SYLLABUS FOR

M.SC. (ELECTRONICS)

(SEMESTER SYSTEM)

TO BE IMPLEMENTED FOR NEW BATCH FROM 2018-19

DEPARTMENT OF PHYSICS & ELECTRONICS

DR. RAM MANOHAR LOHIA AVADH UNIVERSITY, FAIZABAD

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DR. RAM MANOHAR LOHIA AVADH UNIVERSITY, FAIZABAD
DEPARTMENT OF PHYSICS AND ELECTRONICS
M.SC. ELECTRONICS SYLLABUS
SEMESTER I TO IV

M. SC. PERVIOUS- SEMESTER I

		Th + S*
ELE-C-101	Mathematical Techniques	70 + 30
ELE-C-102	Physics of Electronic Materials	70 + 30
ELE-C-103	Programming and Simulation	70 + 30
ELE-C- 104	Electronics Circuits and Digital Electronics	70 + 30
Practical-I	Electronics and (Programming Laboratory)	100
	Seminar-I	100
	TOTAL MARKS OF FIRST SEMESTER	600

M. SC. PERVIOUS- SEMESTER II

		Th + S*
ELE-C-201	Electromagnetic Fields and Antenna	70 + 30
ELE-C-202	Optoelectronics and Optical Communication	70 + 30
ELE-C-203	Network Analysis and Synthesis	70 + 30
ELE-C- 204	Linear Integrated Circuit and Applications	70 + 30
Practical-II	Linear Integrated Circuit and Communication Lab	100
	Seminar-II	100
	(Related to MOOCS Course)	
	TOTAL MARKS OF SECOND SEMESTER	600

M. SC. FINAL- SEMESTER III

		Th + S*
ELE-C-301	Digital Signal Processing	70 + 30
ELE-C-302	Analog and Digital Communication	70 + 30
ELE-C-303	VLSI Technology and VHDL	70 + 30
ELE-E-304	Elective –I	70 + 30

Practical-III	VLSI Technology and communication Lab	100
	Project(Review of Literature and Seminar)	100
	TOTAL MARKS OF THIRD SEMESTER	600

Elective-I
1.Power Electronics
2.IC and Thin Film Techniques

M. SC. FINAL- SEMESTER IV

		Th + S*
ELE-C-401	Control Systems	70 + 30
ELE-C-402	Microprocessor and Microcontroller	70 + 30
ELE-C-403	Microwave Electronics	70 + 30
ELE-E- 404	Elective – II	70 + 30
Practical-IV	Microprocessor and Microcontroller Interfacing Lab	100
Project	Project work / Dissertation work	100
	TOTAL MARKS OF FOURTH SEMESTER	600
	GRAND TOTAL	2400

Elective-II

1. Nanoelectronics and Biomedical Electronics
2. Digital Image Processing
3. Radar, Satellite Communication and Remote sensing
4. Robotics and Artificial Intelligence

***Sessional Marks Distribution**
1. Test-1:10 Marks
2. Test-2:10 Marks
3. Student Response in Class: 5 Marks
4. Student Attendance: 5 Marks

First Semester

ELE-C-101 Mathematical Techniques

UNIT I: Functions of complex variable, Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formulae for derivatives of analytic function, Taylor's and Laurent's series, Singularities, Residue theorem.

UNIT-II: Periodic functions, Fourier Series of periodic functions, Even and odd functions, Dirichlets Condition,Wave Symmetry, Fourier series exponential term, Fourier analysis of half range and half wave expansion, Fourier Transform,Theorems, Parseval Theorem, Fourier Transform Of Different Functions, Application of fourier transform in Electronics.

UNIT-III: Laplace Transform and its existence, Laplace Transform of standard functions,properties of Laplace Transform, Laplace Transform of periodic functions, LaplaceTransform of some special functions, inverse Laplace Transform, circuit analysisusing Laplace Transform (R, RC, LC, RLC circuits).Inverse Laplace

UNIT IV: Classification of signals, Correlation, Auto correlation and Cross-correlation function, Convolution. Probability and events, Random signals, Random variable and Random Process, Statistical averages and moments, Probability density function and Power spectral density, Gaussian distribution.

RECOMMENDED BOOKS

1. A text Book of Engineering Mathematics-Manish Goyal and N. P. Bali
2. Principles of Communication system- Taub and Schilling, TMH
3. Advanced Engineering Mathematics by H. K. Das, S. Chand
4. Networks And Systems D .Roy Chaudhary
5. Fourier transformation and Laplace transformation, Schaum Series Book.

ELE-C-102 Physics of Electronic Materials

UNIT-I: Space lattices and Crystal structures, Crystal directions and planes, Crystalline state and non crystalline states, Covalent solids, metals and alloys, Ionic solids, Classifications of polymers, Structure and crystallinity of long chain polymers, Crystal imperfections, reciprocal lattice, Miller indices, Miller-Bravais lattice, Diffusion in soilds.

UNIT-II: Types of Semiconductors, Compound semi conductor, Direct and indirect semiconductor, Position of Fermi level in semiconductor (Qualitative idea) , The effective density of states and carrier concentration, Intrinsic conductivity and mobility, variation of carrier concentration with temperature, determination of band gap of intrinsic semi conductor, kinetics of extrinsic case, Hall effects in semiconductors, Degenerate semiconductors

UNIT-III: Dielectrics, Parameters for dielectrics (Dielectric constant, dipole moment, polarization, polarisability), mechanism of polarization. Permanent dipole moment, Space charge polarization, Internal field and its expression, Clausius Mossotti relation, Maxwell relation, Debye's quantization of Clausius Mossotti equation, polar and non-polar solids, classification of dielectrics, piezoelectric, pyroelectric, Ferroelectric, Paraelectric and ferromagnetic materials. Ferromagnetic domain, Real and imaginary dielectric constants, Dielectric losses, Effect of frequency and polarization.

UNIT-IV: Superconductivity and Liquid Crystals:,Different Properties Of Superconductor Meissner effect,London equation,BCS theory,Josephson effect,High Temperature Superconductor,Types of liquid crystals and their mesomorphous phases, Elementary theory of order, Transition Metal Alloys.

RECOMMENDED BOOKS:

1. A First Course In Material Science by Raghvan, Mac-Graw Hill
2. Solid State Electronics by Mermin And Ashcroft
3. A first Course In crystallography by O.N.Srivastava And A.R.Verma
4. Liquid Crystals by S.Chandrsekhar

5.Electronic Properties of Materials: R.E. Hummel

6.Electronic Properties of Materials: David Jiles 3. VLSI fabrication principles: S.K. Ghandhi

7.Electronic components & materials principles, manufacturing, maintenance: -S. M. Dhir TMH

8.Principle of electronic material and devices - S. O. Kasap TMH

ELE-C-103 Programming and Simulation

UNIT-I. Introduction to C. Data types, Constants, Variables and arrays, Strings, Declarations, Expressions, Statements, Symbolic constants. Operators: Arithmetic, binary, relation for common operations. Operator precedence and associativity. Bitwise operations . Special operators . Data input and output. Single character input and output. Formatted input and output, String input and output. Control statements: the while and do-while statements; the for statement; nested loops, if-else statement; the switch statement; the break statement; the continue statement; the comma operator; the go to statement.

UNIT -II Functions; defining a function; accessing a function; passing arguments to a function; specifying argument data types. String-andling function. Recursion. Storage classes; automatic, external, static and register variables. Arrays; defining and processing, passing arrays to a function, multi-dimensional arrays, initialization. Programming in C.

UNIT -III. Pointers: declaration; passing pointers to a function; pointers and one dimensional arrays; operations on pointers; pointers and multidimensional arrays; arrays of pointers; passing function to other functions. Structures and unions defining and processing a structure; structures and pointers; passing structure to a function; self referential unions.

UNIT-IV: Introduction to MATLAB and its applications in electronics.

RECOMMENDED BOOKS:

1. LET US C BY YASHAVANT KANETKAR ,BPB PUBLICATION,3RD EDITION
2. Exploring C by Kanetkar
3. C++ by Balaguru Swamy
4. The Waite group's object oriented programming in Turbo C++: Robert Lafore, Galgotia Publication. Pvt. Ltd, 2005

ELE-C -104 Electronics Circuits and Digital Electronics

UNIT - I: Bipolar Junction Transistors (BJT): Transistor fundamentals, DC operating point, BJT characteristics & parameters, fixed bias, emitter bias with and without emitter resistance, analysis of above circuits and their design, variation of operating point and its stability. Small Signal BJT amplifiers: AC equivalent circuit, hybrid, re model and their use in amplifier design.Multistage amplifiers, frequency response of basic & compound configuration, Power amplifiers: Class A, B, AB, C and D stages, IC output stages.

UNIT - II: Feedback & Oscillator Circuits : Concept of feedback, Effect of positive and negative feedbacks, basic feedback feedback topologies & their properties, Analysis of practical feedback amplifiers, Sinusodial Oscillators (RC, LC and Crystal), Multivibrators, The 555 timer.

UNIT - III: Data and number systems - Binary representation, Codes and their conversions: BCD, Octal, Hexadecimal, ASCII, EBDIC, Gray, Signed binary number representation with 1's and 2's complement methods, Binary arithmetic,Boolean algebra, logic gates and circuits, Minimization of logic expressions by algebraic method, K-map method and Quine Mc Clauskey method Combinational circuits- adder, subtractor, encoder, decoder, comparator, multiplexer, de-multiplexer, parity generator, etc Design of combinational circuits-Programming logic devices and gate arrays.

UNIT - IV: Sequential Circuits- Flip Flops, various types of Registers and counters and their design, Different type of logic: TTL, ECL, MOS and CMOS, their operation and specifications

RECOMMENDED BOOKS:

1.Jain—Modern Digital Electronics, 2/e ,TMH
2. Digital Logic Design- Morries Mano, PHI.
3. Jacob Millman, and C.C. Halkias, "Electronic devices and circuits", TMH Publications.
4. Ben G. Streetman, Solid State Electronic Devices, PHI, 5th Ed, 2001.
5. Functional Electrronics-Ramnan

Second Semester

ELE-C-201 Electromagnetic Fields and Antenna

UNIT I : Maxwell's equations, correspondence of field and circuit equations, Vector and Scalar potentials, Poynting's Theorem, Plane Waves in a Non-Conducting medium. Reflection and refraction of electromagnetic waves, propagation of waves in a conducting medium wave equation,Skin Effect, Poynting vector theorem.

UNIT-II: Characteristic impedance and admitance, electromagnetic radiation, retarded potentials, radiation from an oscillating dipole, linear antenna, Lienard-Wiechart potentials, potential for charge in uniform motion(Lorentz formula),field of an accelerated charge, radiation from an accelerated charged particle a low velocity, radiation from charged particle moving in circular orbit.

UNIT-III: Basic antenna concept, parameters (patterns, beam area, radiation intensity, beam efficiency, directivity and again, effective aperture, scattering aperture, physical aperture, effective height), Friis transmission formula, duality of antenna, , centre fed dipole antenna, antenna field zone, array of dipole (broadside and endfire case), antenna with parasitic elements (Yagi- Uda), horn antenna and micro- strip antenna,its types,properties and applications.

UNIT-IV : Propagation Characteristics and Factors Involved in the Propagation of Radio Waves. Different aspects of Surface Wave, Space Wave, Troposcatter and Ionospheric Propagation. Duct Propagation, Radio Horizon, Line of Sight. Fading.

RECOMMENDED BOOKS

1. Electromagnetics: J. D. Kraus, McGraw Hill.
2. Microwave devices and circuits: S. Y. Liao, Prentice Hall.
3. Electromagnetic waves and Radiating System by E. C. Jorden, D. G. Balmein

ELE-C-202 Optoelectronics and Optical Communication

UNIT-I: Light sources and detectors, Black body radiation, Sources of light and their spectral characteristics, Interaction of radiation with matter, photo conductivity, photo detectors and their figure of merit, Introduction to solar cells, Luminiscence and their uses, optical sources (LED).

UNIT-II : Lasers, Theory of Stimulated emission and optical oscillator in solid state semiconductors, dye lasers, Laser diode, non linear interaction, Ruby Laser, He-Ne Laser and Solid state Lasers, ND-YAG and Eximer lasers.

UNIT-III : Optical detectors-optical detector principle, absorption coefficient, detector, characteristics, Quantum efficiency, responsivity, response time-bias voltage, Noise in detectors P-N junction-photo diode, characteristics, P-I-N-photo diode, response, Avalanche photo diode (APD) multiplication process-B,W-Noise photo transistor

UNIT-IV: Optical fibers: modes of an optical fiber, multimode fibers, single mode fibers and their propagation characteristics. Dispersion management in optical fibers and link design considerations, Modal analysis of guided modes in symmetric step-index planar wave-guides, Optical fiber- numerical aperture, V-parameter, refractive index profile.Integrated optics: planar and channel waveguides. BER calculation,quantum limit ,EDFA ,Raman amplifier.

RECOMMENDED BOOKS

1. Optical Communication- John M. Senior
2. Optical Communication –Gerd Keiser
3. Optical communication and Systems- Pallies
4. Optical Electronics by Ghatak and Thyagrajan
5. Optical Communication by Gower
6. Optoelectronics-An Introduction- J. Wilson & S. F. B. Hawkers, Prentice-Hall, India 1996.
7. Semiconductor optoelectronic devices- P. Bhattaharya, 2nd edition, Pearson education Singapore.

ELE-C-203 Network Analysis and Synthesis

UNIT I: Network terminology, Network and network demands, Branch, modes and Mesh, Network Functions: Concepts of complex frequency, Transform impedance, Networks function of one port and two port network, concepts of poles and zeros, property of driving point and transfer function, Time domain behavior of pole-zero plot.

UNIT II: Two Port Networks: Two port network description in terms of open circuits impedance, Short circuit admittance, Hybrid and inverse hybrid, ABCD and inverse ABCD parameters.

UNIT III: Graph theory: Graph, Tree and link branches, Network matrices and their relations, Choice of linearly independent network variables, Topological equations for loop current and topological equation for nodal voltage, Duality Network Theorems: Source transformation, Superposition Theorem,Thevenin's theorem, Norton's theorem, Reciprocity theorem and Maximum power transfer theorem ,Tellegen's theorem and their applications.

UNIT IV: Network Synthesis: Introduction, Positive Real Functions : Definition, Necessary and sufficient conditions for a function to be positive real, Elements of circuit synthesis, Foster and cauer forms of LC Networks, Synthesis of RC and RL networks.

RECOMMENDED BOOKS:

1. Chakarbarti,A., Circuit Theory, Dhanpat Rai and Co. (P) Ltd. (2006). 2. Roy Chowdhuary, D., Networks and Systems, New Age International (P) Limited, Publishers (2007). Hill (2006).
3. Sudhakar, A., Circuits and Networks, Tata McGraw
4. Suresh Kumar, K.S. Electrical circuits and Networks, Pearson Education, (2009).
5. Network Analysis and Synthesis- Bakshi and Bakshi Technical Publication.

ELE-C-204 Linear Integrated Circuit and Applications

UNIT I: OPERATIONAL AMPLIFIERS: Basic differential amplifier analysis, Single ended and double ended configurations, Op-amp configurations with feedback, Op-amp parameters, Inverting and Non-Inverting configuration, Comparators, Adder.

UNIT-II: OPERATIONAL AMPLIFIER APPLICATIONS: Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters. Oscillators: Phase shift, Wien bridge, Quadrature, square wave, triangular wave, saw tooth oscillators. Voltage controlled oscillators. The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger

UNIT III: ACTIVE FILTERS: Low pass, high pass, band pass and band reject filters, All pass filter, Switched capacitor filter, Butterworth filter design, Chebyshev Filter design.

UNIT IV: PHASE-LOCKED LOOPS: Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, Frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM565 PLL , Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators

RECOMMENDED BOOKS:

1. R. A. Gayakwad - Op-amplifiers & Linear ICs, Pearson Education.
2. J.M. Jacob – Applications & Design with Analog Integrated Circuits, Prentice Hall of India.
3. RAMAKALYAN: LINEAR CIRCUITS (Includes CD), Oxford 4. K.R. Botkar – Integrated Circuits, Khanna Publications.
4. Linear Integrated Circuit by Shail and Jain.

Third Semester
ELE-C-301 Digital Signal Processing

UNIT-I: Introduction of continuous and discrete time signals and their mathematical representation. Signal energy and power. Even and odd signals. Periodic, exponential and sinusoidal signals. Unit impulse and unit step functions for both discrete and continuous time signals. Difference equation. Discrete time Linear Time Invariant (LTI) systems with convolution sum. Continuous time LTI system with convolution integral.

UNIT – II: Z-Transform: The Z–transform, properties of ROC, properties of Z– transform, inversion of Z– transform, transfer function, causality and stability, frequency response from poles and zeros, unilateral Z-transform. Laplace Transform, Fourier Transform .

UNIT -III : Discrete Fourier Transform (DFT): Discrete Fourier series, Discrete-time Fourier transform, DFT and its properties, Fast Fourier Transform (FFT), DFT properties of circular convolution, fast convolution by signal segmentation, correlation, circular correlation, property of circular correlation, spectrum analysis, power density spectrum.

UNIT-IV: Digital filters, FIR digital filters, the moving average digital filter, frequency sampling design method, the window method, the comb filter. IIR Digital filters: Design based on prototype analog filters, Butterworth normalized low-pass filter, Chebyshev normalized low-pass filter, (sinx)/x digital correction filter. Structures for FIR Systems & IIR Systems, Introduction to Programmable Digital Signal Processors, Architecture of P-DSPs, Introduction to Digital Signal processing toolbox (MATLAB).

RECOMMENDED BOOKS:

1. Digital Signal Processing: Terrell T J and Lik-Kwan Shark, Publisher: Palgrave Macmillan 1996
2. Discrete time signal processing: Alan V, Oppenheim and Ronald W Shafer, 3nd Edition, PHI,2009
3. Digital Signal Processing and Applications with the C6713 and C6416 DSK: RulphChassing, John Wiley, 2005.
4. Introduction to Digital Signal Processing-Kur R McGraw Hill, Newyork, 1988
5. Digital Signal Processing-Avtar Singh, Srinivasan S, Thomson Publications, 2004.
6. Digital Signal Processors- Architecture, Programming and Applications: Venkataramani B &Bhaskar M,TMH, 2002.

ELE-C-302 Analog and Digital Communication

UNIT I: Definition of modulation and applications, Types of Modulation, need of modulation, Amplitude modulation, Single Tone Modulation, Spectrum & power relations in AM systems. Methods of Modulation & Demodulation of AM-DSB, DSB-SC and SSB and VSB.

UNIT II: FREQUENCY MODULATION: Phase & freq. modulation & their relationship, Spectrum & band width of a Sinusoidal modulated FM signal, Narrow band & wide band FM. Generation & demodulation of FM signals.

UNIT III: Digital Transmission of Analog Signals: Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation.

UNIT IV: Digital Modulation Techniques: Geometric interpretation of signals and Ortho-gonalization , ASK, BPSK, PSK modulation techniques, Information Theory: Shannon's Theorem and Shannon's bound.

RECOMMENDED BOOKS:

1. Principles of Communication Systems, Herbert Taub, Donald Schilling, Goutam Saha, TMH
2.Analog and Digital Communication, Schum Series, TMH
3.Digital & Analog Communication Systems, Leon W. Couch, Pearson
4.Analog & Digital Communication Systems, Singal, TMH
5. An Introduction To Analog & Digital Communications, Haykins, Wiley.
6.Electronic Communication Systems-, Kennedy Devis, TMH

ELE-C-303 VLSI Technology and VHDL

UNIT I: MOS TRANSISTOR THEORY NMOS and PMOS transistors, CMOS logic, MOS transistor theory – Introduction, Enhancement mode transistor action, Ideal I-V characteristics, DC transfer characteristics, Threshold voltage Body effect- Design equations.

UNIT II: CMOS TECHNOLOGY AND DESIGN RULE CMOS fabrication and Layout, CMOS technologies, P -Well process, N -Well process, twin -tub process, MOS layers stick diagrams and Layout diagram, Layout design rules, Latch up in CMOS circuits, CMOS process enhancements, Fabrication and packaging.

UNIT III: INVERTERS AND LOGIC GATES : NMOS and CMOS Inverters, Inverter ratio, DC and transient characteristics , switching times, Super buffers, Driving large capacitance loads, CMOS logic structures , Transmission gates, Static CMOS design, dynamic CMOS design, transistor sizing.

UNIT IV: Introduction to VHDL: Different type Modeling in VHDL, describing hardware in VHDL, entity, architectures,Concurrent signal assignment, Introduction to behavioral modeling,Sequential Processing: Process statement, Combinational and Sequential circuit example, sequential statements, IF, CASE, LOOP, NEXT, EXIT and ASSERT statements, assertion BNF, WAIT ON signal, WAIT UNTIL expression, WAIT FOR time expression, multiple, wait conditions, Data types: Object types- signal, variable, constant, Data types- scalar types, composite types.

RECOMMENDED BOOKS:

1. Neil H.E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, Pearson Education ASIA, 2nd edition, 2000.
2. John P.Uyemura “Introduction to VLSI Circuits and Systems”, John Wiley & Sons, Inc., 2002.
3. Eugene D.Fabricius, Introduction to VLSI Design McGraw Hill International Editions, 1990.
4. Pucknell, “Basic VLSI Design”, Prentice Hall of India Publication, 1995.
5. VHDL, Programming by Example: Douglas L. Perry, 4thEdn.-TMH.
6. VHDL, Primer: J Bhasker, 3rdEdn- Pearson Education.

Elective – I

ELE--E-304Power Electronics

UNIT- I : Introduction to power electronics: Power semiconductor devices: Power diodes, Power junction FETs: Basic structure and operation. Power MOSFETs: Structure and operation. power transistors. Thyristor firing circuits: Limitations of di/dt and dv/dt ratings, main features of firing circuits, R and RC firing circuits, UJT firing circuit. Commutation Techniques, series and parallel operation of thyristors.

UNIT-II : Controlled rectifiers, Single phase semi, full and dual converters, single phase series converter, power factor improvement, Extinction Angle control, Symmetrical angle control, Pulse width modulation control, Sinusoidal pulse width modulation, Ac voltage controllers, on off and phase control, Single phase bi-directional controllers.

UNIT-III: DC choppers, step up and step down operation, classification of choppers, switching mode regulators, single phase Invertors, Voltage control of single phase invertors, Current source invertors, Resonant pulse converters. Switching-mode regulators- buck regulators, boost regulators, buck-boost regulators, cuk regulators.

UNIT-IV : Cycloconvertors, single and three phase cycloconvertors; Reduction of output harmonics, Power supplies, Protection of Devices and Circuits, Snubber circuits, Varistors.

RECOMMENDED BOOKS

1. Power Electronics: Bimbhra P S, Khanna Publishers, 2003.
2. Power Electronics Circuit devices and applications: Rashid M H, PHI.
3. Thyristor Engineering: Berde, M S Khanna publishers.
4. Power Electronics: Vedam Subrahmanyam, New Age International, 2002.
5. Modern Power Electronics and AC Drives: Bimal K Bose, Pearson Education, 2002.
6. Semiconductor power devices- S K Gandhi, John Wiley, 1977.
7. Power Electronics: Mohan, Undeland, Robbins, John Wiley, 2003.

ELE-E-304 IC and Thin Film Techniques

UNIT-I : Wafer manufacture, silicon refinement, crystal growth (Czochralski technique) wafer formation, wafer cleaning, Properties of silicon wafers: Mechanical, Electrical, structural Epitaxial growth, VPE, LPE and MBE, mechanism, apparatus and methods of evaluation of EPI-layers, Thermal Oxidation, Ion implantation, ion implantation system and principles, Annealing and sintering. Diffusion: Fick's law, diffusion mechanism, measurement techniques, diffusion in SiO2

UNIT-II: Metallization: Deposition techniques, CVD and PVD, Laser ablation, Laser annealing and mixing. Lithography, photolithography, EBMF and X-ray lithography, Wet chemical etching, lift off process and plasma etching. Bonding

UNIT-III: MOS Technology and VLSI, Electrical properties of MOS circuits and Device modelling, Sealing of MOS circuits, MOS Transistors – fabrication and characteristics. MOSFET scaling and short-channel effects . Analysis and design of inverters and inverter based circuit.

UNIT-IV: Properties of thin Film Passive circuit elements, Properties of thin film active elements,photographic Techniques, Mask fabrication, Thin film Image sensors.

RECOMMENDED BOOKS

1. VLSI Fabrication Principles, S.K. Gandhi, John Willey & Sons.
2. VLSI Technology, S.M. Sze, McGraw Hill,Int. Book Company.
3. Integrated Circuit Engineering, A.B. Glasser, S.Sharpe
4. Semiconductor & Integrated, P.E. Gise, R. Blanchard Fabrication Techniques Restonn Pub.Co.Inc. PHC
5. Large Scale Integration, M.J. Hower, D.V.Morgan,John Wiley & Sons Ltd..
6. VLSI Technology, C.Y. Chang, S.M. Sze, McGraw Hill.

Fourth Semester

ELE-C-401 Control Systems

UNIT-I : Introduction to Control Systems, Basic components of control system, Open-loop and closed-loop systems, Transfer functions of linear systems, block diagrams. Signal flow graphs, their properties and gain formula, types of feedback control systems.

UNIT-II : Standard test signals, time domain performance of control systems, transient response of the first and second order systems, stability, steady state errors, effect of adding poles and zeros,The concept of stability, necessary conditions stability, Routh's stability criterion, relative stability analysis. Root locus technique, construction rules.

Unit-III: Correlation between time and frequency responses,Stability analysis in frequency domain: Nyquist stability criterion,polar plot, Bode plots. Gain Margin and Phase Margin.

UNIT-IV: P controller, PD controller, PI controller, PID controller. Compensators: realization of basic lead, lag, lead-lag compensations.

RECOMMENDED BOOKS:

1. Control System Engineering- A J Nagarath and M Gopal, Wiley Eastern , 2nd Edition, 1982.
2. Modern Control Systems- Richard C Dorf, Robert H Bishop, Addison Wesley, 12th Edition, 2010.
3. Control Engineering- Ganesh Rao, Pearson Education India, 2010
4. Modern Control Engineering- K Ogata-PHI – 2nd Edition, 2010
5. Feedback and Control Systems – Schaum's Outline series McGrawHill 6. Automatic Control Systems- Benjamin C Kuo, PHI, 9thEdition, 2009

C-402 Microprocessor and Microcontroller

UNIT –I: MICROPROCESSOR 8085: Arcitecture and Internal operation of Intel 8085, Introduction, Opcodes, Operands and mnemonics, Constituting machine language codes for instruction. Instruction execution timing diagram, Instruction word size and addressing modes, Instruction set, Stacks, Subroutines and Interrupts. I/O interfacing and data transfer scheme, Machine programming instruction and directive.

UNIT –II : Microprocessor 8086 : Assembly language programming, Architecture and Internal operation of 8086, Pin description for minimum and maximum modes, Addressing modes, Instruction set and directives, Brief idea about microprocessor 80286, 80386 and 80486 and Pentium.

UNIT –III: Microcontroller, Microcontroller survey, Introduction and Hardware of 8051 microcontroller, input/output pins, ports and circuits, external memory, counter and timers, serial data input and output interrupts.

UNIT –IV : Microprocessor Based Measurement/Control Circuits : Transducer, D/A and A/D Converters, PPI 8255 Data Acquisition and storage, Microprocessor based traffic light controller, Waveform generation and frequency measurement.

TEXT & REFERENCE BOOKS:

1. Fundamentals of Microprocessor and Microcomputer : B. Ram.
2. Microprocessor System the 8086/8088 Family : Liu and Gibson.
3. Microprocessor Architecture Programming and Application : R.S. Goanker.
4. Introduction to microprocessor : A.P. Mathur.
5. Microprocessor and Interfacing : D.V. Hall.
6. The 8051 microcontroller architecture, Programming applications- K. J.Ayala, Penram International Publishing.
7. The 8051 microcontroller & Embedded systems by Mazidi and Mazidi.

ELE-C -403 Microwave Electronics

UNIT-I: Introduction of Microwaves and their applications. Rectangular Waveguides: TE and TM wave solutions, Field patterns, Wave impedance and Power flow, Definition of transmission line, function of transmission line, examples and applications of transmission line, Two wire parallel open lines, Types of transmission line, Stripline and microstrip lines – Dominant mode of propagation, Field patterns, Characteristic impedance, Basic design formulas and characteristics. Parallel coupled striplines and microstrip lines- Even- and odd- mode excitations. Slot lines and Coplanar lines. Advantages over waveguides, SWR and VSNR Smith chart, stubs.

UNIT-II: MICROWAVE NETWORK ANALYSIS: Impedance and Admittance matrices, Scattering matrix, Parameters of reciprocal and Loss less networks, ABCD Matrix, Scattering matrices of typical two- port, three-port and four-port networks, Conversion between two- port network matrices.

UNIT-III: MICROWAVE PASSIVE COMPONENTS: Waveguide Components: E- plane and H- plane Tees, Magic Tee, Shorting plunger, Directional couplers, and Attenuator, Stripline and Microstrip line Components: Open and shorted ends. Half wave resonator, Lumped elements (inductors, capacitors and resistors) in microstrip.

UNIT-IV: MICROWAVE MEASUREMENTS: Detection of microwaves, Microwave power measurement, Impedance measurement, Measurement of reflection loss (VSWR), and transmission loss in components.

RECOMMENDED BOOKS:

1. A. Das and S. Das, Microwave Engineering, Tata McGraw-Hill, 2000.
2. D. M. Pozar, Microwave Engineering, John Wiley & Sons, 1998. (Use the latest version)
3. B. Bhat and S. K. Koul, Stripline-like Transmission Lines for Microwave Integrated Circuits, Wiley Eastern Ltd.
4. P.A. Rizzi, Microwave Engineering- Passive Circuits, Prentice Hall,.
5. Robert E. Collin, Foundations for microwave engineering 2ed
6. Microwave Engineering , Raghuvanshi,Cengage learning.

7. Microwave Engineering – G. S. N. Raju, I K International.

Elective- II

ELE-E-404Nanoelectronics and Biomedical Electronics

UNIT I: Nano technology and nano electronics: Introduction to nanotechnology, size dependent physical properties, Melting point, Solid state phase transformation, excitons, band-gap variation-quantum confinement, effect of strain on band gap, inepitaxial quantum dots.
Optical: Absorption, transmission, photo luminescence, phosphorescence, Surface Plasmon resonance.

UNIT II: Physics of Nanostructures, The physics of low dimensional semiconductors: Sequence quantum well of finite depth, parabolic and triangular quantum wells, quantum wires, quantum dots, strained layers, band structures in quantum wells, semi conductor quantum nano structure and superlattices, MOSFET structure, Hetero-junctions quantum wells, Electric field transport in nanostructure, Parallel and perpendicular transport, quatum transport in nano structures, Transport in magnetic field and Quantum Hall effect, Buckminster fullerene, carbon nanotubes.

UNIT III: Bio-medical instrumentation:, Biomedical signals analysis techniques, Origin of bio-electric signals, electrodes for ECG, EEG, and EMG, block diagram of ECG and EEG systems, brief analysis of graphs. Basic of Diagnostic Radiology, X-Rays & Properties of X-ray, Dental X- ray machine, CT scanner, Nuclear magnetic resonance (NMR) system, Echocardiograph.

UNIT IV: Data acquisition systems: Block diagram, signal conditioner, instrumentation amplifier, waveform generator, A/D and D/A converter blocks. Introduction to advanced measuring instruments: Spectrum Analyzer and Network Analyzer, CRO.

RECOMMENDED BOOKS:

1. Introduction to nanoscience and nanotechnology-K. K. Chattopadhyay and A N Banerjee, PHI
2. Nanotechnology- Principles and Practice- Sulabha K. Kulkarni, 3rd edition, springer 2015.
3. Nanomaterials, vishwanathan-Narosa Publicationm 2nd edition-2011.
4. Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices: Karl Goser, JanDienstuhl and others.
5. Nano Electronics and Information Technology: Rainer Waser
6. Concepts in Spintronics – Sadamichi Maekawa
7. Spin Electronics – David Awschalom
8. Biomedical instrumentation and measurement (2nd Edition) Cromwell, wiebell,

Pfeiffer. PHI ,Delhi (1996)
9.Biomedical instrumentation and measurements: Leslie-Cromwell, Fred J
10. Weibell, Erich A Pfieffer, PHI, 1994.

ELE-E-404Digital Image Processing

UNIT I: DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS Elements of visual perception, Image sampling and quantization Basic relationship between pixels, Imagin geometry, Review of matrix theory results, Row and Column ordering, Review of image transform:2D-DFT, FFT.

UNIT II: IMAGE ENHANCEMENT TECHNIQUES Spatial Domain methods: Basic grey level transformation, Histogram equalization, Image subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters: Smoothing, Sharpening filters, Homomorphic filtering.

UNIT III: IMAGE RESTORATION Model of Image Degradation/restoration process, Noise models, Inverse filtering, Least mean square filtering, Constrained least mean square filtering, Blind image restoration, Pseudo inverse, Singular value decomposition.

Unit-IV: IMAGE COMPRESSION Lossless compression: Variable length coding, LZW coding, Bit plane coding, predictive coding, DPCM. Lossy Compression: Transform coding – Wavelet coding, Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization.

RECOMMENDED BOOKS:

1.Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing, Pearson Education 2003.

2. William K Pratt, Digital Image Processing, John Willey Publishers

3. Millman Sonka, Vaclav hlavac, Image Processing Analysis and Machine Vision,Thompson Learning (1999).

4. A.K. Jain, Fundamentals of Digital Image Processing, PHI.

5. Image processing, Analysis and Machine vision- M. Sonka, V. Alavae, R. Boyle, Vikas Publishing.

ELE-E-404Radar, Satellite Communication and Remote Sensing

UNIT I: Basic Pulsed radar system, Display devices, MTI radar, CW radar, FMCW radar, radar altimeter.

UNIT II: Principle of satellite communication, general and technical characteristics, Active and passive satellite, Modem and codec, general lionk design equation, atomospheric and ionospheric effect on link design, earth station parameters.

UNIT III : Satellite orbital mechanism, Placement of satellite in geostationary orbit, Altitude and Orbit Control, telemetry, tracking and command.

UNIT IV : Remote sensing, concept and foundation of remote sensing, Electromagnetic radiation (EMR), interaction of EMR with atmosphere and earth surface, Application area of remote sensing, Ground, air and space platforms, Return beam vidicon, multi spectral scanners, brief description of landsat and IRS satellite.

RECOMMENDED BOOKS:

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.
2. Satellite Communication, by Timothy Pratt, Charles Bostian, Jeremy Allnutt, Willey Student edition, second edition

3. Introduction to Radar System M.I. Skolnik ,McGraw Hill
4. Elements of Electronic Navigation Systems", Tata McGraw-Hill,
5 . Radar Systems and Radio Aids to Navigation, Sen & Bhattacharya, Khanna publishers.
6. Satellite Communications- D C Agarwal and A K
7. Satellite Communication-Prats and Bostian
8. Introduction to remote sensing- J. B. Campbell
9. Manual of remote sensing, Vol. I & II- R N Colwall, American Society of Photogrammetry.

ELE-E-404Robotics and Artificial Intelligence

UNIT-I: Introduction:symbol system,semantics,modelling,Dimentions of representation, programs, patterns, simplicity and effectiveness, concept of search and blind search, directed and Hierarchical search.

UNIT-II: Understanding knowledge systems in context, formulating expertise, collaborating articulation, work practice, knowledge versus complexity, reasoning about shape, uncertainty and vagueness, representing uncertainty and vagueness, Models for classification and domains

UNIT-III: Coordinate transformation, kinematics and inverse kinematics, trajectory planning and remote manipulation, Robot sensors, proximity sensors, visual sensors, auditory sensors, Robot manipulators, manipulator dynamics, wrist, end efforts, Robot grippers.

UNIT-IV : Basics of learning, planning movement, Robot programming language, principles of edge detection, determining optical flow and shape, image segmentation, pattern recognition, nodel directed scene analysis. overview of Robot applications.

RECOMMENDED BOOKS

1.Introduction to knowledge systems by S.Mark,Maurgan-Koffmann Publishers Inc,1995.
2.Introduction to Artificial Intelligence by Charnaik and McDarmott, Macgraw Hill,1986.
3.Robotics for Engineers by Koren,McGraw Hill international Company, Tokyo, 1995.
4.Introduction to Robotics by Vokopravotic, Springer, 1988
5.Robot Technology and Applications by K.Rathmill, Springer, 1985
6. Robotics Control, Sensing,vision and intelligence by K.S.Fu, R.C.Gonzally, C.G.S.Lee, McGraw Hill Book Company, 1997.