KARNATAK UNIVERSITY, DHARWAD

DEPARTMENT OF ELECTRONICS

M.Sc. Electronics

D. Format for Indicating Employability*/Entrepreneurship**/ Skill Development*** Aspects in the curriculum (to be prepared for all previous five years – 2016-17 to 2020-21, for whatever curriculum was/is in force)

M.Sc. FIRST SEMESTER		
Unit Name: ELCT 1.1: ANALOG AND DIGITAL ELECTRONICS		
Unit:	Content Highlighted	Hrs:
Unit:1	Op-Amp applications and specialized IC's: Introduction, Instrumentation amplifier, Waveform generators (Sine, Triangular and Saw tooth) Voltage comparator, window detector, Schmitt trigger, Precision Rectifier, Peak detector, Sample-Hold circuits, and Log/Antilog Amplifiers. Timer 555 applications (Monostable & Astable Multivibrators), Monolithic waveform generators, V-F and F-V converters. Analog multipliers, PLL, Universal active filter and switched capacitor filter.	12 hours
Unit:2	A-D and D-A Converters: Performance Specifications, D-A conversion Techniques- Weighted Resistor DACs, Voltage mode R-2R ladder DAC, Bipolar DACs multiplying DAC applications. A-D conversion Techniques: DAC based A-D conversion, Successive-Approximation ADC, Flash Converters, Integrating Type Converters.	12 hours
Unit:3	Digital Arithmetic circuits and Flip-Flops: ALU, Parallel binary adder, Design of Full adder, carry look ahead adder. NAND and NOR latches, clocked flip-flop (S-R, J-K, D and T). Counters: Synchronous and asynchronous counters, UP/DOWN counter and counter applications. Shift Registers: Concept of Shift Registers and its applications.	12 hours
Unit:4	MSI Logic families: Decoders, BCD-to-7 segment decoder/driver, encoders, Multiplexers and their applications, Demultiplexers, Magnitude Comparator, and Data bus operation. Memory devices: Read-Only memories, ROM architecture, Types of ROMs, flash memory. Programmable Logic Devices: Basic idea, PLD architecture (PROM), PAL, PALs, Applications of a programmable Logic Devices-GAL 16V A and Programming PLDs	12 hours
Reference: Text books: 1. "Op–Amps and Linear Integrated Circuits", Ramakant A Gayawad, PHI India ltd		

2. "Design with Operational Amplifiers and Analog Integrated Circuits", Sergio Franco, 3/e, TMH, 2002

3. "Digital Systems- Principles and Applications" R. J. Tocci, 6/e, PHI India Ltd.,

Reference books:

1. "Linear Integrated Circuits", D. Roy Choudhary and Shail Jain, New Age International (P) Ltd.

2. "Digital Principles and Applications" A. P. Malvino and Leach, TMH, 1991

3. "Digital Logic and Computer Design". Morris Mano, PHI India Ltd.,

4. "Digital Fundamentals" Floyd–Merrill's, International Series

COURSE ELCT 1.2: SIGNALS AND SYSTEMS

Unit:	Content Highlighted	Hrs:
UNIT-I	Introduction: Overview of specific signals and systems, Classification of signals, Basic operations on signals. Elementary signals. Systems viewed as interconnections of operations, Properties of systems. Time Domain representations of Linear Time- Invariant systems: Introduction. Impulse response representations of discrete and continuous time LTI systems. Differential and difference equation representations of LTI systems. Block Diagram representation (discrete-time). Exploring concept with MATLAB.	12 Hrs.
UNIT-II	Fourier Representation of Signals: Introduction, Discrete-Time periodic signals, The discrete-Time Fourier series, and Continuous-Time periodic signals. The Fourier series discrete time non-periodic signals, Fourier transform and properties of Fourier representation. Application of Fourier Representation: Introduction, frequency response of LTI systems, Fourier transforms representation for periodic signals, Convolution and modulation of mix signal classes, Fourier transforms representation for discrete time signals. Sampling and reconstruction of continuous time signals, Discrete time processing of continuous time signals. (Exploring concept with MATLAB).	14 hours

UNIT-III	Representation of Signals Using continuous-Time Complex Exponentials: Introduction, Laplace transforms, Universal L-T, Inversion of L-T, Solving Differential Equations with Initial Conditions, The bilateral L-T, Transform analysis of systems.	10 hours
UNIT-IV	Representation of signals Using Discrete-Time Complex Exponentials: The Z- Transform: Introduction, The Z-transform properties of the ROC, properties of the Z- transform. Inversion of Z-transform, analysis of LTI systems. The unilateral Z-Transform.	12 hours

Text book:

1) "Signals and Systems", Simon Haykin and Barry Van Veen-John, Wiley and sons, Inc.

Reference books:

1) "Signals and Systems", Oppenenbeim, A. S. Willsky, 2/e Pearson education, In.,

2) "Signals and Systems", Bagli and Shah, Mahalaxmi Publications, Kolhapur.

COURSE ELCT 1.3: PROGRAMMING IN C WITH DATA STRUCTURES

UNIT – I	C language Preliminaries: Identifiers, basic data types, Constants, variables, operators & Expressions, Library function, Structure of C program, Execution process of C program. Control Statements: if-else, nested if-else, switch statement. Loop statements, breaking control statements. Arrays: declaration, dimensions, initialization, processing with array. String: string handling functions, Operation with character. Local and global variables.	(12 hours)
UNIT -II	Functions in C: Defining functions, Syntax of calling function, Arguments in functions, Recursion functions, arrays to functions,	

	Storage classes in C. Pointers in C: pointers- concepts, initialization, address arithmetic, pointers to pointers, pointers and function, pointer & string, pointers and multidimensional arrays, dynamic memory managements functions. Structures and Unions: declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, type def, bit fields.	(12 hours)
UNIT -III	Data Structures: Classification, basic Operations. Stacks: Representation of stack in C using Array, Operations of stack, Application of stack, Infix, Postfix, & Prefix Expressions, postfix expression evaluation. Recursion: Recursive definition, working, The Tower of Hanoi Problem. Queue: Representation of Queue using Array, Operations on queue, Double ended and Circular queue. Linked List: Advantages of linked list, basic component of list, representation of list, basic operation of singly list, types of list, Circular linked list, doubly linked list.	(12 hours)
UNIT – IV	Trees: Tree terminology, classification, representation of tree, binary tree, tree traversal. Sorting: Bubble sort, selection sort; merge sort, Radix sort, heap sort, shell sort. Searching: Basic searching techniques, binary search, interpolation search, Hashing	(12 hours)

Text Books:

1) "Systematic Approach to Data Structures Using C", A. M. Padma Reddy.

2) "Let us C." Yashwant Kanetkar Publisher: BPB

Reference Books:

1) Expert Data structure with C- R,B.Patel, Khanna Publication

2) The Complete Reference 'C' -Fourth Edition - Herbert Schildt - Tara Mc-Graw Hill

3) Programming Language in 'C' Gottfried -Tata McGraw Hill.

	COURSE ELCT 1.4: POWER ELECTRONICS DEVICES AND SYSTEMS.	
UNIT-I	Power Electronics Devices: Characteristics of power devices– characteristics of SCR, diac, triac, SCS, GTO, PUJT–power transistors–power FETs–LASCR–two transistor model of SCR – Protection of thyristors against over voltage – over current, dv/dt and di/dt.	12 hours.
UNIT II	Triggering Techniques: Turn on circuits for SCR – triggering with single pulse and train of pulses–synchronizing with supply–triggering with microprocessor–forced commutation– different techniques–series and parallel operations of SCRs.	12 hours
UNIT III	Controlled Rectifiers: Converters–single phase–three phase–half controlled and fully controlled rectifiers–Waveforms of load voltage and line current under constant load current–effect of transformer leakage inductance–dual converter.	12 hours
UNIT IV	Inverters: Voltage and current source inverters, resonant, Series inverter, PWM inverter. AC and DC choppers–DC to DC converters–Buck, boost and buck–boost. DC motor drives– Induction and synchronous motor drives – switched reluctance and brushless motor drives– Battery charger–SMPS–UPS–induction and dielectric heating.	12 hours

Text Books:

1. Muhamed H.Rashid : Power Electronics Circuits, Devices and Applications, 3rd Edn. 2004PHI.

2. Singh and Kanchandani : Power Electronics, TMH, 1998.

References:

1. Sen : Power Electronics, TMH, 1987.

2. Dubey : Thyristorised power controllers, Wiley Eastern 1986.
3. Vithayathil : Power Electronics – Principles and applications McGraw-Hill, 1995.
4. Lander : Power Electronics, 3rd Edition, McGraw-Hill, 1994.

	ELCP 1.5: Practical-I: Analog, Digital and Matlab	
	ELCP 1.6: Practical-II: Programming in C and Power Electronics	
	M.Sc. SECOND SEMESTER	
	Course ELCT 2.1: DIGITAL SIGNAL PROCESSING	
UNIT I	Discrete Fourier Transform (DFT): Introduction, Definition of DFT: Linearity, Circular shift of a sequence, Symmetry properties, Circular convolution, Linear convolution using DFT. Computation DFT: Introduction, Decimation-in-time FET algorithm and in-place computations, and Decimation-in-frequency FET algorithm and in-place computations, Chirp Z-Transform.	12 hours

UNIT II	IIR Filter Design: Introduction, Design of IIR digital filter from analog filters, Impulse invariance, Design based on numerical solution of differential equations, bilinear transformation, Application of above techniques to the design of Butterworth & Chebyshev filters.	12 hours
UNIT III	FIR Filter Design Properties of FIR Digital Filters, Different types of windows: Rectangular, Barlett, Hanning, Blackmann & Kaiser windows, design of FIR filters using above windows, Frequency sampling design, Equiripple filter design, A comparison of IIR and FIR digital Filters.	12 hours
UNIT IV	Digital Filter Structures: Basic IIR filter Structures: Direct forms (I&II), Cascade and parallel realizations, Basic FIR filter structures: Direct from and linear phase FIR structure.	12 hours

Text books:

1) "Digital Signal Processing", Rabiner and Gold, Prentice Hall of India Ltd.
2) Digital Signal Processing by Lie Tan.

Reference books:

1) "Digital Signal Processing", Proakis, Prentice Hall of India Ltd.
2) "Digital Signal Processing", Sanjit. K. Mitra, Tata-McGraw Hill.

	COURSE ELCT 2.2: CONTROLS AND INSTRUMENTATION	
UNIT I	Control Systems: Introduction, examples of Control Systems and Closed-loop versus Open-loop controls. Mathematical Modeling of dynamic systems: Transfer function and impulse-response function, automatic control systems, modeling in state space, State-space representation of dynamic systems, Electrical and	12 hours

	Electronic systems, Signalflow graphs.	

UNIT II	Transient and steady state response analysis: First-order and Second-order systems, Ruthe's stability criterion, Effects of Integral and derivative control actions on systems performance, Steady-state errors in unity-feedback control systems. Root-Locus analysis: Root-Locus plots, General rules for constructing Root Loci, Positive-feedback Systems. Control systems design by the Root-Locus method: Preliminary design considerations Lead and Lag compensations, Lag-Lead compensation.	12 hours
UNIT III	Frequency-Response analysis: Bode diagrams, Polar plots, Log-Magnitude-versus- Phase plots, Nyquist stability criterion, Stability analysis, Relative stability.	12 hours
UNIT VI	Digital Instruments: Dual slope integrating type DVM, Integrating type DVM, Continuous Balance DVM, 3-1/2 digit, Resolution and sensitivity of digital meters, General specification of DVM, MP based Ramp type DVM, Digital Multimeters, Digital Frequency meter, Digital PH meter, Digital Phase meter, Digital Capacitance meter Digital readout oscilloscope, Digital storage oscilloscope and IEEE 488 Bus. 12 hours	12 hours

Text books:

1) "Modern Control Engineering", K. Ogata, 4/e, PHI, 2003.
2) "Electronic Instrumentation" H.S. Kalsi, TMH 1995

Reference books:

1) "Modern Control Engineering", D. Roy Choudhary, PHI, 2005.
2) "Automatic Control Engineering", B.C. Kuo, 7/e, PHI, 1995.
3) "Modern Electronic Instrumentation and Measurement Techniques", A.D. Helfricand W.D. Cooper, PHI of India ltd.,

	COURSE: ELCT 2.3: MICROCONTROLLER AND APPLICATIONS	
UNIT I	Introduction to Microcontrollers: Microcontrollers and	12 hours

	Microprocessors, Embedded versus External Memory Devices, 8-bit and Microcontrollers, CISC& RISC processors. 8051 Microcontrollers: MCS-51 architecture, Resistors in MCS-51, 8051 pin description, pin connectors, Parallel I/O ports and memory organization. 8051 addressing modes, instructions: 8051 addressing modes, Instruction Set.	

UNIT II	8051 programming: Assembly language Programming tools, Development Systems and Tools. MCS-51: Interrupts, Timer/Counters and Serial communications: Interrupts in MCS-51, Timers and Counters, Serial Communication. Design with Atmel Microcontrollers: Atmel Microcontrollers, Architectural overview of Atmel 89C51 and Atmel 89C2051, pin description of 89C51 and 89C2051, Using Flash Memory devices ATMEL 89CXX and 89C20XX, Power saving options.	12 hours
UNIT III	PIC Microcontrollers: Overview and features, PIC 16C6X/7X, PIC reset actions, Oscillator connection, Memory organization, PIC 16C6X/7X instructions, Addressing modes, I/O ports, Interrupts, PIC 16C61/71 timer and A/D converter. PIC 16F8XX Flash Microcontrollers: Pin diagram of 16F8XX, STATUS Register, OPTION_REG Register, Power Control Register, PIC 16F8XX program memory, data memory, Data EEPROM and FLASH Program EEPROM, Interrupts in 16F877, I/O ports and timers.	12 hours
UNIT IV	Automation and Control applications: Stepper motor, Waveform generation-Sine, Square, Pulse, Ramp, Staircase, Pulse width Measurement, Frequency Counter. Interfacing and industrial Applications of Microcontrollers: Interfacing of keyboard, 7-segment LED, LCD, ADC, and DAC, Optical Rotary shaft encoder, LVDT, Angular speed measurement, Digital thermometer, load cell.	12 hours

Text books:

1) "Microcontroller: Theory and Applications", Ajay V. Deshmukh, Tata McGraw-Hill, New Delhi, 2005.

2) "The 8051 Microcontrollers and Embedded Systems", M.A. Mazidi and J.G. Mazidi, Pearson Education, Inc., 2002.

Reference Books:

1) "The 8051 Microcontroller Architecture, Programming & Applications", K.J. Ayala,2/e, Penram International Publishing (India) Pvt. Ltd., 1996.

2) "Designing with PIC Microcontrollers", Pearson Education, John B. Peatman, Inc.,1998.

3) "Programming and Customizing the 8051 Microcontroller", Myke Predko, TMH.1999.

	ELET-2.4: BASIC ELECTRONICS & LINEAR INTEGRATED CIRCUITS	
	Circuit Variables: Circuit concepts Units, Standards and Dimensions. Electric current, Electric charge, potential difference, Electric power and Energy. Circuit elements: Passive elements and active elements. Network Law's: Ohm's Law's, Junction Law's (KCL), Mesh Law's (KVL) Application of Network Law's to simple dc networks theorems- Thevnin's theorem, Norton's theorem Max power transfer theorem.	
	Semiconductors: Energy bands theory, Intrinsic semiconductors, extrinsic semiconductor, effect of temperature on Impurity semiconductors and mechanism of current conduction in semiconductor. Junction Diodes: p-n junction, an unbiased p-n junction, Energy band of unbiased p-n junction, a biased p-n junction and V-I characteristics of P-n junction. Some special P-N junction:- Photodiodes, LED and Solar Cell. Junction transistor, Transistor static characteristic Self-bias or emitter bias, Two- port representation of Transistor (hybrid Parameter) JFET: Static Characteristic of FET comparison of FET with Bipolar transistor. Applications of BJT and JFET.	
	Operational Amplifier characteristics & Applications: Introduction, Ideal Op-Amp, DC and AC Characteristics.: Instrumentation Amplifier, V to I and I-V converter Precision rectifier, Differentiator and Integrator. Comparator Schmitt trigger wave generators (Square wave and Triangular wave) and first order Low pass and High pass filters.	
	Special IC: series Op-Amp regulator, IC voltage regulators, 555 Timer as Monostable and Astable operation. D-A and A-D converters, PLL: Basic principles PLL as Frequency multiplication /Division.	

	ELCP 2.5: Practical–III: DSP and Instrumentation	
	ELCP 2.6: Practical–IV: Microcontrollers	
	M.Sc. THIRD SEMESTER	
	COURSE ELCT 3.1: DIGITAL COMMUNICATION	
UNIT-I	Communication: Introduction, Differences between digital and analog communication systems, Block diagram of a digital communication system. Digital Transmission of Analog Wave forms: Introduction, Sampling Theory and Practice, Sampling Theorem, Ideal Sampling and Reconstruction low pass signals, the uniform Sampling Theorem for Band pass signals Practical sampling, Digital Coding of Analog Waveforms: Digital Pulse Modulation, Uniform Quantization, non-uniform Quantization. Differential Pulse Code Modulation, Delta Modulation and Time-Division Multiplexing (T1 system).	12 hours
UNIT-II	Baseband transmission of binary data: The inter symbol interface problem, Ideal solution, Raised Cosine Spectrum, Correlative-level coding, Base band transmission of M-ray Data, Eye Pattern, Adaptive Equalization. Digital modulation techniques: Binary Modulation Techniques; ASK, PSK, and FSK Generation and Detection of Binary Modulated Waves, Quadrature phase-shift Keying, Optimum (or Correlation) receivers: Matched Filter receiver, Properties of Matched Filter.	12 hours
UNIT-III	Introduction to Spread Spectrum Techniques: A notion of Spread Spectrum, Frequency-Hop Spread Spectrum: Slow-Frequency and Fast-Frequency Hopping. Fundamental of Limits on Performance: Properties of Entropy, Extension of a DMS, source coding theorem, Prefix Coding, Huffman Coding, Channel coding, Mutual Information and properties of Mutual Information.	12 hours
UNIT-	Error Control Coding: Introduction, Linear Block Codes, Matrix	12 hours

IV	Description of Linear Block Codes, Single error-correcting Hamming Codes, Binary cyclic codes, Encoding using an (n-k) bit shift register, Golay Codes, BCH Codes, Burst-error Correcting codes and Convolution Codes.	

Text books:

1) "Digital Communications", Simon Haykin, John Wiley & Sons Publications.
2) "Digital and Analog Communication Systems" K. Sam Shanmugam, John Wiley &sons (Asia) pte ltd., 2000.

Reference books:

1) "Principles of Communication Systems", 2/e, Taub Schilling, TMH, 1991.
2) "Digital Communications, Fundmentals and Applications", Bernard Sklar, 2/e,Pearson Education.
3) "Coding Theory", by Abrahanson, Prentice Hall of India.

	COURSE ELCT 3.2: INTRODUCTION TO VLSI CIRCUITS	
UNIT-I	An overview of VLSI, Logic Design with MOSFETs and Physical Structure of CMOS: Complexity and Design, Basic concepts, Ideal switches and Boolean operations, MOSFETs as switches, Basic logics gates in CMOS, Complex logic gates in CMOS, Transmission Gate circuits, Clocking and data flow control. Integrated Circuit layers, MOSFETs, CMOS layers, Designing FET arrays.	12 hours
UNIT-II	Fabrication of CMOS ICs and Elements of Physical Design: Overview of silicon processing, material growth and deposition, Lithography, The CMOS process flow,	12 hours

	Design rules. Basic concepts, layout of basic structures, Cell concepts, FET sizing and the unit transistor, physical design of logic gates, Design hierarchies.	
UNIT-III	Electrical Characteristics of MOSFETs and Electronic analysis of CMOS logic gates: MOS physics nFET current-voltage equations, FET RC model, pFET characteristics, modeling of small MOSFETs. DC characteristics of the CMOS inverter, Inverter switching characteristics, Power dissipation, DC characteristics: NAND and NOR gates, NAND and NOR transient response, Analysis of complex logic gates, Gate design for transient performance, Transmission gates and pass transistors.	12 hours
UNIT-VI	Advanced Techniques in CMOS Logic Circuits: Mirror circuits, Pseduo n MOS, Tristate circuits, clocked CMOS circuits, Dynamic CMOS logic circuits and Dual rail logic networks.	12 hours

Text books:

1) "Introduction to VLSI Circuits and Systems", John P. Uyemura, John Wiley & Sons(Asia) Pte. Ltd., 2003.

Reference books:

1) "VLSI Fabrication Principles", S.K. Ghandhi, 2/e, John Wiley & Sons (Asia) Pte. Ltd.,2003.
2) "VLSI Technology", 2/e, S.M. Sze, McGraw-Hill, 1988.
3) "Principles of CMOS VLSI Design", N.H.E. Weste and K. Eshraghian,Pearson Education, Inc., 1999.
4) "Fundamentals of Modern VLSI Devices", Yuan Taur and T.H. Ning," CambridgeUniversity Press, 1998.
5) "VLSI Design Techniques for Analog and Digital Circuits", R.L.Geiger, P.E. Allenand N.R. Strader, McGraw-Hill, 1990.

	COURSE ELCT 3.3: ADVANCED MICROPROCESSORS AND MICROCOMPUTERS	
UNIT-I	Microprocessor and its Architecture: Internal Microprocessor architecture, Real mode protected modes of memory addressing, Memory paging. Addressing modes: Data addressing modes, program memory-addressing modes. Stack-memory addressing modes. Instruction Set: data movement instruction, Arithmetic and logic instructions, Program control instructions, Assembler details.	12 hours
UNIT-II	Programming the Microprocessor: Modular programming, using the keyboard and video display, Data conversions.	12 hours

	Hardware Specifications: Pin-outs and the pin functions, Clock- generator (8284A), Bus buffering and latching, Bus timing Ready and wait state, Minimum mode versus maximum mode.	

UNIT-III	Memory Interface: Memory devices, Address decoding, 8088 and 80188 (8-bit) memory interface 8086, 80186, 80286 and 80386 (16-bit) memory interface. Basic I/O Interface: Introduction to I/O interface, I/O port address decoding, 8255, 8279, 8254, ADC and DAC (excluding multiplexed display & keyboard display using 8255).	12 hours
UNIT-IV	Interrupts: Basic interrupts processing, Hardware interrupts, expanding the interrupt structure, 8259A PIC. Direct Memory Access: Basic DMA operation, 8237 DMA controller. Advanced Microprocessor: 80186, 80188 and 80286 Microprocessors; 80186/80188 Architecture, Introduction to 80286 and Microprocessors.	12 hours

Text book:

1) "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro Processor Architecture, Programming and Interfacing", B.B.Brey, 4/e, PHI 1999.

Reference books:

1) "Microprocessor and Interfacing, Programming and Hardware", 2/e, Douglass V. Hall,McGraw Hill International Edition, 1992.

2) "The 80x86 IBMPC and Compatible Computers (Volumes I & II)", 2/e, Muhammad AliMazidi and Janice Gillispie Mazidi, Prentice Hall of Inc, 1998.

3) "Software, Hardware and Applications", Walter A. Tribel and Avatar Singh, PHI, 1995.

4) "Microcomputer Systems: The 8086/8088 Family Architecture,Programming and Design", Yu Cheng Lin and Glen A. Gibson, PHI, 1992.

5) "The 8086 Microprocessor: Programming & Interfacing the PC", K.J. Ayala, PenramInternational Publishing (India) Pvt, Ltd., 1995.

	ELET-3.4: COMMUNICATION AND DIGITAL CIRCUITS	
UNIT-I	Radio wave Propagation: Ground or surface wave, Space or tropospheric wave and Skywave. Ionosphere, Effect of Ionosphere	

	on Radio waves, Skip distance, maximum Usable frequency and Ionospheric fading. Antenna: Introduction, loop and ferrite rod antenna, Yagi-Uda, Dish antenna and Microstrip antenna (Qualitative).	
UNIT-II	Modulation and detection: Modulation, AM, Power in AM, FM, Comparison of AM & FM. Generation and detection of AM wave. Super-heterodyne radio receiver (Block Explanation)	
UNIT III	Optical fiber communication: Principles of light transmission, Fiber index profiles, Modes of propagation, losses in fibers. Types of Light Sources and Photo detectors (Qualitative).	
UNIT IV	Digital circuits: Introduction, Decimal, Binary and Hexa decimal number systems, Conversions, Binary addition and subtraction, OR, AND and NOT Circuits. Boolean algebra, De Morgan's Theorem, additional laws and theorems. NOR and NAND gates. Flip-Flop and RS Flip-Flop using NAND gate.	

Text books:

1) "Foundations of Electronics", D. Chattopadhyaya, P.C. Rakshit, B Saha and N NPurkait , New Age International Edition.
2) "Electronic Communications", D. Roddy and J. Coolen, PHI of India ltd.,

Reference books:

1) Electronic Communication Systems. G. Kennady, TMH Edition.
2) Electronic Principles A.P. Malvino, TMH Edition.
3) A Textbook of Electronics (Second Edition) S.L Kakani and K.C.Bhandari

	Elcp-3.5: Practical-V: Digital Communication & VLSI and	
	ELCP-3.6: Practical-VI: 8086 Assembly Programming & Linux Shell Script.	
	M.Sc. FOURTH SEMESTER	
	COURSE ELCT 4.1: MICROWAVE AND OPTICAL FIBER COMMUNICATIONSYSTEMS	

UNIT-I	Electromagnetic Theory: Maxwell's equations, Fields in media and boundary conditions, the wave equation and the basic plane wave solutions, General Plane wave solutions, energy and power. Waveguide Theory: General solutions for TEM, TE and TM waves parallel plate waveguide, Rectangular waveguide. Transmission Line theory: Field analysis of transmission lines, Smith chart , Single stub tuning, Double stub tuning and the quarter wave transformer.	12 hours
UNIT-II	Antennas: Types of antennas, Hertz and Marconi antennas, Yagi-Uda antenna, Reflector antenna, lens antenna, Helical antenna, Log periodic antenna, Phased array antenna, Microstrip antenna Microwave Tubes- Two cavity Klystron, Reflex Klystron and TWT Microwave Solid-state devices and components : Varactor diodes, PIN diodes, Tunnel diodes, GUNN diode. Basic properties of dividers and couplers, Wave-guide directional couplers, Coupled line directional couplers and Microwave Systems (qualitative).	12 hours
UNIT-III	Optical Fibers: Basic optical laws, optical fiber modes and configurations, mode theory for circular waveguide- Maxwell's equation and waveguide equations, Signal attenuation, optical sources- Topics from semiconductor Physics, LEDs and Laser diodes.	12 hours
UNIT-IV	Photodetectors : Physical principle, PIN and Avalanche type photodetectors. Optical receiver Operation – Digital signal Transmission, Error sources, Receiver configuration. Advanced systems and Techniques:- WDM, optical Amplifiers, Mechanical	12 hours

	and Integrated-optical switches.	

Text books:

1) "Microwave Devices Circuits", 3/e, Samuel. Y. Liao, Prentice Hall of India, 1998

2) "Microwave and Radar: Principles and Applications", 2/e, A.K. Maini, KhannaPublishers. 2001.

3) Optical Fiber Communications by Gerd Keiser McGRAW – HILL International Ed(second Edition)

Reference books:

1) "Microwave and Radar Engineering", M. Kulkarni, Umesh Publications, 3/e, 003.

2) "Electronics Communication Systems", 4/e, Wayne Tomasi, Pearson Education.

3) Modern Electronic Communication", 7/e, G.H. Miller and J.S. Beasley, Prentice Hallof India.

4) "Microwave Engineering", 2/e, David M. Pozar, John Wiley & Sons (Asia) Pte, Ltd,1999.

	COURSE ELCT 4.2: COMPUTER COMMUNICATION	
UNIT-I	Introduction: The use of computer network, Network structure, Network Architecture, The OSI reference models, The TCP/IP reference model, Services, Network Standardization, Example networks.	10 hours
UNIT-II	The Physical Layer Transmission And Switching: Frequency and time division multiplexing, Circuit switching, Packet Switching Hybrid Switching ISDN-Integrated services digital network, ISDN services, Evolution of ISDN, ISDN system architecture, The digital PBX, ISDN interface, ISDN signaling Perspective on ISDN, Terminal, handling: Polling, Multiplexing versus concentration.	12 hours

UNIT-III	The Medium Access Sublayer: The local and metropolian area networks, the ALOHA protocols, IEEE standard 802 for LAN, Fiber optic networks, satellite networks, pocket radio networks. The Data Link Layer: Data Link Layer design issues, Error detection and correction, Elementary data link protocols, sliding window protocols performance, Protocol specification and verification.	14 hours
UNIT-IV	The Network Layer: Network layer design issue, Routine algorithms, Congestion control algorithms, Internet Working, Network layer in the Internet and ATM networks. The Transport Layer: Transport service, transport protocols, Internet transport protocol (TCP & UDP).	12 hours
	Text book: 1) "Computer Networks", Tanenbaum, Prentice Hall of India Pub. Reference book: 1) "Computer Networks, Protocols, Standard and Interfaces", Ulyses Black,Prentice Hall of India Pub.	
	COURSE ELCT 4.3: DIGITAL SYSTEM DESIGN-VHDL	
UNIT-I	Basic terminology, Entity declaration, Architecture body, Configuration declaration, Package declaration, Package body, Model analysis, Simulation. Basic Language Elements: Identifiers, Data objects, Data types, Operators. Behavioral Modeling: Entity declaration, Architecture body, process statement, Variable assignment statement, Signal assignment, Wait statement, If statement, Case statement, Null	12 hours

	statement, Loop statement, Exit statement, Next statement, Assertion statement, Report statement, other sequential statements, Multiple processes, Postponed processes.	

UNIT-II	Data flow modeling: Concurrent signal assignments statement, Concurrent versus sequential signal assignment, Delta delay revisited, Multiple drivers, Conditional signal assignment statement, elected signal assignment statement, The unaffected value book statement, concurrent assertion statement, Value of a signal. Structural modeling: Component declaration, Component instantiation, resolving signal values.	12 hours
UNIT-III	Generics: Configuration specification, Configuration declaration, Default binding rules, Conversion functions, Direct instantiation, Incremental binding. Subprograms and Overloading: Subprograms-Subprogram overloading, Operator overloading, Signatures, Default values for parameters. Package and Libraries: Package declaration, Package body, Design file, Order of analysis, implicit visibility, explicit visibility.	12 hours
UNIT-IV	Advanced Features: Entity statements, Generate statements, Aliases, Qualified expressions, Type conversions, Guarded signals, Attributes, Aggregates targets, More on block statements, Shared variables, Group More on ports. Model Simulations: Simulation-Writing a Test Bench, Dumping results into a text file Reading vectors from a text file-A test bench example-initializing a memory. Hardware Modeling example: Modeling entity interfaces, Modeling simple elements, Different styles of modeling regular structures, Modeling delays, Modeling conditional operations. A clock divider, A generic binary multiplier, A pulse counter.	12 hours

Text books:

1) ”VHDL Promer”, 3/e, J. Bhaskar, Addison Westly Longman (Singapore) Pvt.

Ltd.,2000.

2) "Circuit Design with VHDL", Volnei A Pedroni, MIT Press.

Reference books:

1) "VHDL-Analysis and Modeling of Digital Systems", Zainalabedin Navabi, McGraw-Hill International Editions, 1998.

2) "VHDL-Techniques, Experiments and Caveates", Joseph Pick, McGraw- HillInternational, 1996.

3) "Introduction to VLSI Circuits and Systems", John P. Uyemura, John Wiley & Sons(Asia) Pte. Ltd., 2003.

	COURSE ELCT 4.4: MICRO ELECTRO MECHANICAL SYSTEMS	
Unit 1	Introduction to MEMS Technology: Basic definitions, history and evolution of MEMS. Microelectronics and MEMS, Scaling issues in microdomain, scaling laws in electrostatic, electromagnetic MEMS sensors and actuators. Types of MEMS, Applications of MEMS in various disciplines. Introduction to design, modeling and simulation, fabrication, optimization, reliability and packaging of MEMS.	12 Hrs
Unit II	Microfabrication/Micromachining: Overview of micro fabrication, review of micro- electronics fabrication processes like photolithography, deposition, doping, etching, structural and sacrificial materials, and other lithography methods, MEMS fabrication methods like surface, bulk, LIGA and wafer bonding methods.	12 Hrs
Unit III	Transduction And Actuation Principles In Microdomain : Radio Frequency (RF) MEMS: Introduction, Review of RF-based communication systems, RF –MEMS like MEMS inductors, varactors, tuners, filters, resonators, phase shifters, switches. Optical MEMS: Preview, passive optical components like lenses and mirrors, actuators for active optical MEMS.	12 Hrs
Unit 1V	MEMS Modeling: Basic modeling elements in electrical, mechanical, thermal and fluid systems, analogy between 2nd order mechanical and electrical systems. Modeling elastic, electrostatic, electromagnetic systems. Case Studies: case studies of microsystems including microcantilever based sensors and actuators with appropriate selection of material properties: Static and dynamic mechanical response with different force mechanisms: electrostatic, electromagnetic, Thermal etc	12 Hrs

Text Books:

1) Nitaigour Premchand Mahalik, "MEMS", TMH, 2007.
2) G.K.Ananthasuresh, K.J. Vinoy, S.Gopalakrishnan, K.N.Bhat, V.K.Aatre, "Micro and Smart Systems", Wiley India, 2010.
3) Tai, Ran Hsu, "MEMS and Microsystems Design and Manufacture", TMH, 2002.
4) Chang Liu, "Foundations of MEMS", Pearson International Edition, 2006.

Reference Books:

1) Campbell, "The Science and Engineering of Microelectronic Fabrication", 2nd edition, Oxford, 2001.
2) Madou, "Fundamentals of Microfabrication", CRC Press, 1997.
3) Kovacs, "Micromachined Transducers Sourcebook", McGraw-Hill, 1998.
4) Nadim Maluf, "An Introduction to Microelectromechanical Systems Engineering", Artech House, 2000.
5) Micro Electro Mechanical System Design – James J. Allen (CRC Press, Taylor &Francis Group, 2005)

	ELCP 4.5: Practical-VII: Optical Fiber Communication & VHDL	
	ELCP 4.6 (PROJECT)	