diode. Rectifiers and filter circuit: Half wave rectifier, Full wave rectifier, bridge rectifier and their analysis, Clippers , Clampers, Regulated supply using zener diode.

UNIT-II BIPOLAR JUNCTION TRANSISTOR:

Construction, basic operation, current components ,CB, CE and CC- configuration, input and output characteristics, Early effect, Region of operations: active, cut-off and saturation region. BJT as an amplifier, Ebers-Moll model, Power dissipation in transistor (P d, max rating).

Transistor biasing circuits and analysis: Introduction, various biasing methods:Fixed bias,Self bias, Voltage Divider bias, Collector to base bias, Load-line analysis: DC and AC analysis, Operating Point , Bias Stabilization and Thermal Runaway.

AC Model: h-parameter model of BJT, Hybrid π model of BJT.

UNIT - III FIELD EFFECT TRANSISTORS

FET : Construction, n-channel and p-channel, transfer and drain characteristics, Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET, drain and transfer Characteristics.

UNIT -IV AMPLIFIER AND OSCILLATORS:

Amplifier Types and Analysis: Introduction, Voltage amplifier, current amplifier, transconductance amplifier and transresistance amplifier. Analysis of transistor amplifier using h-parameter model,Single stage RC coupled amplifier.

Multistage Amplifier: Cascading amplifier, Boot-strapping Technique, Darlington amplifier and cas-code amplifier, Coupling methods in multistage amplifier,Low and high frequency response.

LargeSignal analysis and Power Amplifiers:Class A,Class B,Class AB,Class C,Class D, Transformer coupled and Push-Pull amplifier.

UNIT-V FEEDBACK AMPLIFIER AND OSCILLATORS:

Feedback Amplifier: Classification of amplifiers, The Basic concepts of Feedback, Effect of Negative Feedback, Varoius Feedback Topologies,Method Of Identifying Feedback Topology and Feedback Factor , Stability Of Feedback Amplifier.
OSCILLATORS: Criterion for oscillation, Types of oscillators: Hartley oscillator, Colpitt oscillator, RC-phase shift oscillator, Wein bridge oscillator.

TEXTBOOKS

1. Millman and Halkias: Integrated electronics, TMH.
2. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.

REFERENCES:

1. Sedra and Smith: Microelectronics, Oxford Press.
2. Anil K. Maini, VarshaAgarwal: Electronic Devices and Circuits, Wiley Publications.
3. Donald A Neamen: Electronic Circuits Analysis and Design, TMH
5. Salivahanan: Electronic Circuits Analysis and Design, TMH
6. Mottershead: Electronic Devices and Circuits an introduction, PHI
7. Kumar and Jain: Electronic Devices and Circuits, PHI.
8. David A. Bell Electronic Devices and Circuits Oxford University press.

LIST OF PRACTICALS:

1. To determine and analyzethe V-I characteristics of PN Junction diode and Zener diode.
2. To realize and analyze full wave rectifier with different filters.
3. To realize and analyze different clipper and clamper circuits.
4. To determine input and output characteristics of transistor amplifiers in CE, CB &CC configurations.
5. To determine the frequency response of transistor CE amplifier, direct coupled and RC coupled amplifier.
6. To determineDrain and Transfer Characteristicsof JFET .
7. To determineDrain and Transfer Characteristicsof Enhamncement and Depletion type MOSFET .
8. To determine the frequency response of two stage CE amplifier with direct coupling and RC coupling.
9. To determinecharacteristics of class A and B power amplifiers.
10. Realization of Wein Bridge and RC Phase Shift Oscillator.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO05	Circuit Analysis and Synthesis	3	1	2	5

UNIT -I INTRODUCTION TO CIRCUIT THEORY

Graphs, Tree, Tree branches and links, cut sets, and tie set schedules. Basic circuit element R,L,C elements,Ideal and Practical voltage and current sources,controlled & uncontrolled sources,source transformation,Star and delta conversion, KCL and KVL analysis, Nodal & mesh analysis of circuits containing resistors and independent and dependent sources. Dot convention,coupling coefficient,tuned circuits,series & parallel resonance.

UNIT- II TRANSIENT ANALYSIS AND CIRCUIT THEOREMS

Response of RL,RC and RLC circuits for unit step, ramp, and impulse function. Transients in RL,RC and RLC circuits, initial and final conditions, time constants and steady state analysis.

Linearity of a Circuit and Superposition Theorem, Thevenin's Theorem and Norton's Theorem -Determination of Equivalents for Circuits with Dependent Sources ,Reciprocity Theorem , Maximum Power Transfer Theorem , Millman's Theorem, Tellegen's theorem ,Substitution Theorem, Compensation Theorem.

UNIT -III LAPLACE TRANSFORM

Laplace Transform,Properties of Laplace transform, Initial value and Final Value Theorem, Solution of integral and differential equations using Laplace Transform, Time domain analysis of LTI network using Laplace transform, Waveform Synthesis, LT of Complex waveforms,.Concept of Transfer function, Relation between impulse response and system function.

UNIT- IV TWO PORT NETWORK

Two Port Network Analysis: Introduction, z parameters, y- parameters, hybrid parameter, ABCD parameters, condition of reciprocity and symmetry in two port parameter presentation. Interrelationship between parameters of two port networks. Expression of input and output impedance in terms of two port parameter, ladder network, equivalent T and π section representation in parametric form.

UNIT-V NETWORK SYNTHESIS

Synthesis of Passive Networks, Concept of Stability of a System from Pole Zero Concept, Necessary condition of Stability of a Network Function, Hurwitz Polynomial, Properties of Hurwitz Polynomials, Positive Real Function, Concept of Network Synthesis, Reactive Network, Driving Point Immitance of LC Network, LC Network

Synthesis, Foster and Cauer form, RC and RL Network Synthesis By Foster and Cauer form.

TEXT BOOKS:

1. Network Analysis :- By M.E Van Valkenburg PHI Publication
2. Engineering Circuit Analysis : - By W H Hayt, J E Kemmerly, S M Durbin 6th Edition TMH Publication
3. Network Analysis & Synthesis By Franklin S. KUO, Wiley Publication
4. Fundamentals of Electric Circuits By Matthew N.O. Sadiku,McGraw-Hill International

REFERENCE BOOKS:

1. Roy Choudhary D; Network and systems; New Age Pub.
2. Sudhakar Circuit Network Analysis & Synth (TMH).
3. S P Ghosh, A K Chakraborty Network Analysis & Synth. (MGH).

WEB

1. http://www.nptelvideos.in/2012/11/networks-signals-and-systems.html

LIST OF PRACTICALS

1. To measure and calculate currents and voltages for a given resistive circuit and verify KCL and KVL.
2. To verify superposition theorem experimentally for a given resistive circuit consisting two independent sources .
3. To verify Thevenin's theorem and Norton's theorem experimentally for a given circuit.
4. To verify maximum power transfer theorem experimentally for a given circuit.
5. To verify reciprocity theorem experimentally for a given circuit.
6. To measure and calculate Z-parameters for a given two-port system.
7. To measure and calculate Y-parameters for a given two-port system.
8. To measure and calculate h-parameters for a given two-port system.
9. To measure and calculate ABCD-parameters for a given two-port system. To measure and calculate RC time constant for a given RC circuit.
10. To measure and calculate RL time constant for a given RL circuit.
11. To Find Frequency Response of RLC Series Circuit RLC parallel Circuit and determine resonance and 3-dB frequencies.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO07	Digital Electronics	3	0	2	4

UNIT INUMBER SYSTEM :
Introduction to binary numbers, data representation , binary, octal, hexadecimal number system and their conversion, Various coding schemes such as BCD codes, Excess-3 code, Gray code. Binary arithmetic, Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard forms, minimization techniques, Sum of products and Product of Sums Simplification, Karnaugh's map method, Quine Mecluskey method.

UNIT IILOGIC GATES AND COMBINATIONAL LOGIC:
Digital Logic Gates such as AND,OR, NAND,NOR, EX-OR,EX-NOR. Realization of Boolean functions using logic gates. Adders, substractors, BCD adder, magnitude comparator, decoders and encoders, multiplexers and demultiplers, code converters. Analysis and design of combinational circuits. Implementation of combinational logic using multiplexers, decoders etc.

UNIT IIISEQUENTIAL CIRCUITS:
Introduction, comparison of sequential and combinational circuits. Various types of flip-flops and their conversions, triggering of flip flops, timing issues, setup and hold times, registers, counters, ring, johnson, asynchronous and synchronous. Finite state machines, Moore and Mealy, design of synchronous sequential circuits.

UNIT IVMEMORIES:
ROM, PLA and PAL. Memories : organisation and construction of RAM, SRAM, DRAM, ROM, PROM, EPROM, EEPROM.

UNIT VLOGIC FAMILIES:
DTL, RTL, TTL, IIL, PMOS, NMOS and CMOS logic families, interfacing between TTL and MOS vice-versa.

Text Book:

1. D Roy Chudhury, Digital Electronics,Vol-I & II,TMH Publication.
2. M. Mano, Digital and Computer Design, Pearson Education.

REFERENCES :

1. Leach and Malvino, Digital Principles and Applications, TMH.
2. Millman and Taub, Pulse, Digital and Switching Waveforms, MGM.
3. A.Anand Kumar: Digital Circuits, PHI.

4. Salivahanam and Ari Vahagan: Digital Circuits and Design, Vikas Publishing House.

LIST OF PRACTICALS :-

1. To test and study of operation of all logic gates for various IC's
2. Implementation of AND, OR, NOT, XOR and XNOR gates using universal gates.
3. Binary addition by half adder and full adder.
4. Binary substraction by half substractor and full substractor circuit.
5. Design of BCD to excess-3 code converter.
6. Realization of circuit for binary to gray conversion and vice-versa.
7. Verification of Demorgans' theorem.
8. Study of RS, JK, T and D flip flops
9. Realization of 4 bit binary counter.
10. Realization of 4-bit shift register.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3ES09	Engineering Material	3	0	0	3

UNIT I BASIC

Atomic structure, molecules and general bonding principles, crystal system and structure , Miller indices, Bravais lattice, crystal structure for metallic elements, structural imperfections, dielectric parameters, polarization, static dielectric constant of solids, ferroelectric materials, piezoelectricity, complex dielectric constant, dielectric loss, insulating materials and their properties, composite materials.

UNIT II MAGNETIC MATERIALS

Fundamental concepts pertaining to magnetic fields, magnetic dipole movement of current loops, orbital magnetic dipole movement and angular momentum of simple atomic model, classification of magnetic materials, spin magnetic moment, paramagnetic, ferromagnetism, spontaneous magnetization and Curie-Weiss law, ferromagnetic domains, magnetic anisotropy, magnetostriction, anti-ferromagnetism, ferrites and its applications.

UNIT III CONDUCTORS AND INSULATORS

The resistivity range, free electron theory, conduction by free electrons, conductors and resistor materials, resistivity of metals, Linde's rule, Joule's law, thermal conductivity, Electronic and Ionic conduction, Energy Band structures in solids, Electron Mobility, Temperature variation of conductivity, Superconductivity - The free electron model, thermodynamics and properties of superconductors, Meissner effect, classification of superconductors.

UNIT IV SEMI-CONDUCTING MATERIALS

The energy gap in solids, intrinsic semiconductor, extrinsic semiconductor, Temperature Dependenceof Conductivity, Direct and Indirect Band gap. Semiconductors, Hall Effect, mechanism of current flow, drift current, diffusion current, Einstein relation, fabrication of integrated circuits, some semiconductor devices.

UNIT V OPTICAL PROPERTIES OF MATERIALS

Introduction, electromagnetic radiation spectrum, refractive index, reflection, Birefringence, dispersion, absorption, photoelectric emission, electroluminescence, photoconductivity, lasers, ruby lasers, Nd-YAG laser, carbon dioxide laser, optical fibers, fiber materials, fabrication of fiber cables.

TEXT BOOKS:

1. Banerjee- Electrical & Electronics Material,PHI.
2. S. O. Kasap- Priniciple of Electronics Material &Device,TMH.
3. Jones-Material Science for Electrical & Electronics Enginnering,Oxford.

4. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
5. Material Science and Engineering-An Introduction: Callister, W.D., John Wiley & Sons, Delhi.
6. Elements of Material Science and Engineering:VanVlack, Wesley Pub. Comp. Introduction to Engineering Materials: B. Agarwal, McGraw Hill Publication

REFERENCE:

1. J.AllisonElectronicsEnginnering, Material &Device,TMH.
2. Gilmore: Material Science, Cengage Learnings.
3. Gupta & Gupta Advance Electrical & Electronics Material,Wieley India.
4. James F.Shackelford - Introduction Material Science for Enginnering Pearson.
5. V.Rajendran -Material science,TMH.
6. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi
7. Material Science - Narula, Narula and Gupta. New Age Publishers

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO15	Electronics Engineering Workshop	0	0	2	1

1. Study of various electrical components and their representation like Resistor, Capacitor, Inductor, Transformer, Fuse, Diode and its types, BJT, FET, MOSFET, SCR , wires etc.

2. Identification and analysis of different types of resistors like carbon composition, carbon film, cracked carbon, metal oxide film, wire-wound, variable resistors. Identification and analysis of various capacitors like paper, silvered paper, mica, silvered mica, ceramic plastic foil, electrolytic also identify various inductors fixed and variable inductors. Identification of values and other specifications like voltage rating, tolerance, temperature using color code and other information (like letter code) specified on the component.

3. Study of IC, types, analysis of the IC number, surface mount devices.

4. Study of Ammeter, Voltmeter and Watt meter. Use of multimeter for measurement of voltage, current, resistance, continuity, diode terminals, BJT testing etc, study of IC tester.

5. Study of CRO and its demonstration kit, Study of different types of probes.

6. Study of different transducers and sensors for the measurement of pressure, temperature, flow, level, displacement.

7. Study of simple experimental set ups for the measurement of physical signals like pressure, displacement etc.

8. Study of PCB , types , steps involved in manufacturing of circuits on PCB such as circuit design, PCB layout, drilling, etching, soldering etc. Introduction to software for PCB design.

9. Study and practice of soldering and de-soldering of electronic components on PCB. Types of soldering, solder material, solder flux. Soldering of SMD.

10. Develop a simple circuit on PCB like power supply (fixed and variable), Opamp Based circuits like filters, oscillators etc..

REFERENCE BOOKS

1 Murthy, D. V. S. Transducers and Instrumentation PHI Learning 2011

2 Kalsi, H.S. Measurement Systems Mcgraw hill Publishers 2011
3 Bell, D.A. Electronic Instrumentation and Measurements PHI Learning 2010
4 Alan Winstanley , "The Basic Soldering Guide", Kindle Edition, July, 2013
5 Raghbir Singh Khandpur., "Printed Circuit Boards: Design, Fabrication, and Assembly " , McGraw-Hill Electronic Engineering-2006

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO17	Linear Integrated Circuit & Applications	3	0	2	4

Unit I-Introduction

Introduction to integrated circuits: Advantages of IC's, basic building components.

Operational Amplifier: Introduction of OP-AMP, Block diagram, characteristics and equivalent circuits of an ideal OP-AMP, Power supply configurations for OP-AMP.

Differential amplifier and analysis: Configurations- Dual input balanced output differential amplifier, Dual input unbalanced output differential amplifier, single input balanced output differential amplifier, single input unbalanced output differential amplifier, Common-Mode Rejection Ratio (CMRR), Current Follower, Voltage Follower.

Characteristics of OP-AMP: Ideal and Practical, input offset voltage, offset current, input bias current, Output offset voltage, Compensation circuits for offset reduction, thermal drift, Effect of variation in power supply voltage, slew rate and its effect, Power Supply Rejection Ratio (PSRR) and gain bandwidth product, frequency limitations and compensations, transient response.

Unit-II OP-AMP Amplifiers and Wave Shaping

OP-AMP applications: Inverting and non-inverting amplifier configurations, summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier.

Generator and Wave Shaping: Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, Voltage Controlled Oscillator, Comparator, Zero Crossing Detector.

Unit-III OP-AMP Filters

Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter, all pass filters, self-tuned filters, AGC and AVC using op-AMP.

Unit-IV Timer

IC-555 Timer concept, Block pin configuration of timer. Mono-stable, Bi-stable and A-stable Multi-vibrator using timer 555-IC,Schmitt Trigger, Voltage limiters, Clipper and clampers circuits, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter.

Unit-V Regulators

Voltage Regulator using OP-AMP, Fixed and Adjustable Voltage Regulators. Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs (LM317, LM78XX and LM79XX). Type of regulator: Series and Shunt, Line and Load Control, Regulated and Unregulated power supply, Switch Mode Power Supply (SMPS)

Text Books:

1. Ramakant A. Gaikwad, OP- Amp and linear Integrated circuits, Pearson.
2. B. Visvesvara Rao Linear Integrated Circuits Pearson.
3. D. Roy Choudhury, Linear Integrated Circuits, New Age Publication.

References:

1. David A. Bell: Operational Amplifiers & Linear ICs, Oxford University Press
2. J. Millman and C. Halkias: Integrated electronics, TMH.
3. A. Sedra and K. Smith: Microelectronics, Oxford Press.

Web Sources:

1. http://www.nptelvideos.in/2012/11/analog-ics.html

List of Experiment

1. To determine common mode gain and differential mode gain of duel input balanced output differential amplifier.
2. To determine CMRR and slew rate of 741
3. To study inverting and non inverting amplifier and realize circuits with different gain
4. To realize arithmetic circuits like adder, substractor, log amplifier using op amp.
5. To realize integrator and differentiator using op amp
6. To realize phase-shift oscillators, Wein bridge oscillator using op amp.
7. To realize I and II order LPF using op amp
8. To design a quasi stable multi vibrator with given duty cycle using 555 timer.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO04	Analog Communication	3	1	2	5

Unit-I: Amplitude Modulation: Block Diagram of Communication system, Need of Modulation, Type of Modulation, Amplitude Modulation and spectral interpretation, BW, Power requirement and Efficiency. Study of AM suppressed carrier (DSB-SC, SSB-SC, VSB-SC), BW & power requirement, Efficiency, Generation & detection methods of AM, synchronous detection & carrier acquisition.

Unit-II : Angle Modulation system:- Types of Angle Modulation, NBFM, WBFM, frequency domain representation, , BW, Power requirement and efficiency, generation of FM (Direct & Indirect method), Detection of FM by various methods (frequency discriminators & phase discriminators, PLL). Advantages of FM over AM.

Unit-III : AM & FM transmitter, Receiver:- Low & high level AM transmitters, features of a receiver, TRF receiver, Super heterodyne Receiver, Image frequency rejection, FM transmitter and receiver, pre-emphasis and de-emphasis, AGC, AVC, AFC.

Unit-IV: Noise: - Correlation, Energy Spectral Density & Power Spectral Density. Noise classification, Sources of noise, Noise Figure, Noise temperature, Noise Bandwidth, Figure of Merit, Narrow Band Noise, Figure of Merit for various AM & FM, and effect of noise on AM & FM receivers.

Unit V : Sampling, Pulse Modulation:- Types of Pulse modulation (PAM, PWM, PPM) : their generation & Detection.

Text Books:

1. Simon Haykins, Communication System, John Willy
2. H. Taub & D. Schilling, Principles of Communication Systems, TMH.
3. R. P. Singh & S.D. Sapre, Communication System, TMH

Reference Books

1. B.P.Lathi, Modern Digital & Analog Communication System, TMH
2. J.G. Proakis, M. Salehi, Fundamentals of Communication Systems, Pearson Edu.
3. A. B. Carlson, Communication System, Mc-Graw Hill

Web Source

1. https://onlinecourses.nptel.ac.in/noc17_ec11

www.nptelvideos.in/2012/11/communication-engineering.htm

List of Practical

1. Study of front panel of Digital Storage Oscilloscope (DSO) and function generator.
2. Generate DSB-FC (AM), DSB-SC and SSB signals. Calculate the modulation index by using formula and trapezoidal pattern for DSB-FC and DSB-SC.
3. Demodulation of DSB-FC using Envelope detector.
4. Perform experiment based on AM transmitter and receiver, and study the Superheterodyne Receiver.
5. Modulate and demodulate FM signal. Calculate the frequency deviation and modulation index.
6. To understand the principle of pre-emphasis and de-emphasis circuits and measure the operating characteristics of pre-emphasis and de-emphasis circuits through the experiment.
7. Study of Frequency Division Multiplexing/De-multiplexing with sinusoidal inputs / audio inputs.
8. Analyze the spectrum of AM, SSB and NBFM modulation using TINA PRO.
9. Study of spectrum analyzer and observe the spectrum of sine waveform and modulated AM and FM wave.
10. To examine the operation of Noise generator, Signal Attenuator, Square wave distortion and measure the output power, frequency response of sine wave and Noise Figure.
11. Study and perform experiment based on Pulse Modulation and Demodulation techniques (PAM, PWM and PPM).

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO06/EI3CO06	Digital Signal Processing	3	1	2	**5**

Unit-I Orthogonal transforms: Properties and applications of DFT, implementing linear time invariant systems using DFT, circular convolution, linear convolution using DFT; two dimensional DFT,FFT algorithms: Decimation in time, decimation in frequency; Goertzel algorithm, Chirp Z, DCT.

Unit-II Digital Filter design techniques: Design of digital IIR filters: Impulse invariant, and bilinear transformation techniques for Butterworth and Chebyshev filters; Design of FIR filters: linear phase in FIR filters, Windowing(Rectangular, Bartlett, Hann, Hamming etc), frequency sampling filter design, optimum. approximations of FIR filters.

Unit-III Implementation of digital filters : Direct form-I, Direct form-II, Cascade form and Parallel form structures for FIR and IIR filters. Lattice and Lattice-Ladder Structures. Telligen's theorem for digital filters and its applications. Quantization, round-off and over flow errors in Digital Filters.

Unit-IV Discrete Random Signals: Random variables, statistical averages , corelation, covariance, central limit theorem, Discrete time random process ,response of linear system to random signals, power spectral density of random process, bandpass random processes, optimum filtering.

Unit-V DSP Processor: Features and architectures of DSP processor, Fixed point processor, Floating point processor, applications of DSP processor, Introduction to Texas instrument series TMS320C67XX(13 and 48).

Text Books:

1. A.V. Oppenheim and R. W. Schafer, Digital Signal Processing, Prentice Hall.
2. L. R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall.
3. J.G. Proakis, and D.G. Manolakis, Digital Signal Processing, PHI.

Reference Books

1 Andreas Antoniou, Digital Filters, Analysis, Design and Applications, McGraw Hill.
2 S. K. Mitra, Digital Signal Processing: A computer based approach, Tata McGraw Hill.

Experiment List

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).

3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.
6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT-Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc)

Note: Above mentioned experiments are required to be performed on MATLAB environment as well as on DSP Processor Kit (TMS320C6713).

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO08	Engineering Electromagnetics	4	0	0	**4**

Unit-I Co-ordinate Geometry and Vector calculus

Co-ordinate systems and Co-ordinate geometry, Line, Surface and Volume integrals, curl, divergence and gradient, Divergence theorem and Stokes' theorem. Laplacian for scalar and vectors. Vector identities.

Unit-II Electrostatics

Coulomb's law, Field due to different charge distributions, electric flux density, dielectric constant, Gauss's law and its applications, Potential difference and potential, Potential field of a point charge and different charge distributions, Potential gradient, Dipole, Capacitance between two isolated conductors, Boundary conditions at discontinuities between two media including conducting boundaries, Energy density in electrostatic field, Poisson's and Laplace equation, solution of Laplace equation, Ohm's Law and Continuity of current.

Unit-III Magnetostatics

Biot-Savart's law, magnetic field intensity, magnetic flux density, permeability, Ampere's circuital law, applications of Ampere's law, solenoid and toroid, point form of Ampere's circuital law, vector magnetic potential, magnetization, Magnetic boundary conditions, Magnetic circuit, Self inductance and Mutual inductance.

Unit-IV Time Varying Fields and Maxwell's Equations

Lorentz force equation, Force on a moving charge, Faraday's law, Displacement current, modified Ampere's law, Maxwell's equations in point and integral forms for time varying fields, Maxwell's equation for time harmonic field, wave equations in source free region, solution to wave equation, Intrinsic impedance, Poynting theorem, complex Poynting vector. Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, Skin Depth.

Unit-V Polarization and uniform plane waves

Linear, circular and elliptic polarization, Reflection of uniform plane waves, Plane waves at normal incidence and at oblique incidence, Standing wave ratio, Brewster Angle, total internal reflection, transmission line analogy.

Text Books:

1. Matthew Sadiku, Elements of Electromagnetics, Oxford University Press.
2. E.C. Jordan & K.G. Balmian: Electromagnetic wave and Radiating System, PHI.
3. S.P. Seth , Elements of Electromagnetic Fields, Dhanpat Rai Publication

Reference Books:

1. William H. Hayt, Engineering Electromagnetic, TMH
2. John D. Kraus, Electromagnetics, Mc. Graw Hill.
3. Joseph Edminister, Electromagnetics -Schaum's Outline Series, TMH

Web Sources

1. https://www.youtube.com/watch?v=pGdr9WLto4A&list=PLl6m4jcR_DbOx6s2toprJQx1MORqPa9rG&spfreload=10
2. https://www.youtube.com/watch?v=EiX3R6IkDDU&list=PLBZrb0wA6HTd9CclN_Ku_I065MXbHZh6U&index=2&spfreload=10

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3EL08 / EI3EL08	Program Elective I (Computer Organization and Architecture)	3	0	0	3

UNIT I

Fundamentals of Computer Architecture:

Evolution of Computers, Computer Classification, Measuring Computer Performance, von Neumann Machine Architecture, Functional Units and Components in Computer Organization, Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control.

UNIT II

Instruction Set Architecture

Representation of Positive and Negative Numbers, Binary Fixed- Point Representation, Floating Point Representation, , Addressing Modes, RISC and CISC Instruction set formats, RISC and CISC processor characteristics.

UNIT III

Pipelining and Parallel Processing

Basics of pipelining, Role of Cache memory, Pipeline performance, Data hazards, Instruction hazard.

UNIT IV

Parallel Processing

Parallel Processing- Basic Concept of program, process, thread, Superscalar operation concept, Vector and Array Processor, Introduction to Multi-core Architecture, Flynn Classification.

UNIT V

Memory Hierarchy Design

Memory Hierarchy, Internal Organization of Semiconductor Main Memory Chips, Virtual memory System, Cache Memories and Management, Classification of different memory, Classification of Shared Memory Systems

Text Book

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill.
2. Nicholas Carter and Raj Kamal, Computer Architecture and Organization, Schaum's Outlines, Tata McGraw-Hill.
3. K. Hwang & F. A. Briggs, Computer Architecture and Parallel Processing, TMH

Reference Book

1. K. A. Parthasarathy, A. Ramachandran, R. Purushothaman, Advanced Computer Architecture, Advanced Computer Architecture, Thomson Learning,
2. J. L. Hennessy, D. A. Patterson, Computer Architecture: A Quantitative Approach, Elsevier
3. D. Sima, T. Fountain & P. Kacsuk. Advanced Computer Architectures, Pearson Education

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3ES09	Engineering Material	3	0	0	3

UNIT I BASIC

Atomic structure, molecules and general bonding principles, crystal system and structure , Miller indices, Bravais lattice, crystal structure for metallic elements, structural imperfections, dielectric parameters, polarization, static dielectric constant of solids, ferroelectric materials, piezoelectricity, complex dielectric constant, dielectric loss, insulating materials and their properties, composite materials.

UNIT II MAGNETIC MATERIALS

Fundamental concepts pertaining to magnetic fields, magnetic dipole movement of current loops, orbital magnetic dipole movement and angular momentum of simple atomic model, classification of magnetic materials, spin magnetic moment, paramagnetic, ferromagnetism, spontaneous magnetization and Curie-Weiss law, ferromagnetic domains, magnetic anisotropy, magnetostriction, anti-ferromagnetism, ferrites and its applications.

UNIT III CONDUCTORS AND INSULATORS

The resistivity range, free electron theory, conduction by free electrons, conductors and resistor materials, resistivity of metals, Linde's rule, Joule's law, thermal conductivity, Electronic and Ionic conduction, Energy Band structures in solids, Electron Mobility, Temperature variation of conductivity, Superconductivity - The free electron model, thermodynamics and properties of superconductors, Meissner effect, classification of superconductors.

UNIT IV SEMI-CONDUCTING MATERIALS

The energy gap in solids, intrinsic semiconductor, extrinsic semiconductor, Temperature Dependenceof Conductivity, Direct and Indirect Band gap. Semiconductors, Hall Effect, mechanism of current flow, drift current, diffusion current, Einstein relation, fabrication of integrated circuits, some semiconductor devices.

UNIT V OPTICAL PROPERTIES OF MATERIALS

Introduction, electromagnetic radiation spectrum, refractive index, reflection, Birefringence, dispersion, absorption, photoelectric emission, electroluminescence, photoconductivity, lasers, ruby lasers, Nd-YAG laser, carbon dioxide laser, optical fibers, fiber materials, fabrication of fiber cables.

TEXT BOOKS:

1. Banerjee- Electrical & Electronics Material,PHI.
2. S. O. Kasap- Priniciple of Electronics Material &Device,TMH.
3. Jones-Material Science for Electrical & Electronics Enginnering,Oxford.
4. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
5. Material Science and Engineering-An Introduction: Callister, W.D., John Wiley & Sons, Delhi.

Medi-Caps University
Faculty of Engineering

6. Elements of Material Science and Engineering:VanVlack, Wesley Pub. Comp. Introduction to Engineering Materials: B. Agarwal, McGraw Hill Publication

REFERENCE:

1. J.AllisonElectronicsEnginnering, Material &Device,TMH.
2. Gilmore: Material Science, Cengage Learnings.
3. Gupta & Gupta Advance Electrical & Electronics Material,Wieley India.
4. James F.Shackelford - Introduction Material Science for Enginnering Pearson.
5. V.Rajendran -Material science,TMH.
6. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi
7. Material Science - Narula, Narula and Gupta. New Age Publishers

Knowledge is Power	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
OE00004	**Electronics Engg. Material**	3	0	0	3

UNIT I BASIC

Atomic structure, molecules and general bonding principles, crystal system and structure , Miller indices, Bravais lattice, crystal structure for metallic elements, structural imperfections, dielectric parameters, polarization, static dielectric constant of solids, ferroelectric materials, piezoelectricity, complex dielectric constant, dielectric loss, insulating materials and their properties, composite materials.

UNIT II MAGNETIC MATERIALS

Fundamental concepts pertaining to magnetic fields, magnetic dipole movement of current loops, orbital magnetic dipole movement and angular momentum of simple atomic model, classification of magnetic materials, spin magnetic moment, paramagnetic, ferromagnetism, spontaneous magnetization and Curie-Weiss law, ferromagnetic domains, magnetic anisotropy, magnetostriction, anti-ferromagnetism, ferrites and its applications.

UNIT III CONDUCTORS AND INSULATORS

The resistivity range, free electron theory, conduction by free electrons, conductors and resistor materials, resistivity of metals, Linde's rule, Joule's law, thermal conductivity, Electronic and Ionic conduction, Energy Band structures in solids, Electron Mobility, Temperature variation of conductivity, Superconductivity - The free electron model, thermodynamics and properties of superconductors, Meissner effect, classification of superconductors.

UNIT IV SEMI-CONDUCTING MATERIALS

The energy gap in solids, intrinsic semiconductor, extrinsic semiconductor, Temperature Dependenceof Conductivity, Direct and Indirect Band gap. Semiconductors, Hall Effect, mechanism of current flow, drift current, diffusion current, Einstein relation, fabrication of integrated circuits, some semiconductor devices.

UNIT V OPTICAL PROPERTIES OF MATERIALS

Introduction, electromagnetic radiation spectrum, refractive index, reflection, Birefringence, dispersion, absorption, photoelectric emission, electroluminescence, photoconductivity, lasers, ruby lasers, Nd-YAG laser, carbon dioxide laser, optical fibers, fiber materials, fabrication of fiber cables.

TEXT BOOKS:

1. Banerjee- Electrical & Electronics Material,PHI.
2. S. O. Kasap- Priniciple of Electronics Material &Device,TMH.
3. Jones-Material Science for Electrical & Electronics Enginnering,Oxford.
4. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
5. Material Science and Engineering-An Introduction: Callister, W.D., John Wiley & Sons, Delhi.

Medi-Caps University
Faculty of Engineering

6. Elements of Material Science and Engineering:VanVlack, Wesley Pub. Comp. Introduction to Engineering Materials: B. Agarwal, McGraw Hill Publication

REFERENCE:

1. J.AllisonElectronicsEnginnering, Material &Device,TMH.
2. Gilmore: Material Science, Cengage Learnings.
3. Gupta & Gupta Advance Electrical & Electronics Material,Wieley India.
4. James F.Shackelford - Introduction Material Science for Enginnering Pearson.
5. V.Rajendran -Material science,TMH.
6. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi
7. Material Science - Narula, Narula and Gupta. New Age Publishers

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3

Unit I: Concepts of Management

Definition, characteristics and importance of management; Management: Science or Art, Difference between Management and Administration, Levels of management, Functions of Management, Managerial Roles, Managerial skills and competencies; Decision Making: Definition, process and types; Decision making under certainty, uncertainty and risk; Cross cultural issues in management and challenges.

Unit II: Fundamentals of Marketing and Human Resource Management

Introduction to Marketing: Definition, importance, function and scope of marketing, Core concepts of marketing, Marketing concepts and orientations, Marketing environment, Marketing-mix, Holistic marketing concept, Customer Relationship Management (CRM).

Introduction to Human Resource Management (HRM): Nature, Scope, Objectives and Functions; Role of HR manager, Process and need for Human Resource Planning, Human resource policies, Changing role of Human Resource in India, Globalization and its impact on Human Resource.

Unit III: Fundamentals of Economics

Introduction to Economics: Definition, nature, scope and significance; Difference between micro and macro economics; Time value of money, Law of diminishing marginal utility; Theory of Demand and Supply, Price elasticity of demand; Meaning and types of costs, Law of variable proportions; Types of market structure; National income and related aggregates; Meaning and types of Inflation; Meaning and phases of business cycle.

Unit IV: Basic Accounting Principles

Accounting Principles and Procedure, Double entry system, Journal, Ledger, Trail Balance, Cash Book; Preparation of Trading, Profit and Loss Account; Balance sheet; Cost Accounting: Introduction, Classification of costs, Methods and Techniques of costing, Cost sheet and preparation of cost sheet; Breakeven Analysis: Meaning and its application.

Unit V: Fundamentals of Financial Management

Introduction of Business Finance: Meaning, Definition of Financial Management, Goals of Financial Management (Profit Maximization and Wealth Maximization), Modern approaches to Financial Management – (Investment Decision, Financing Decision and Dividend Policy Decisions).

Text Books

1. R. D. Agarwal, "Organization and Management", McGraw Hill Education.
2. P. C. Tripathy and P. N. Reddy, "Fundamentals of Management, Economics and Accountancy", Tata McGraw Hill
3. Kotler Philip and Keller Kevin Lane, "Marketing Management", Pearson

Reference Books

1. Peter F Drucker, "The Practice of Management", McGraw Hill
2. Harold Koontz, "Essentials for Management", Tata McGraw Hill
3. M Y Khan and P K Jain, "Management Accounting", Tata McGraw Hill

Website Link

1. https://nptel.ac.in/courses/122108038/ (Management Concepts)
2. https://nptel.ac.in/courses/110104068/ (Marketing)
3. www.hrmguide.net (Human Resource Management)
4. http://economicsconcepts.com (Economics)
5. https://nptel.ac.in/courses/110101003/ (Accounting)
6. https://nptel.ac.in/courses/105103023/39 (Financial Management)

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO09	Control System	3	0	2	4

UNIT I Introduction

Concept of control system, basic terminology, objectives/specifications. Mathematical modeling of physical systems such as mechanical and electrical systems, differential equations, transfer function, block diagram representation and reduction, signal flow graph techniques, Mason's Gain formulae. Concept of feedback, open loop and closed loop systems, types and effects of feedback.

UNIT II Time response analysis

Standard test signals, time response analysis (1^{st} and 2^{nd} order),Transient and steady state response, response parameters and their qualitative analysis; Transient and steady state response analysis for 1^{st} and 2^{nd} order systems with negative feedback ; effect of close loop on system parameters. Stability of linear systems, stability norms, effects of pole location on system stability, necessary
conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus., applications of root locus.

UNIT III Frequency response analysis

Concept of frequency response, Frequency response plots such as Polar plots, Bode Plots, log-magnitude versus Phase-Plots, M and N circles, Correlation between time and frequency response.
Frequency domain stability analysis, Nyquist stability criterion, stability margins: phase margin and gain margin, Relative stability analysis using Nyquist plot and Bode plot.

UNIT IV Compensators and controllers

Design problem, types of compensation techniques, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain. P, PD, PI, PID error control strategies; effect of controllers on transient and Steady state response.

UNIT V State space analysis

State space representation of systems, State Space equations in Canonical forms, Modeling of electrical and mechanical systems in State Space form, Solution of state space equation, state transition matrix, Controllability and Observability, Relation between transfer function and state space representations, Design of state feedback controller.

Text books

1. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Publishers.
2. Benjamin C. Kuo, "Automatic Control systems", Wiley India Pvt. Ltd.
3. K. Ogata, "Modern Control Engineering", PHI.

Reference Books

1. M. Gopal, "Control System Principles and Design", Tata McGraw Hill, New Delhi.
2. S. Salivahanan, "Control System Engineering", Pearson Education, New Delhi.

List of Practicals

1. Transfer Function From Zeros And Poles
2. Zeros And Poles From Transfer Function
3. Impulse, Step And Ramp Response Of A Transfer Function
4. Time Response Of A Second Order System
5. Root Locus From A Transfer Function
6. Bode Plot From A Transfer Function
7. Nyquist Plot From A Transfer Function
8. Transfer Function From State Model State Model From Transfer Function
9. State From Zeroes And Poles Zeros And Poles From State Model
10. Lag And Lead Compensator
11. Pid Controller

Medi-Caps University
Faculty of Engineering
Syllabus for Bachelor of Technology
Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO11	Digital Communication	3	1	2	5

UNIT I Digital communication system model, analog vs. digital communication; Fundamental limitations of communication systems. PCM, Quantization (uniform and non-uniform), quantization noise, DPCM, ADPCM, DM, ADM. Audio and video compression.

UNIT II Baseband Pulse Transmission : Line coding: Characteristics of line codes, NRZ and RZ forms of unipolar, polar, bipolar and bi-phase line codes, their waveforms & PSD. **Baseband demodulation techniques:** Matched filter, Inter Symbol Interference, Pulse shaping (Raised cosine spectrum, duo-binary signaling), Equalization, Eye patterns. **Signal-space representation:** Geometric representation of signals and WGN. MAP and ML detectors. Error performance of detectors.

UNIT III Digital Passband Modulation, Demodulation and Spread Spectrum techniques: BPSK, DPSK, QPSK, BFSK, M-ary PSK & FSK, MSK, QAM, Non-coherent BFSK and DPSK: Their generation, detection, waveforms, PSDs, performance of these systems in the presence of noise. Introduction to Spread Spectrum techniques: Spread Spectrum overview, pseudo-noise sequence, Direct Sequence & Frequency Hopping Spread Spectrum.

UNIT IV Introduction of Information theory: Concept of amount of information, entropy & its types, source encoding such as Shannon-Fano, Huffman Codes, Information rate, Channel capacity (its calculation for BSC, BEC, noiseless channels and Gaussian channel), Shannon's theorem, Bandwidth and S/N trade off.

UNIT V Channel coding: Linear Block codes (Systematic codes, Parity check matrix, Syndrome testing), Cyclic codes, Hamming codes, BCH codes, Convolutional codes. Low Density Parity Check codes. Block codes

Text Books

1. S. Haykin, "Digital Communication", John Wiley & Sons.
2. B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press.
3. Taub & Schilling, "Principles of Communication System", TMH.

Reference Books

1. J. G. Proakis & M. Salehi, "Digital Communications", McGraw-Hill International.
2. M. S. Roden, "Analog and Digital Communication Systems", Discovery Press.
3. B. Sklar, "Digital Communications", Pearson.

Web resources

1. Prof. Bikash Kumar Dey, Digital Communication, IIT Bombay (nptel.iitm.ac.in)\
2. SaswatChakrabarti, Prof.R.V. Rajakumar, Digital Communication, Prof., IIT Kharagpur (nptel.iitm.ac.in)
3. Prof. Lizhong Zheng, Prof. Robert Gallager, Principles of Digital Communications I, MIT

List of Practicals

1. Understand the concept of TDM and perform four channel time division multiplexing and de multiplexing operation.
2. Generate PCM, learn transmitter and receiver system based on PCM
3. Generation of modulated signal based on Delta and Adaptive Delta method and demodulates them.
4. Generate and observe the data using various data formatting techniques.
5. Perform Experiment based on digital companding techniques (A-law & μ-law)
6. Study of digital carrier techniques (ASK, FSK, PSK) transmitter and receiver system.
7. Experiments based on MATLAB Simulation tool
    a. To design and verify the operation of ASK, FSK and PSK generator & demodulation
    b. Calculate BER of ASK, FSK & PSK using constellation diagram.
8. Write a program for determination of various entropies and mutual information of a given channel. Test various types of channel such as
    a) Noise free channel. c) Binary symmetric channel
    b) Error free channel d) Noisy channel
9. Write a program for generation and evaluation of variable length source coding using
    a) Shannon –Fanocodingandecoding b) Huffman Coding and decoding
10. Write Programs for coding & decoding of Linear block codes and cyclic code.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO13	Antennas and Propagation	3	1	2	5

UNIT I

BASIC CONCEPTS OF RADIATION

Basic sources of Radiation i.e. Single-wire, Two-wires, Dipole, Radiation Integral and Auxiliary Potential Functions. Basic antenna parameters – Types of Radiation pattern, Antenna field Zones, Radiation power density, Radiation Intensity, Beamwidth, Directivity, Antenna efficiency, Gain, Beam efficiency, Bandwidth, polarization, Antenna Impedance, Antenna Vector effective length and Equivalent Area, Maximum Effective Area, Friis transmission and Radar range equation, Reciprocity Theorem. **Radiation from Wires -** Infinitesimal dipole, finite-length dipole, Half dipole, Monopole antenna.

UNIT II

ANTENNA ARRAYS ANALYSIS AND SYNTHESIS

Two element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, Endfire Arrays, EFA with Increased Directivity; Concept of Scanning Arrays. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Related Problems. **Antenna Synthesis**- Schelkunoff Polynomial Method, Fourier Transform Method, Doph-Chebyshev Synthesis Method, Synthesis Related Problems.

UNIT III

SPECIAL ANTENNAS

Traveling wave, slot, Loop and folded dipole antennas, Arrays with Parasitic Elements, Yagi - Uda Arrays & their characteristics, Log Periodic Antenna, Reflector Antennas: Flat Sheet and

Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds. **Helical Antennas** – Significance, Geometry, basic properties; Design considerations for monomial helical antennas in Axial Mode and Normal Modes (Qualitative Treatment). Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Base Station Antenna, Mobile Station Antenna.

UNIT IV

MICRO STRIP ANTENNA

Radiation from rectangular and circular patches, feeding techniques. Rectangular patch radiation analysis from cavity model; input impedance of rectangular patch; Basic Knowledge Microstrip array and feed network; Introduction to CAD tools used for antenna modeling i.e. CST, HFSS, IE3D.

UNIT V

PROPAGATION OF RADIO WAVE

Basics of propagation – Ground wave propagation, Effect of Earth on Radiation Pattern, Space wave propagation – considerations in space wave propagation , super refraction , Ionospheric wave propagation - Structure of ionosphere mechanism of Ionospheric propagation, Effect of earth's magnetic field on radio wave propagation, Virtual height, MUF, Skip distance, OWF, Ionosphere abnormalities.

Text Books

1. A. Balanis, "Antenna Theory Analysis and Design", John Wiley and Sons, New York.
2. J.D. Kraus, "Antennas for All Application", III edition, Tata McGraw-Hill.
3. Jordan and Balmain " Electromagnetic Waves and Radiating System" , PHI Learning

Reference Books

1. R.E. Collin and F. Zucker– "Antenna theory" Part I, Tata Mc Graw Hill, New York.
2. I.J. Bahl and P. Bhartia," Microstrip Antennas", Artech House, Inc.

Website Resources

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

1. Online Antennas course by IIT Bombay https://onlinecourses.nptel.ac.in/noc18_ee13.
2. You Tube Video on antennas https://www.youtube.com/channel/UCjzx-cRhnmymh18W18sMdjw/videos.

List of Practicals

1 Introduction of a Motorized Antenna Trainer Kit & Knowledge of Antenna designing tools like (HFSS and CST)

2 I. Design and analysis of Simple Dipole (L = 3λ/2, λ/2, λ/4) antenna using full wave simulator.
II. Plotting & Comparisons of the Polar graph/ radiation pattern of Simple Dipole (L = 3λ/2,λ/2, λ/4) antenna using Antenna Trainer Kit

3 I. Design and analysis of Yagi-UDA 5 & 7 Element Simple dipole antenna using full wave simulator.
II. Plotting the Polar graph/ radiation pattern & Comparisons of Yagi-UDA 5 & Element Simple dipole antenna using Antenna Trainer Kit.

4 I. Design and analysis of Yagi-UDA 3 & 5 Element Simple dipole antenna using full wave simulator.
II. Plotting the Polar graph/ radiation pattern & Comparisons of Yagi-UDA 3 & Element Simple dipole antenna using Antenna Trainer Kit.

5 I. Design and analysis of Log Periodic & Helix Antenna using full wave simulator.
II. Plotting the Polar graph/ radiation pattern of Log Periodic & Helix Antenna using Antenna Trainer Kit.

6 I. Design and analysis of slot, Loop and Rhombus Antenna using full wave simulator.
II. Plotting the Polar graph/ radiation pattern & Comparisons of slot ,Loop and Rhombus antenna using Antenna Trainer Kit

7 I. Design and analysis of cut Parabolic Reflector Antenna using full wave simulator.
II. Plotting the Polar graph/ radiation pattern of cut Parabolic Reflector antenna using Antenna Trainer Kit

8 I. Design and analysis of λ /2 Phase Array (End fire) antenna & λ / 4 Phase Array (End fire) Antenna using full wave simulators.
II. Plotting the Polar graph/ radiation pattern of λ /2 Phase Array (End fire) antenna & λ / 4 Phase Array (End fire) antenna using Antenna Trainer kit.

9 I. Design and analysis of λ /2 Phase Array (End fire) antenna & λ / 4 Phase Array (End fire) Antenna using full wave simulators.
II. Plotting the Polar graph/ radiation pattern of Combined Co-linear Array and Broadside Array Antenna

10 I. Design and Analysis of Micro strip Patch antenna for Wi-Fi Application using full wave simulator.

[* All antennas should be design & simulate for 750MHz/ 1GHz Frequency using any full wave simulator.]

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3EC04	Satellite Communication	3	0	0	3

Unit 1 Basic Principles of Satellite
Introduction, Evolution and growth of satellites, General features, frequency allocation for satellite services, properties of satellite communication systems, role and application of Satellite Communication

Unit 2 Satellite Orbits
Elements of orbital mechanics, Equation of Motion, Kepler's laws, orbital characteristics, satellite spacing and orbital capacity, angle of elevation, eclipses, launching and positioning, satellite drift and station keeping

Unit 3 Satellite Space Segment
Attitude and orbit control system; telemetry, tracking and command; power systems, communication subsystems, antenna subsystem, equipment reliability and space qualification

Unit 4 Satellite Links and Earth station
General link design equation, system noise temperature, uplink design, downlink design, complete link design, effects of rain, earth station subsystem, different types of earth stations

Unit 5 Multiple Access and Capacity Enhancement
Space segment access methods, TDMA, FDMA, CDMA, SDMA, assignment methods, Nonlinearity, Synchronization

Text books –

1. Timothy Pratt, Charles W. Bostian, Satellite Communications, John Wiley & Sons 2001.
2. Dennis Roddy, Satellite Communications, 3rd Ed., Mc. Graw-Hill International Ed. 2001.
3. W L. Pritchard, HG. Suyderhoud, RA. Nelson, “Satellite Communication System Engineering”.

Reference Books –

1. *Agarwal: Satellite Communications, Khanna Publishers*
2. *Raja Rao: Fundamentals of Satellite communications, PHI Learning.*

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO10	Microprocessor & Microcontrollers	3	0	2	**4**

UNIT I BASICS OF MICROPROCESSOR SYSTEM

Evolution of microprocessor, internal architecture and pin diagram of 8085 microprocessor, operations of microprocessor, address de-multiplexing in microprocessor, addressing modes, memory and concept of memory/IO device interfacing, timing diagram of memory read, memory write cycle, definitions of Machine cycle, instruction cycle and T state.

UNIT II 8086 MICPROCESSOR

Internal architecture and pin diagram of 8086 microprocessor, segmentation of memory, minimum mode and maximum mode operation, addressing modes and instruction set of 8086, assembler directives, assembly language programming, and interrupt of 8086.

UNIT III INTERFACING OF DEVICES WITH 8086

Memory interfacing, interfacing of 8255 PPI, 8253/54 Programmable Counter/ Timer, 8257 DMA controller, USART 8251 and 8259A Programmable Interrupt controller.

UNIT IV 8051 MICROCONTROLLER

Difference between microcontroller and microprocessor, internal architecture and pin diagram of 8051 microcontroller, memory organization, Timer/counter and interrupt , addressing modes, instruction set of 8051 , and applications of microcontroller.

UNIT V HIGH END PROCESSSORS & MICROCONTROLLER

Concepts of RISC & CISC, Von Neumann and Harvard Architecture, Salient features of miroprocessors 80286, 80386, 80486, and Pentium, Introduction to ARM processors (ARM 7,9,11), ARM Programmer's Model.

Text Books:

1. R.S. Goankar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International Publishing.
2. A.K. Ray and K. M. Bhurchandi, Advanced Microprocessoprs and Peripherals-Architecture , Programming and Interfacing ,Tata McGraw-Hill
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded System, Pearson Education.

Reference Books

1. Steve Furber, ARM system-on-chip architecture, Addison Wesley Publication.

2. Hall Douglas V, Microprocessor and Interfacing, McGraw-Hill Education (India) Pvt Limited.
3. Kenneth J. Ayala, The 8051 Microcontroller Architecture the III Edition- Cengage Learning.
4. Eben Upton, Raspberry Pi – User Guide, John Wiley & Sons Publication.

Web Sources:

1. https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/ia-introduction-basics-paper.pdf

Experiment List

1. Assembly Language Programs based on 8086 microprocessor.
2. I/O devices interfacing with 8086/8051 (microprocessor/microcontroller) using Peripheral ICs.
3. Hands-on with Raspberry Pi kit.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3ET04	Data Structure	3	0	0	3

UNIT I Linear Data Structures:
Abstract Data Types - Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Arrays : Definitions, Representations and Examples – Stacks and Queues, Linked List, Linked List based implementations of Stack and Queues, Evaluation of Expressions – Linked list based polynomial addition. Applications of Linked List, Arrays and Queues in Computer field.

UNIT II Non-Linear Data Structures:
Trees: Binary Trees, Binary tree representation and traversals, Threaded binary trees, Binary tree representation of trees. Application of Trees: Set representation and Union; Find operations, Graph and its representations, Graph Traversals, Connected components.

UNIT III Search Structures And Priority Queues:
AVL Trees: Red-Black Trees, Splay Trees, Binary Heap, Leftist Heap. Applications of Queues in computer field.

UNIT IV Sorting:
Insertion sort, Merge sort, Quick sort, Heap sort, Sorting with disks – k-way merging – Sorting with tapes – Polyphase merge. Applications of sorting in computer field.

UNIT V Searching And Indexing:
Linear Search, Binary Search, Hash tables, Overflow handling, Cylinder Surface Indexing – Hash Index – B-Tree Indexing. Applications of searching and indexing in computer field.

Text Books

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Sorce, Gurgaon.
2. Gregory L. Heilman, Data Structures, Algorithms and Object Oriented Programming, Tata Mcgraw-Hill, New Delhi.

Reference Books

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi.
3. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, Tata McGraw-Hill

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3EV07	VLSI Technology	3	0	0	3

UNIT-I

Environmental conditions for VLSI technology: clean room and safety requirements, Different crystalline orientation, Crystal defect, Wafer cleaning process and wet chemical etching techniques, CZ method, wafer preparation techniques.

UNIT-II

Oxidation: kinetics of silicon dioxide growth for thick, thin and ultra-thin films. Oxidation technologies in VLSI and ULSI; Characterization of oxide films, Methods of Impurity incorporation: solid-state diffusion modeling and technology, Ion implantation techniques

UNIT-III

Lithographic techniques: Photolithography techniques for VLSI, Mask Generation.
Chemical Vapour deposition techniques: CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitride and metal films; epitaxial growth of silicon; modeling and technology.

UNIT-IV

Metallization techniques: evaporation and sputtering techniques, multilevel Metallization schemes. Masking Sequence and Process flow for MOS and BIPOLAR Devices.

UNIT-V

LAYOUT DESIGN RULES: Need for Design Rules, Rules for the Silicon Gate NMOS Process, CMOS Based Design Rules, Simple Layout Example.

Text Book

1. S.M.Sze (Ed), "VLSI Technology", McGraw-Hill.
2. C.Y. Chang and S.M. Sze (Ed), "ULSI Technology", McGraw-Hill Companies Inc.

References:

1. S.K.Gandhi, "VLSI fabrication Principles",John Wiley Inc., New York
2. Sorab K. Gandhi, “The Theory and Practice of Microelectronics”, John Wiley & Sons
3. B.G Streetman, “VLSI Technology” , Prentice Hall

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00002	Neural Network and Fuzzy System	3	0	0	3

UNIT-I

Introduction: Evolution of neural networks, Biological Neurons, Artificial neurons, Basic model of Artificial Neural Network (ANN), Classification, Topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline, Basic Learning laws, Hebb's rule, Delta rule, widrow and Hoff LMS learning rule.

UNIT–II

Feed Forward Neural Networks:

Single -layer perceptron: Topology, learning allgorithms, Perceptron convergence theorem, limitations. Multi-layer perceptron: Topology, Back propagation learning algorithm, Kolmogorov Theorem, limitations.

UNIT–III

Recurrent Neural Networks:

Recurrent Neural Networks: Basic concepts, Architecture and training algorithms, Hopfield network: Topology, learning algorithm. Applications of Neural networks: Communication, Robotics, and pattern recognition.

UNIT–IV

Fuzzy Logic:

Basic concepts of Fuzzy logic, Fuzzy vs Crisp set, Linguistic variables, Fuzzy sets and elements: Representation, Operations and Properties, Fuzzy Relations: Cardinality, Operations, Properties, Membership function and uncertanity. Fuzzy equivalence and tolerance relation, Value assignment: cosine amplitude and max-min method;

UNIT-V

Fuzzification, Membership value assignment, development of rule base and decision making system.Defuzzification to crisp sets, Defuzzification methods,

Applications of fuzzy theory: fuzzy logic control.

Text Book

1. S. Hakins, Neural Networks – , Pearson Education.
2..T. J. Ross, Fuzzy Logic with Engineering Applications, McGraw Hill.

Reference Book

1. B.Yegnanarayana, Artificial Neural Networks, PHI, India.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

2. F. O. Karray and C. De Silva., Soft Computing and Intelligent Systems Design, Theory, Tools and Applications, Pearson Education, India.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
OE00003	Industrial Electronics	3	0	0	3

Unit I

Power semiconductor devices

Operation, characteristics and construction of Power diodes, Power transistor, Power MOSFET. Thyristor**:** Construction of Silicon controlled rectifies (SCR), Modes of operation, V-I characteristics, two transistor analogy of SCR, turn-on and turn-off methods, thermal characteristics of SCR. Other members of SCR family such as DIAC, TRIAC, IGBT, GTO.

Unit II

SCR Analysis and Phase Controlled Rectifier

Triggering methods of SCR and other members, types of commutation, analysis of SCR commutation circuits , Operation and characteristics of UJT, relaxation oscillator.

Phase Controlled rectifiers, Half wave and full wave configurations, Phase controlled rectifiers with R , RL and RLE load. Use of freewheel diode in controlled rectifiers.

Unit III

DC-DC Converters and Regulators:

Principle of chopper operation, Chopper classifications, constant frequency system, variable frequency system.

Buck converter, Boost converter, Buck-Boost converter. Cuk converters, series, shunt, fixed voltage regulators and adjustable voltage regulators.

Unit IV

Inverters:

Classification and analysis of single phase inverters, Voltage and Current commutated Inverters, PWM inverters. Voltage Source Inverter and Current source inverters.

Unit V

Cyclo converter and AC Voltage Converters:

Classification and operation of single phase Cyclo-converters and AC Voltage Controller, analysis for different types of loads..

Text Books

1. M. H. Rashid, 'Power Electronics - Circuits, Devices and Applications', Prentice Hall Publications.
2. P. S. Bimbhra, 'Power Electronics', Khanna publishers.

Reference Books:

1. V. Subramaniam, 'Power Electronics', New Age International (P) Ltd Publishers.
2. V.R.Moorthi, 'Power Electronics- Devices, Circuits and Industrial Applications', Oxford University Press.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00057	System, Design and Modelling	3	0	0	3

Unit 1
Data and Information – Types of information: operational, tactical, strategic and statutory – why do we need information systems – management structure – requirements of information at different levels of management – functional allocation of management – requirements of information for various functions – qualities of information – small case study.

Unit 2
Systems Analysis and Design Life Cycle: Requirements determination – requirements specifications – feasibility analysis – final specifications – hardware and software study – system design – system implementation – system evaluation – system modification. Role of systems analyst – attributes of a systems analyst – tools used in system analysis .

Unit 3
Random Variables- Definition, Discrete Random Variables, Probability mass Function , Distrribution Functions: Bernoulipmf, Bionomialpmf, Geometric pmf, Poisson pmf, ContinuousRandom Variables, Cumulative Distribution Function(CDF), Probability Density Function (PDF), Exponential Distribution, Reliability and failure rate, Normal Distribution, Uniform Distribution. Mean, Variance and Moments of Random Variables, Function of a Random Variable and it's Expectation, Jointly Distributed Random Variable.

Unit 4
Markov Chains- Classification of stochastic process, Introductionto Markov chains, Classification of States, Transition Probabilities, Limiting State Probabilities, HigherTransition Probabilities, Concept of Transient States and Absorption Probabilities, Solution of Problems Based on Markov Chains.

Unit 5
Markov Processes -Introduction to Continues Time Markov Chains, Birthand Death Processes, The Transition Probability Function, Limiting Probabilities, Exponential Distribution & Poison Process. Solution of Problems Based on Continuous Time Markov Chains, Introduction to Queuing Theory and M/M/1 Queuing Systems.

Reference:
1. S.M. Ross, "Introduction to Probability Models, 9th Edition, Elsevier Publication", 2007.
2. K.S.Trivedi, "Probability and Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition , A Wiley-Interscience Publication.

3. Averill M. Law,W. David Kelton, “Simulation Modeling and Analysis”, 3rd Edition, Tata McGraw-
Hill Publication.
4. A Papoulis, S.VPillai, “Probability Random Variables and Stochastic Processes”, 4th Edition, TMH Publication, 2002.

Web Sources:

1. NPTEL video lectures on **System Analysis and Design**

Medi-Caps University
Faculty of Engineering
Syllabus for Bachelor of Technology
Department of Electronics Engineering

260

HOD EC.
The course will be run as given.

27/8/18

Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology (Proposed)

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
	Open Elective - V-1 Basics of Enterprenourship	3	0	0	3

UNIT I

Discover Yourself: Finding Your Flow, Introduction to the principles of Effectuation, Introduction to Wadhwani Foundation's 5M, Identify your entrepreneurial style, Entrepreneurial Style Quiz; to reveal the specific entrepreneurial traits, capabilities, drivers etc., Help students to discover their passion and interest before embarking on the long journey.

Identify Problems Worth Solving: What is a business opportunity and how to identify it, Find problems around you that are worth solving, Methods for finding and understanding problems (Observation, Questioning, Design Thinking (DT), Jobs to be done (JTBD), How to run problem interviews to understand the customer's world view, Introduction to Design Thinking - Process and Examples, Generate ideas that are potential solutions to the problem identified- DISRUPT, GOOTB: Run problem interviews with prospects, Class Presentation: Present the problem you "love", Form teams.

UNIT II

Identify Customer Segments and Early Adopters: The difference between a consumer and a customer (decision maker); Market Types, Segmentation and Targeting, Defining the persona: Understanding Early Adopters and Customer Adoption Patterns, Identify the innovators and early adopters for your startup Come up with creative solutions for the identified problems, Deep dive into Gains, Pains and "Jobs-To-Be-Done" (using Value Proposition Canvas, or VPC), Identify the UVP of your solution using the Value Proposition section of the VPC.

Get Started With Lean Canvas: Basics of Lean Approach and Canvas; Types of Business Models (b2b; b2c), Sketch the canvas- "Document your Plan A", Introduction to Risks; Identify and document your assumptions (Hypotheses); Identify the riskiest parts of your plan, Class Presentation: Present your Lean Canvas

UNIT III

Validation: Develop the solution demo build solution (mock-ups) demo, how to run solution interviews, GOOTB (Get-Out-Of-The-Building): run solution interviews, Does your solution solve the problem for your customers; the problem-solution test sizing the opportunity- differences between a startup venture and a small business; Industry Analysis; Understanding what is Competition and it's role, Analyze competition, Case study: Blue Ocean Strategy, Building an MVP (minimum viable product) Identify an MVP and build it; Document and validate your assumptions, Build-Measure-Learn feedback loop and the MVP Lavelin Board, How to do MVP Interviews, GOOTB- Run MVP interviews, Is there a market for your product-market fit test, Class Presentation: Present your MVP

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

UNIT IV

Money: Revenue Streams, Pricing and Costs, Financing Your New Venture, Understand income, costs, gross and net margins, Identify primary and secondary revenue streams, Value, price, and costs; Different pricing strategies, Understand product costs and operations costs; Basics of unit costing

Team: Shared Leadership, Role of a good team in a venture's success; What to look for in a team; How do you ensure there is a good fit? Defining clear roles and responsibilities, How to pitch to candidates to join your startup, Explore collaboration tools and techniques - Brainstorming, Mind mapping, Kanban Board.

UNIT V

Marketing and Sales: Positioning-Understand the difference between product and brand and the link between them, Define the positioning statement for your product/service and how it should translate into what your customers should see about that brand in the marketplace, Channels & Strategy-Building Digital Presence and leveraging Social media, Creating your company profile page, Measuring the effectiveness of selected channels, Budgeting and planning

Sales Planning- Understanding why customers buy and how buying decisions are made; Listening, Sales planning, setting targets, Unique Sales Proposition (USP); Art of the sales pitch (focus on customers needs, not on product features), Follow-up and closing a sale; Asking for the sale. **Support:** Planning & Tracking: Importance of project management to launch and track progress, Understanding time management, work flow, and delegation of tasks, Business Regulation; Basics of business regulations of starting and operating a business; Importance of being compliant and keeping proper documentation, How to find help to get started

Text Books:

1. V. Desai, Fundamentals of Entrepreneurship & small business management, Himalaya Publishing House.
2. S.S. Khanka, Entrepreneurial Development, S. Chand Publication.
3. P.T. Vijayashree and M. Alagammal, Entrepreneurship Development & Small Business Management, Margham Publication.

References Books :

1. S. Shane, A General theory of entrepreneurship: The individual opportunity nexus, Edward Elgar Publication.
2. J. A. Timmons and S. Spinelli, New Venture Creation: Entrepreneurship for the 21st century TMH.
3. R. D. Hisrich, M. P. Peters, D. A. Shepherd and P. Mombourquette, Entrepreneurship TMH.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3ET01	Artificial Intelligence	3	0	0	3

UNIT I

Introduction to artificial intelligence, various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search techniques.

UNIT II

Optimization Problems: Hill-climbing search Simulated annealing like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies, Heuristic Functions, Constraint Satisfaction Problem.

UNIT III

Knowledge Representation, structures, Predicate Logic, Resolution, Refutation, Deduction, Theorem proving, Inferencing, Semantic networks, Scripts, Schemas, Frames, Conceptual dependency.

UNIT IV

Uncertain Knowledge and Reasoning, forward and backward reasoning, monotonic and nonmonotonic reasoning, Probabilistic reasoning, Baye's theorem, Decision Tree, Understanding, Common sense, Planning.

UNIT V

Game playing techniques like minimax procedure, alpha-beta cut-offs etc, Study of the block world problem in robotics.

Text Book

1. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair, TMH
2. Artificial Intelligence: A Modern Approach by Peter and Norvig

Reference Books

1. Artificial Intelligence by Saroj KausikISBN, Cengage Learning
2. Nils Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann
3. David Poole, Alan Mackworth, Artificial Intelligence: Foundations for Computational Agents, Cambridge Univ. Press.
4. Artificial Intelligence and Intelligent Systems by Padhy, Oxforfd University Press,

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EV03	Low Power VLSI Design	3	0	0	3

UNIT-I

Introduction: Introduction to VLSI design, Review of MOS transistor models, CMOS logic families including static and dynamic logic.

Power dissipation mechanisms: Sources of power dissipation in VLSI circuits, Physics of power dissipation in CMOS devices – Basic principle of low power design.

UNIT-II

Static Power Dissipation: Charge leakage mechanisms in MOS transistors, Technology scaling and its effect; Threshold voltage roll-off and its effect on sub-threshold current, Gate leakage – limitations of SiO2 as gate oxide, high-k dielectric and its advantages.

Low power approach: Power supply gating principles, Multiple-threshold circuits, Frequency vs. dissipation, strained Silicon MOS technology requirements.

UNIT-III

Dynamic Power dissipation – Short circuit power, switching power dissipation, Supply voltage scaling approaches: Static Voltage Scaling; Single-level Voltage Scaling (SVS), Frequency vs. dissipation.

Low power approach: Circuit level – Transistor sizing, Scaling Approaches, Architecture level – Parallel and pipeline architectures, Algorithm level – Transformations to exploit concurrency,.

UNIT-IV

Low power Architecture & Systems:

Adders: Standard Adder Cells, CMOS Adders Architectures, Low Voltage Low Power Design Techniques, Current Mode Adders.

Multipliers: Types Of Multiplier Architectures- Braun, Booth Multipliers and their performance comparison.

Memories: Sources of power dissipation in SRAMs, Low power SRAM circuit techniques, Sources of power dissipation in DRAMs, Low power DRAM circuit techniques.

UNIT-V

Power estimation techniques – logic power estimation, Simulation power analysis, Probabilistic power analysis.

Synthesis and software design for low power – Behavioral level transform, software power estimation – co-design.

Text Books

1. Gary K. Yeap, Practical Low Power Digital VLSI Design, KAP, 2002

2. Rabaey and Pedram, Low power design methodologies, Kluwer Academic,1997
3. Kiat Seng Yeo and Kaushik Roy, Low- Voltage, Low-Power VLSI Subsystems, Edition 2009, Tata Mc Graw Hill
4. Abdelatif Belaouar, Mohamed.I.Elmasry, "Low power digital VLSI design", Kluwer, 1995.

References

1. Soudris D, Piguet C and Goutis C, Designing CMOS Circuits for Low Power, Kluwer Academic Publishers, 2002 .
2. Kaushik Roy, Sharat Prasad, Low-Power CMOS VLSI Circuit Design, Wiley, 2000
3. J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999.
4. A.P.Chandrasekaran and R.W.Broadersen, "Low power digital CMOS design", Kluwer,1995.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3CO16	Microwave Engineering	3	1	2	5

UNIT I

INTRODUCTION

RF & Microwave Spectrum. Historical Background. Typical applications of RF & Microwaves. Transmission lines and Waveguides: Circuit model for transmission lines, loss less and lossy lines, field analysis of transmission lines, Smith chart, impedance matching.

UNIT II

PLANAR STRUCTURE

Concept of Mode, Characteristics of TEM, TE ,TM and Hybrid Modes; Rectangular and Circular Waveguides, Cut-off frequency, Propagation characteristics, Wall current, Attenuation constant, Waveguide excitations.

Strip Lines: Microstrip lines, coplanar structures, Slot lines, Substrate Integrated Waveguide Suspended strip lines, Fin lines – configurations, Field patterns, propagation characteristics, Design considerations. Comparison of characteristics of lines.

UNIT III

WAVEGUIDE PASSIVE COMPONENTS

Waveguide Resonators-Rectangular & Cylindrical; Resonant frequencies, Mode structures, Q factor, Co-axial Resonators; Excitation & Coupling of cavities, Design of resonators. N-port networks – circuit representations, Z – matrix, Y – matrix, S – matrix, transmission matrix;

their relationships; Attenuators, Phase shifter, Directional couplers, Bethe-hole coupler, Power divider E & H plane Tee, Magic Tee, Hybrid ring, Circulators, Isolators, Flanges, Bends, Irises, Posts, Loads.

UNIT IV

SOLID STATE MICROWAVE DEVICES

Tranferred electron devices- GUNN EFFECT; negative differential resistance phenomenon, field domam formation. GUNN diode structure. Avalanche transit time devices, IMPATT, TRAPATT, BARITT diodes, parametric amplifiers.

UNIT V

MICROWAVE FILTERS

Periodic Structures, Filter Design by the Image Parameter Method, Filter Design by the Insertion Loss Method, Filter Transformations, Filter Implementation, Stepped-Impedance Low-Pass Filters, Coupled Line Filters, Filters Using Coupled Resonators.

TEXT BOOKS

4. David M. Pozar, "Microwave Engineering", Third Edition, Wiley India.
5. R.E.Collin, "Foundations for Microwave Engineering", Second edition, IEEE Press.
3. Samuel Y. Liao, Microwave Devices and Circuits, PHI.

REFERENCE BOOKS

3. M.L. Sisodia and G.S.Raghuvanshi, Microwave Circuits and Passive Devices, Wiley Eastern Ltd., New Age International Publishers Ltd.

4. I.J. Bahl and P. Bhartia," MicroSrip Transmission Lines", Artech House, Inc.

WEBSITE RESOURCES

3. Online Microwave Theory & Techniques course by IIT Bombay
   http://nptel.ac.in/noc/individual_course.php?id=noc18-ee22.

List of Experiment

1 Introduction & study of Different microwave measurement instrument and components.
Design and analysis of X- BAND Rectangular and Circular waveguide using full wave simulator.

2 To study the V-I characteristics of Gunn oscillator and to observe the variation of power & frequency with the biasing voltage.

3 Characterization of a crystal detector at microwave frequency using waveguide test bench (WR 90).

4 To study the variation of output power and frequency of a Reflex Klystron with the variation of repeller voltage (Dynamic method) & hence to determine mode number, transit time, electronic tuning range (ETR) and electronic tuning sensitivity (ETS).

5 Measurement of Wavelength, Guided wave length and Frequency using Waveguide test bench (WR-90). Calculation of broad wall dimension of waveguide and plot ω-β.

6 Measurement of Unknown Impedance (Inductive, Capacitive and Resonant Windows) using Smith Chart.

7 Measurement of Coupling Factor and Directivity of Directional Coupler using Calibrated Attenuator
Design and analysis of Directional Coupler using full wave simulator.

8 Measurement of Reflection Coefficient without using Slotted line.

9 To Measure the dielectric constant of a low loss solid dielectric using waveguide test bench (WR 90).

10 To measure the Scattering Matrix of Magic Tee & E & H Plane Tee.
Design and analysis of Magic Tee & E & H Plane Tee using full wave simulator.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO14	Fiber Optic Communication	3	1	2	5

Unit 1:

Optical Fibers: Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems The nature of light, basic optical Laws, fiber types, waveguide equations for step index fibers, modes in step index fiber, power flow in the step index fibers, graded index fiber, modes in graded index fiber. Fiber fabrication: outside vapor phase oxidation, vapor phase axial deposition, modified chemical vapor deposition, double crucible method.

Unit 2:

Signal Degradation: Signal degradation in optical fibers: absorption, scattering losses, bending loss, material dispersion, waveguide dispersion, intermodal distortion, Dispersion- modified - single mode fibers. Fiber splicing: splicing techniques, optical fiber connectors.

Unit 3:

Optical Sources: Types of optical sources, Lasers: basic concepts, absorption and emission of radiation, population inversion, optical feedback and laser oscillation, spontaneous emission, stimulated emission and lasing, laser modes, single mode operation, non-semiconductor laser, Light emitting diodes: the double heterojunction LED, Planner LED, surface emitter LEDs, edge emitter LEDs, LED characteristics, optical output power, output spectrum, modulation bandwidth, reliability.

Unit 4:

Detectors and Amplifiers: Device types, optical detection principles, absorption, quantum efficiency, responsivity, long wavelength cutoff, semiconductor photodiodes without internal gain, photodiodes with internal gain, phototransistors, Optical amplifiers: semiconductor amplifiers, fiber amplifiers.

Unit 5: Advanced Systems And Applications: Wavelength Division Multiplexing, nonlinear optical effects, optical sensors, optical isolators, circulators

Text Books:

[1] Senior, J M, "Optical Communication Principle and Practices", II edition Pearson Education Ltd.

[2] Keiser G, "Optical Fiber communications", second edition, McGrawhill.

REFERENCES:

[1] Biswas Sambhu Nath, Optoelectronic Engineering", Dhanpat Rai Publication.
[2] Gowar J., optical communication systems, PHI.
[3] William B. Jones jr., Introduction to optical fiber communication systems, Holt, Rinehart and Winston,

List of Experiments:

1. Preparation of optical fiber (single and multi mode) for launching of light into the optical fiber and calculation of numerical aperture and V-number. Identification of single mode and multi mode fiber.
2. Measurement of attenuation loss in an optical fiber.
4. Measurement of connectorzation and splicing losses in an optical fiber system.
5. To set up a fiber optic analog link and study of PAM.
7. To set up a fiber optic digital link and study of TDM.
8. To study and measure propagation losses in an optical fiber system.
9. To study the load cell transducer characteristics of optical fiber.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EC3CO12	VLSI Design	3	1	2	5

Unit1

Introduction, VLSI designs Flow, Y-chart, Moore's law, MOS transistors (Enhancement type): structure and operation, I-V characteristics, Threshold voltage, channel length modulation, body effect. MOS transistor as a switch, pass transistor logic, Tristate inverter, transmission gate operation, transmission gate logic: logic gates, multiplexers, latches and registers.

Unit2

MOS inverters: Resistive Load Inverter, Inverters with n-type MOSFET Load, CMOS inverter: structure, operation, voltage transfer characterstics, switching threshold, noise margin, delay characteristics, power dissipation. Static CMOS: combinational logic circuits, XOR, XNOR gates, half adder, full adder, SR latch, D latch.

Unit3

Synchronous sequential circuits: Finite state machine, state graph, state table,mealy and moore machines, conversion between mealy and moore machines, Excitation table of flip-flops, synthesis of synchronous sequential circuits, state equivalence and machine minimization, simplification of incompletely specified machines.

Unit4

Asynchronous sequential circuits, Fundamental mode circuits, synthesis, Races and cycles, secondary state assignment, pulse mode circuits, hazards in combinational circuits, essential hazards, hazard free realization using SR flip flops. Algorithmic state machine (introduction).

Unit5

Programmable logic devices: PROM, PLA, PAL, programmable interconnects, logic realization by using PLDs, Study of PAL16L8, CPLD, FPGA.

IC fabrication: Basic steps of IC fabrication, CMOS n-well, p-well, twin-tub processes, Bipolar technology. Layout design rules.

Text Books:

1. Neil Weste and D. Harris: CMOS VLSI Design, Pearson Education India
2. Kohavi: Switching & Finite Automata Theory, TMH
3. Kang and Leblebici:CMOS Digital Integrated Circuits: Analysis and Design, TMH
4. S.M.Sze: VLSI Technology , TMH

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

References:

1. Neil Weste and Eshragian: Principles of CMOS VLSI Design, Pearson Education India
2. W. Wolf, Modern VLSI Design – System on Chip Design, Pearson Education
3. Lee: Digital Circuits and Logic Design, PHI Learning.
4. Roth Jr.: Fundamentals of Logic Design, Jaico Publishing House

List of Experiments

1. Design CMOS Inverter using S-edit and getting its transient response.
2. Design Universal gates and all other gates using S-edit and getting its transient response.
3. Obtain the DC- characteristics of CMOS Inverter using DC-analysis.
4. Design Symbol of CMOS Inverter and using instances of its getting transient response.
5. Design Symbol of Universal gates and using instances of them getting transient response.
6. Design a Half Adder and Full adder using instances.
7. Design a Transmission gate using PMOS & NMOS by instance calling.
8. Design of D flipflop using transmission gate.
9. Design the Layout of NMOS and PMOS transistor.
10. Design the Layout of CMOS Inverter.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EC05	Wireless & Mobile Communications	3	0	0	3

UNIT 1
Introduction
Introduction to wireless communications: history and evolution, current wireless communication systems, requirements of wireless services and technical challenges of wireless communications

UNIT 2
Propagation mechanism and performance analysis
Radio wave propagation in the mobile environment: Free-space propagation, Multipath scenario, large scale and small scale fading, signal time spreading, time variance of the channel caused by motion,

UNIT 3
Wireless Access
Path loss models: fading channel coefficient, Characterization of fading channel, performance analysis of fading channel, mitigating the degradation effect of fading- diversity technique and interleaver.

UNIT 4
Cellular Systems:
Evolution of cellular systems, principles and operation of cellular systems, narrowband systems: FDMA and TDMA systems, frequency planning, and capacity considerations, CDMA wideband systems: resource allocation, soft handover, power control, interference and capacity, OFDM wideband systems, and Standardized cellular communications systems.

UNIT 5
Wireless Network Standards:
Wireless LANs, wireless MANs, short range wireless networks, standards, capabilities and applications, broadband wireless networks, and integration of different types of wireless networks

Course Texts
1.Wireless Communications", A. Goldsmith, Cambridge University Press.
2.Wireless Communications", A. Molisch, Wiley-IEEE.
3.Cellular and Mobile Communication", W. C. Y Lee, TMH.
4. Wireless Communications: Principles and Practice", T. S. Rappaport, Prentice Hall.
5. Fundamentals of Wireless Communications", D. Tse and P. Viswanath, Cambridge University Press.

6. Digital Communications", B. Sklar, P K Ray, Pearson.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OEXXXXX	**Optimization Techniques**	**3**	**0**	**0**	**3**

Unit I: Introduction to Optimization Techniques

Engineering applications of Optimization, Statement of an Optimization problem: design vector, design constraints, constraint surface, objective function, objective function surfaces; Classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization; Multi variable Optimization without constraints: necessary and sufficient conditions for minimum/maximum; Multivariable Optimization with equality constraints: Solution by method of Lagrange multipliers; Multivariable Optimization with inequality constraints –Kuhn – Tucker conditions.

Unit II: Linear Programming

Standard form of a linear programming problem; Geometry of linear programming problems Definitions and theorems ; Linear programming problem-simplex method, Two Phases of the Simplex Method, Duality, Mixed-integer programming. Goal programming, Quadratic programming, Transportation models and its variants, Sequencing problem, Replacement theory.

Unit III: Unconstrained Nonlinear Programming

One dimensional minimization methods and Classification, Fibonacci method and Quadratic interpolation method; Quadratic interpolation method; Newton method; Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method.

Unit IV: Constrained Nonlinear Programming

Characteristics of a constrained problem; Classification ; Complex method ;Sequential linear programming; Basic approach of Penalty Function method : convex programming problem; Basic approaches of Interior and Exterior penalty function methods .

Unit V: Dynamic Programming

Formulation of Multi stage decision problem–Characteristics; Concept of sub-optimization and the principle of optimality; Formulation of Dynamic programming–Backward and Forward recursion; Computational procedure–Conversion offinal value problem in to Initial value problem.

TEXT BOOKS:

- Singiresu S. Rao "Engineering Optimization: Theory and Practice", Fourth Edition ,John Wiley &Sons, Inc.
- Hillier and Lieberman "Introduction to Operations Research", TMH.
- R.Panneerselvam, "Operations Research", PHI.
- HamdyATaha, "Operations Research –An Introduction", Prentice Hall India.

REFERENCES:

- Philips, Ravindran and Solberg, "Operations Research", John Wiley.
- Ronald L.Rardin, "Optimization in Operation Research" Pearson Education Pvt. Ltd. New Delhi.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

With effect from 2018 Batch

Electronics & Communication Engineering

Course Code	Course Name	Hour Per Week			Credit
		L	T	P	
EC3EL02 / EI3EL02	Data Communication and Computer Networks	3	0	0	3

UNIT I Overview of data communication, Introduction to computer networks: network criteria and application, protocol and standards, line configuration, topologies, categories of networks. Concepts of layering and layered model: OSI reference model, TCP/IP reference model, their comparative study. **The Physical Layer:** Introduction to physical layer-data and signal, digital data transmission, parallel and serial transmission, transmission impairments, channel capacity, performance metrics of networks, overview of bandwidth utilization: multiplexing schemes, concepts of switching: Circuit switching: time division & space division switch, TDM bus, message switching and packet switching.

UNIT II The Data Link Layer: Error detection techniques: Parity check, Vertical and longitudinal redundancy check, CRC code and checksum. Data link layer issues-Point to point and multipoint links, flow control, sliding window protocol, various ARQ techniques for error and flow control and their comparison.

UNIT III Medium Access Control- Pure and slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Protocol, **LAN/WLAN Standards:** A brief survey of IEEE LAN standards, Comparative study of Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, IEEE802.11.

UNIT IV The Network Layer: Network layer Services, Design Issues, Concept of Internet working & devices-Repeaters, Hubs, Bridges, Switches, Router and Gateway. Routing algorithms-shortest path algorithm, flooding, distance vector routing and link state routing. Internet addressing- IP addressing scheme, IPv4 protocol, IPv6 protocol.

UNIT V The Transport & Application Layer: Transport layer services, User Datagram Protocol and Transmission Control Protocol, Congestion control algorithm-Leaky bucket algorithm, Token bucket algorithm, choke packets, Quality of service-techniques to improve QoS, Application Layer Design issues and services, client server model, HTTP, SMTP, domain name system.

Text Book:

1. Behrouz A. Forouzan, Data Communication and Networking, Tata-McGraw Hill.
2. Andrew S. Tanenbaum, Computer Networks, Pearson Education.

References:

1. Bertsekas and Gallager, Data Networks, Pearson Education
2. William Stallings, Data and Computer Communications, Pearson Education.
3. Uyless D. Black, Computer Networks, Pearson Education.
4. Alberto Leon-Gracia, Indra Widjaja, Communication Networks: Fundamental Concepts and Key Architectures, Tata-McGraw Hill.
5. Gerd Keiser, Local Area Network, Tata-McGraw Hill.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EL05	Information Theory And Coding	3	0	0	3

UNIT I
Information measure of a source and symbol, average information or entropy of a source, rate of information, joint and conditional entropies, mutual information

UNIT II
Discrete memoryless channel, Channel Matrix, Types of channels: Lossless, Deterministic, Noiseless, BSC, Cascaded channels, Capacity of channel, Shannon-Hartley theorem of channel capacity, Shannon's limit, Capacities of special channels, Bandwidth-S/N trade-off

UNIT III
Source coding: Code Length, Code Efficiency, Source coding theorem, Classification of Codes: Uniquely decodable codes, Instantaneous codes, Prefix-free codes, Optimal Codes, Kraft's inequality,

Entropy Coding: Shannon-Fano Coding, Huffman coding

UNIT IV
Error Control Coding: Channel Coding, Channel Coding Theorem, Linear Block codes, Minimum distance consideration, Hamming Distance and weight, Generator Matrix, Parity check matrix, Syndrome Decoding, calculation of syndrome

UNIT V
Cyclic codes: Code Polynomial, Generator Polynomial, Parity-Check Polynomial, Syndrome Polynomial, Special cyclic codes, Convolutional codes: Impulse response of encoder, tree diagram, Trellis diagram, Decoding of Convolutional codes: Maximum likelihood decoding, Viterbi decoding algorithm

Text Books:
1. Simon Haykin, Communication Systems, John Wiley and Sons.
2. T. M. Cover and J. A. Thomas, Elements of Information Theory, Wiley-Interscience

Reference Books:
1. R. Gallagher, Information Theory and Reliable Communication, Wiley

2. R. Bose, Information Theory, Coding and Cryptography, Tata McGraw Hill Education Pvt. Ltd.
3. S. Gravano, Introduction to Error Control Codes, Oxford University Press, USA

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3ET06	Metaheurisctic Techniques	3	0	0	3

UNIT I
Introduction
Optimization, Type of Optimization, combinatorial optimization, Optimization Algorithms, Metaheuristics, Exploration and Exploitation, Algorithm Complexity, No Free Lunch Theorems, Multiobjective and Multimodel optimization

UNIT II
Genetic Algorithm :
Basic concepts, Search space, working principle. Encoding : binary, permutation, Value and Tree. Decoding, fitness function, Parent Selection : Roulette-wheel, Boltzmann, Tournament, Rank, Crossover : single-pint, two-point, multi-point, uniform, matrix and cross over rate, Mutation , mutation rate, Surviver selection: Delete all , Steady-state and Elitism. Adaptive GA and Real coded GA.

UNIT III
Ant colony and BEE optimization
Ant foraging behavior, Ant Colony Optimization, Double Bridge Problem, Virtual Ant Algorithm
Behavior of Honey Bees, Honey Bee Algorithm, Virtual Bee Algorithm Artificial Bee Colony Optimization, traveling sales man problem, graph portioning,

UNIT IV
Particle swarm Optimization
Basic principle, algorithm, flowchart. Variations of PSO: weighted, repulsive, stretched, comprehensive learning, combined effect PSO , clonal PSO, Accelerated PSO and multimodal PSO

UNIT V
Bacterial Foraging Optimization
Forging theory, social foraging, foraging behavior of E. Coli bacteria, BFO algorithm, chemotatic, swarming, reproduction and elimination and dispersal. Variations of BFO: fuzzy BFO and Adaptive BFO
Applications: function optimization, adaptive system identification, channel equalization and financial forecasting.

TEXT BOOKS:

1. Engineering Optimization: An Introduction with Metaheuristic Applications, Xin-She Yang, John Wiley
2. Evolutionary Computation: A Unified Approach De Jong PHI

REFERENCE BOOKS:

1. K. M. Passino, Biomimicry for optimization, control and automation
2. Search and Optimization by Metaheuristics Techniques and Algorithms Inspired by Nature **Du**, Ke-Lin, **Swamy**, M. N. S. , Birkhauser

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EV05	VLSI for Wireless Communication	3	0	0	3

UNIT I
Communication Concepts in terms circuit designer perspective
Introduction, Access methods, Overview of Modulation schemes (BFSK,BPSK,QPSK), Wireless channel description, Path loss and its characteristics, characteristics of Multipath fading. Importance of Radiofrequency Design, RF Behavior of Passive Components. Review of MOS device physics, Nonideal effects in MOSFET.

UNIT II
Receiver Architectures
Introduction, Receiver front end, Filter design, Rest of receiver front end, Nonlinearity, Harmonic distortion, intermodulation,IP_3, Gain compression, Noise, Noise Sources, Noise Figure.

Low Noise Amplifier (LNA): Introduction, Matching Networks, Matching for Noise and Stability, CMOS LNA.

UNIT III
Mixers
Introduction, mixer fundamentals, Conversion Gain, unbalanced mixer, CMOS active Mixer, single balanced mixer, double balanced mixer: Gilbert Mixer, Passive CMOS Mixer.

UNIT IV
Data Converters
Characteristics of S/H and Quantization noise, ADC and DAC specifications, ADC and DAC architectures, OP-AMP based ADC and DAC.

UNIT V
Frequency Synthesizer: Phase/Frequency-Processing Components Introduction, PLL based Frequency Synthesizer, Phase Detector/Charge Pump, Dividers, VCO, LCO, Ring Oscillator.

Text Books:
1. B. Leung VLSI for Wireless Communication, Prentice Hall - Electronics and VLSI Series
2. B. Razavi, RF Microelectronics, Pearson
3. T. H. Lee, The Design Of CMOS Radio-Frequency Integrated Circuits Cambridge University Press

Reference Books:

1. R. Ludwig, P. Bretchko, “RF Circuit Design” 1st Indian Reprint, Pearson Education Asia
2. B Razavi, “Design of Analog CMOS Integrated Circuits” McGraw Hill.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours per Week			Total Credits
		L	T	P	
EC3EL06	Optical Networks	3	0	0	3

UNIT I

Fundamentals of communication Networks: Basics of optical communication and computer networking, services, switching, multiplexing schemes, telecom network overview and architecture, optical networks, WDM optical networks, WDM network evolution, WDM network construction, broadcast and select optical WDM network, Challenges of optical WDM network.

UNIT II

Optical network Components: Optical transmitters, semiconductor laser diode, tunable laser, photodectors, optical amplifiers and its characteristics, semiconductor laser amplifier, Raman amplifier, OADM, OXC, architecture, Couplers, isolators, circulators, optical line terminals, all optical cross connect configurations.

UNIT III

Optical network architecture: Synchronous optical network/ synchronous digital heirarchy- elements, multiplexing, layers, SONET physical layer, frame structure, WDM network architectures, QoS parameters for optical networks, wavelength routed networks, routing and wavelength assignment (RWA), optical multicast routing, access networks.

UNIT IV

Wavelength routing and Survivability: Classification of RWA algorithms, Problem formulation, routing sub-problem: fixed routing, fixed alternate routing, adaptive routing, fault tolerant routing, wavelength assignment sub-problem, wavelength reuse and conversion criterions, algorithms: flow deviation algorithm, fairness and admission control, restoration schemes, multiplexing schemes, provisioning restorable single fiber networks.

Unit V

WDM Network Design: Cost Trade-Offs, LTD and RWA problems, wavelength conversion, Dimensioning Wavelength-Routing Networks, Statistical Dimensioning models, Maximum load Dimensioning models, Optimization algorithms and methods – routing algorithms, integer and mixed integer linear programming, heuristic optimization algorithms.

Text Books:

1. R. Ramaswami and K N Sivarajan, Optical networks – A practical prespective : Morgan Kaufmann Publishers

2. C. Siva Ram Murthy and M. Gurusamy, WDM optical Networks: Concepts, Design and algorithms , PHI

Reference Books:

1. B Mukherjee, Optical communication networks", Mc-Graw Hill, New York
2. U. Black, "Optical Networks –Third Generation Transport Systems"- Pearson Education.
3. S. Mukherjee, "Optical Networking in Telecommunication- Concepts, Technologies and Components". Jaico Publishing House.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3ET05	Introduction to Machine Learning	3	0	0	3

UNIT I
Introduction to Machine learning, Types of Learning, Hypothesis Space & Inductive Bias, Evaluation, Cross Validation, Linear regression with single and multiple variables, Logistic regression, regularization.

UNIT II
Neural Network: Biological neuron, structure of an artificial neuron, feed forward neural network, back propagation algorithm, single layer perceptron, multi-layer perceptron.

UNIT III
Classification: Generalized linear models, SVM, Non-linear hypothesis and Kernel Methods, Multi-class Classification, Model Representation, learning, unconstrained and constrained optimization.

UNIT IV
Unsupervised learning algorithms: Clustering, Dimensionality reduction, PCA, Anomaly detection, recommender systems.

Unit V
Semi-supervised Learning, Reinforcement Learning: Deep Learning, CNN, RNN architectures, Training RNN- Loss and BPTT, LSTM, Deep RNN and Bi-RNN.

Text Books

1. E. Alpaydin, Introduction to Machine Learning, MIT Press
2. A. Smola and S.V.N. Vishwanathan Introduction to Machine Learning, Cambridge University Press

Reference Books

1. T. Mitchell, Machine Learning, McGraw Hill

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
EC3EV01	Design for Testability	3	0	0	3

UNIT I
VLSI Testing needs and challenges, defects and faults, modelling of faults: stuck at faults, bridging faults, breaks and transistor stuck on/open faults, delay faults, temporary faults.

UNIT II
Fault diagnosis in digital circuits, test generation techniques for combinational circuits: one dimensional path sensitization, Boolean difference, D- algorithm, PODEM, FAN.

UNIT III
Testing of sequential circuits as iterative combinational circuits, state table verification, test generation based on circuit structure, functional fault models, test generation based on functional fault models

UNIT IV
Design for testability: Ad hoc techniques, scan path technique, level sensitive scan design, partial scan, boundary scan.

UNIT V
Built in self test (BIST): Test pattern generation for BIST, exhaustive testing, pseudo exhaustive and pseudo random pattern generator, output response analysis, BIST architecture.

Text Books

1. *N. Jha & S.D. Gupta, "Testing of Digital Systems", Cambridge.*
2. *W. W. Wen, "VLSI Test Principles and Architectures Design for Testability", Morgan Kaufmann Publishers.*
3. *P. K. Lala," Fault tolerant and fault testable hardware design", BS publication.*

Reference Books

1. *M. L. Bushnell &V.D. Agrawal," Essentials of Electronic Testing for Digital, memory & Mixed signal VLSI Circuits", Kluwar Academic Publishers.*
2. *P. K. Lala," Digital circuit Testing and Testability", Academic Press.*
3. *M. Abramovici, M. A. Breuer, and A.D. Friedman, "Digital System Testing and Testable Design", Computer Science Press,*

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00058	Internet of Things	3	0	0	3

UNIT I
Introduction:
Definition, Characteristics of IoT, IoT Components and its Implementation, Physical design of IoT, Logical design of IoT, Applications of IoT, IoT Levels and Deployment Templates.

UNIT II
IoT & M2M:
Machine-to-machine (M2M), SDN (software defined networking) and NFV (Network Function Virtualization) for IoT, IoT Cloud Based Services.

UNIT III
Communication Protocols and Design Principles for Web Connectivity:
IoT Communication Environment, Communication Protocols for IoT/M2M connected devices: COAP, LWM2M, JSON,MQTT, XMPP. Web Connectivity for connected devices network using Gateway,SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity, Internet based communication, IP addressing in IoT.

UNIT IV
Sensors and IoT enabling Technologies:
Sensor Technology, Industrial IoT and Automotive IoT, Actuator, Sensor Data Communication Protocols, RFID IoT Systems, Wireless Sensor Network Concepts and Architecture.

UNIT V
IOT Design methodology & Case studies:
Specifications - Requirement, Process, Domain model, Service, Functional & Operational view. Raspberry Pi & Arduino devices. IoT Case Studies: Home Automation, Smart City Streetlights Control and Monitoring.

Text Book

1. Rajkamal, “Internet of Things”, Tata McGraw Hill publication.
2. V. Madisetti and A. Bahga, “Internet of things (A-Hand-on-Approach)”, Universal Press.

Reverence Book:

1. H. Chaouchi “The Internet of Things: Connecting Objects”, Wiley publication.

2. F. Dacosta “Rethinking the Internet of things: A scalable Approach to connecting everything”, Apress publications .

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00059	Cyber Security	3	0	0	3

UNIT I
Introduction to Cyber Crime
Introduction to Cybercrime, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Hacking, Software Piracy, Password Sniffing, Credit Card Frauds, Cyberstalking, Botnets, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, DoS and DDoS Attacks, Malware, Cyber terrorism.

UNIT II
Introduction to Cyber Security
Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Security Evolution, Need for a Comprehensive Cyber Security Policy.
Securing Web Application, Services and Servers: Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services.

UNIT III
Cyber Security Vulnerabilities and Cyber Security Safeguards
Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Authentication, Biometrics.

UNIT IV
Cryptography and Network Security
Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication and Hash functions, Digital Signatures, Public Key infrastructure, Diffe-Hellman key exchange protocol, Applications of Cryptography, Overview of Firewalls-Types of Firewalls,

UNIT V
Cyber Forensics, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy.

Test Book

1. N. Godbole and S. Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley.
2. W. Stallings, "Cryptography and Network Security: Principles and Practice" Pearson

Reference Books

1. Principles of Cyber crime, Jonathan Clough Cambridge University Press.
2. William Stallings, "Network Security Essentials Applications and Standards Pearson.
3. Fourozon, "Cryptography & Network Security" TMH.
4. Harish Chander , Cyber Laws and IT Protection, PHI.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00060	Robotics	3	0	0	3

UNIT I
Introduction to Robotics
Types and components of a robot, classification of robots, closed loop and open loop control system. Kinematics system; definitions of mechanism and manipulators, social issues and safety.

UNIT II
Robot Kinematics and Dynamics
Kinematic modeling: translational and rotational representation, coordinate transformation, D-H parameters, Jacobian singularity and statics. Dynamic modeling: equation of motion: Euler Lagrange formulation

UNIT III
Sensor and Vision System
Contact and proximity type, position, velocity, force, tactile etc. introduction to Cameras, Camera calibration, geometry of image formation, Euclidean/Similarity/Affine/projective transformations

UNIT IV
Robot Control and Actuation System
Basics of control, transfer functions, industrial controllers such as P PI PID, nonlinear and advanced controls. Actuator, electric, pneumatic and hydraulic transmission gears, timing belts and bearings.

UNIT V
Control Hardware and Interfacing
Embedded systems architecture and integration with sensors, actuators, components, programming for robot applications

Text Books
1. S.K.Saha, “Introduction to Robotics”, McGraw Hill Education, New Delhi
2. A. Ghosal, “Robotics”, Oxford, New Delhi
3. R. K. Mittal and I. J. Nagrath, “Robotics and Control”, TMH

Reference Books
1. J.J. Craig , “Introduction to Robotics: Mechanics and Control”, Pearson, New Delhi

2. K. Fu, R. Gonzalez, and C.S.G. Lee, , “Robotics: Control, Sensing, Vision and Intelligence”, McGraw- Hill,

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00062	Imaging system for Industrial Applications	3	0	0	3

UNIT I
Fundamental of Imaging Systems
Digital and analog Image formation and contrast sensitivity, Sampling and Quantization. Fundamental steps in image processing , Image acquisition, Imaging Geometry, Elements of basic Imaging system, Requirement of imaging system in various Industries, Importantparameters of an imaging system design, Types of Imaging system used inIndustries.

UNIT II
Radiography
Basis of Radiology technique, Nature of X- ray, Production of X-rays, X-ray Machine, visualization of X-rays, Digital Radiography, condition monitoring using radiography, Limitations of radiography.
X-ray Computed Tomography:
Introduction of Computed Tomography, System Components, Gantry Geometry, Image reconstruction.

Unit-III

Ultrasonic Imaging System

Instrumentation Design For Ultrasonic Imaging,Diagnostic Ultrasound, Physics of ultrasonic waves, Basic pulse– echo apparatus, A- scan, B-scanner, real time ultrasonic Imaging System, Multi- element linear array scanners, Through Transmission, Immersion Testing, Straight Beam and Angle beam testing.

Unit-VI
Thermal Imaging System
Thermography, Physics of thermography, Infrared Detectors, Thermo graphics Equipments, Types of thermography, Quantative thermography, ,Thermal Camera based on IR Sensor with digital focal plane array, Advantage of Thermal Imaging.

Unit V
Other Imaging System

Imaging system in nanotechnology: scanning tunneling microscopy, and atomic force microscopy, scanning electron microscopy (SEM),transmission electronic microscopy (TEM).Nuclear Medicine: Gamma camera, SPECT and PET, Holography, Magnetic Resonance Imaging (MRI), Microwave imaging.

Text Books:

1. R.C. Gonzlez., and Paul, Wintz, “Digital Image Processing”, Addison-Wesley Publishing Company.
2. Cartz, Louis. "Nondestructive testing."

Reference Book:

1. R. S. Khandpur, Handbook of biomedical instrumentation. Tata McGraw-Hill Education.

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00061	**Solar Energy and its Utilization**	3	0	0	3

UNIT I
Solar Radiation
Nature of Solar Radiation, Global, Beam and Diffuse Radiation, Hourly, Daily and Seasonal variation of Solar Radiation, Radiation measurements and predictions

UNIT II
Solar Thermal Conversion
Solar thermal conversion: basics , Flat Plate Collector, Hot Air Collector, Evacuated Tube Collector, Parabolic , Compound Parabolic and Fresnel Solar Concentrators, Performance of Solar Collectors, Solar Water Heating Systems, Solar Industrial Process Heating Systems, Solar Thermal Power Systems.

UNIT III
Photovoltaic systems
Principle of photovoltaic conversion, Solar cells & panels, performance of solar cell, Organic solar cells, solar panels, Photovolatic systems, components of PV systems, performance of PV systems, design of PV systems, fabrication of photovoltaic devices

UNIT IV
Solar Photovoltaic energy conversion and utilization
Photovoltaic power generation systems, Off-grid and Grid connected power control and management systems Economics of solar photovoltaic systems

UNIT V
Economic analysis of Solar Energy Systems
Life cycle analysis of Solar Energy Systems, Time Value of Money, Evaluation of Carbon Credit of Solar Energy Systems,

TEXT BOOKS:
1. D.Y. Goswami, F. Kreith & J.F. Kreider, Principles of Solar Engineering, Taylor & Francis
2. G.N. Tiwari, Solar Energy, Fundamentals design, Modelling and Applications. Narosa,

REFERENCES:
1. J.A. Duffie, W.A. Beckman Solar Engineering of Thermal Processes , John Wiley
2. V. V. N Kishore, Renewable Energy Engineering and Technologies, TERI

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

Medi-Caps University, Indore
Department of Electronics Engineering

Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
OE00061	**Solar Energy and its Utilization**	3	0	0	3

UNIT I
Solar Radiation
Nature of Solar Radiation, Global, Beam and Diffuse Radiation, Hourly, Daily and Seasonal variation of Solar Radiation, Radiation measurements and predictions

UNIT II
Solar Thermal Conversion
Solar thermal conversion: basics , Flat Plate Collector, Hot Air Collector, Evacuated Tube Collector, Parabolic , Compound Parabolic and Fresnel Solar Concentrators, Performance of Solar Collectors, Solar Water Heating Systems, Solar Industrial Process Heating Systems, Solar Thermal Power Systems.

UNIT III
Photovoltaic systems
Principle of photovoltaic conversion, Solar cells & panels, performance of solar cell, Organic solar cells, solar panels, Photovolatic systems, components of PV systems, performance of PV systems, design of PV systems, fabrication of photovoltaic devices

UNIT IV
Solar Photovoltaic energy conversion and utilization
Photovoltaic power generation systems, Off-grid and Grid connected power control and management systems Economics of solar photovoltaic systems

UNIT V
Economic analysis of Solar Energy Systems
Life cycle analysis of Solar Energy Systems, Time Value of Money, Evaluation of Carbon Credit of Solar Energy Systems,

TEXT BOOKS:
1. D.Y. Goswami, F. Kreith & J.F. Kreider, Principles of Solar Engineering, Taylor & Francis
2. G.N. Tiwari, Solar Energy, Fundamentals design, Modelling and Applications. Narosa,

REFERENCES:
3. J.A. Duffie, W.A. Beckman Solar Engineering of Thermal Processes , John Wiley
4. V. V. N Kishore, Renewable Energy Engineering and Technologies, TERI

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering

	Medi-Caps University Faculty of Engineering Syllabus for Bachelor of Technology Department of Electronics Engineering