Sant Gadge Baba Amravati University, Amravati
Faculty of Science and Technology

Programme: M.Sc. Electronics Science (CBCS)

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POs:

At the end of the programme, students would be able to

PO1 (Deep subject Knowledge and intellectual breadth) Apply the subject knowledge to the solution of real- world problems.

PO2 (Professional Ethics) Apply ethical principles and commit to professional ethics and responsibilities and norms of the standard practices.

PO3 (Creative & Critical Thinking) Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO4 (Innovation, Research and Problem Solving) Identify, formulate, review research literature, and analyze complex problems reaching substantiated and innovative conclusions. Design solutions for complex problems withappropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. Use research-based knowledge and research methods to provide valid conclusions. Demonstrate the knowledge of, and need for sustainable development.

PO5 (Team work and Communication Skills) Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. Present/communicate research at national/international level, write effective articles, reports and design documentation, make effective presentations, and give and receive clear instructions. Communicate disciplinary knowledge to the community and broader public.

PO6 (Professionalism and Leadership) Readiness Demonstrate personal accountability and effective work habits, e.g., punctuality, working productively with others, and time as well as workload management. Demonstrate integrity and ethical behavior, act responsibly with the interests of the larger community in mind, and to learn from his/her mistakes. Use the strengths of others to achieve common goals, and use interpersonal skills to coach and develop others. Assess and manage his/her emotions and those of others; use empathetic skills to guide and motivate; and organize, prioritize, and delegate work.

PO7 (Lifelong learning) Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PO8 (Competence for Digital World) Prepare well for living, learning and working in a Digital Society; Create, select, and apply appropriate techniques, resources, and modern ICT tools to complex activities with an understanding of the limitations. Use existing digital technologies ethically and efficiently to solve problems, complete tasks, and accomplish goals. Demonstrate effective adaptability to new and emerging technologies.

PO9 (Global Citizenship) Act with an informed awareness of global issues. Engage in initiatives thatencourage equity and growth for all.

PSOs:
Upon successful completion of the Programme, students would be able to

1. Apply knowledge of electronics to solve problems of the society.
2. Design electronics circuits/systems and analyze them

Employability potential in Electronics:
Some of the job profiles that students can opt for are mentioned below:

- Engineering Manager.
- Project Manager.
- Service Maintenance Engineer.
- Research and development engineer
- Marketing manager
- Industrial Engineer
- X-Ray technician
- Medical technician
- Hardware engineer in banking sector
- Engineer in mobile and communication sector
- Teaching sector
- Research sector
- Software development
- Sound technician
- Technical support executive
- Electrical supervisor
- Software test engineer
- Automation engineer
- Field service engineer

Aspirants pursuing M. Sc. Electronics Science have a lot of scope in diverse industries. These graduates can work in both private and public organizations in the fields of design, manufacture, operation, and maintenance of electronics equipment and practices.

A few of those employment areas are listed below:

Areas of employment include but not limited to

- IT sector
- Hardware manufacturing industry
- Telecommunication industry
- Defense sector
- Banking sector
- Tourism industry
- Education sector
- Research sector
- Automobile sector

M.Sc. 2nd year Sem-III & IV
CBCS

SEM –III/paper IX
3ELE1- Antenna and Mobile Communications
Unit I : Antennas
Theory and design of antennas, Antenna parameters -radiation, current elements, radiation resistance, antenna gain, directivity, effective length, antenna aperture; reciprocity theorem
Unit II : Antenna types Short dipole antenna, antenna arrays:
two-element arrays, broadside and end fire arrays, linear arrays, binomial arrays, folded dipole, Yagi-Uda array; traveling wave antenna, rhombic antenna, V-antenna; Horn Antennae, parabolic reflectors, helical antenna, lens antenna, micro-strip and antenna; antenna measurements such as impedance, radiation pattern, gain, antennas for mobile communication
Unit III : Mobile Communications Cellular concepts:
Introduction to cellular mobile systems, frequency reuse, channel assignment and land off strategy, elements of cellular radio system design, switching and traffic, data links and microwaves, system evaluation
Unit IV : Mobile Radio Environment:
Causes of propagation loss, causes of fading; modulation techniques – BPSK, QPSK, QAM and GMSK; fundamentals of equalization, space polarization, frequency and time diversity techniques, channel coding
Unit V : Multiple access Techniques:
Introduction to digital system, digital cellular system, GSM & CDMA systems- service features, GSM architecture, GSM channel types, GSM frame structure, intelligent cell concept and applications; Features of handset, SMS, security; Interfacing of mobile with computer, application of mobile handset as modem, data storage device, multimedia device; Measurement of signal strength.
Recommended Books:
1. Mobile Cellular Telecommunication: William C. Y. Lee (MGH Inc., 1995)
2. Mobile communication : Jochen Schiller (2nd edition, Pearson Education, 2004)
3. Electromagnetic waves and radiation systems: E. C. Jordan and K.E. Balmain
4. Antennas; J. D. Krauss (2nd edition, TMH, New Delhi, 1999)

5. Handbook of Antenna: Jasik
6. Wireless Communications and networking : Jon W. Mark & Weihua Zhuang
7. Antennas and Radiowave Propagation: R. E. Collin (MGH, International Edition)
8. Wireless Digital Communications: Modulation and Spread Spectrum Applications: Dr. Kamilo Feher (PHI, New Delhi, 1999)
9. Antenna Theory: Analysis and Design : Balanis (2nd edition), Wiley Eastern India

Sem-III/Paper X

3ELE2-Power Electronics

Unit-I : Power Electronic Systems:

Introduction-History, Applications and Interdisciplinary Nature. Power Electronic Systems Block Diagram , Types of Converter Circuits, Peripheral Effects ,Thermal Management and Design Aspects. Performance Parameter such as Efficiency, Total Harmonic Distortion, Power Factor and Reliability.

Unit-II : Power Devices :

Ideal Requirements For Power Electronic Devices. Construction, Principle of Operation , I-V Characteristics ,Specifications and Ratings, Selection Criteria and Applications , Turn On and Turn Off Methods . i) Power Diodes-PIN DIODE, SHOTTKEY DIODE, ii) Thyristor Devices-SCR,TRIAC,GTO, iii) Power Transistor Devices-POWER BJT,POWER MOSFET,IGBT Comparison Of all Power Devices

Unit-III : Rectifiers ,AC Controllers and Resonant Converter Rectifiers:

Performance Parameters, Single Phase Bridge Rectifier with R and RL Load, Three Phase Bridge Rectifier with R and RL Load, Three Phase Fully Controlled Bridge Rectifier with R and RL Load, Comparison of all Rectifier Circuits. AC Controllers : Principle of on-of and Phase Control, Single Phase Bidirectional Controller with R and RL Load, Three Phase Bidirectional Controller, Cycloconverter. Resonant Converter: Need of Resonant Converters, their Advantages and Disadvantages, Comparison between PWM and Resonant Converters, Zero Current Switching Converters(ZCS) , Zero Voltage Switching Converter (ZVS),Comparison between ZCS and ZVS Converters.

Unit-IV : Choppers and Inverters Choppers :

Principle of Operation-Step Up and Step Down Choppers, Performance Parameter, Step Down Converter with RL Load , Step Up Converter with RL Load ,Converter Classification and Operation, Chopper Circuit Design Inverters : Principle Of Operation, Performance Parameter, Single Phase Inverter ,Three Phase Inverter, Modulation Technique for Inverters, Inverter Circuit Design

Unit-V : Applications

I) Power Supplies: DC Power Supplies- i)Switching Regulators–Buck, Boost and Buck-Boost Regulators , ii)SMPS-Flyback, Push-Pull, Bridge Converter. AC Power Supplies- UPS-Online, Offline and Interactive.

II) Motor Drives:

Comparison Of Motors, Types of Motor Drives, Equivalent Circuits, Mathematical Equations, Principle of Operation, Torque-Speed Characteristics, Selection Criteria, Performance Parameter. i) AC Motor Drives-Squirrel-Cage induction motor. ii) Dc Motor Drives(chopper drives)- Separately Excited Dc Motor, PMDC. iii) Synchronous Motor (PWM Inverter)Drives – BLDC,PMSM.

Recommended Books :

1) M.H.Rashid: Power Electronics-Circuits, Devices and Applications
2) P.C.Sen: Power Electronics
3) Ned Mohan : Power Electronics-Converters, Applications and Design

Sem III/Paper XI

3 ELE 3-Advanced Microcontroller and Embedded system

Unit –I : PIC Microcontroller & Interfacing:

Introduction, architecture (PIC 16C6X), registers, instruction set, addressing modes, timers, interrupt timing, i/o port expansion-serial peripheral interface, LCD display, I2C bus operation, serial EPROM, DAC, Temp. Sensors, ADC, UART, oscillator configuration, low power operation, serial programming & parallel slave port.

Unit-II : ARM & AVR Processors:

RISC, ARM design philosophy, ARM fundamentals, instruction sets, thumb instruction sets, exception & interrupt handling, efficient C programming, optimizing ARM assembly code, AVR architecture, instruction set, hardware interfacing, communication links & design issues.

Unit-III : Introduction to Embedded Systems:

Introduction to Embedded system, features of embedded system, components of embedded system, processor selection, device drivers, interrupt servicing mechanism. examples of embedded system application.

UNIT IV: Embedded system Hardware:

Interfacing: I/O devices (LCD, Keyboard, ADC, DAC, Stepper motor, PWM, etc.), Data converters, DMA, UART, SPI, PWM, WDT, Memories, serial, parallel Asynchronous and synchronous communication. Communication standards: – RS 232, I2C, USB, SPI, CAN, PCMCIA, IrDA.

UNIT V : Development tools for embedded systems:

Software development tools- Editor, Assembler, linker, simulator, compiler Hardware development tools: programmer (EPROM programmer, microcontroller programmer, universal programmer), Logic analyzer, General purpose evaluation Boards. Hardware and Software combination Tools1. In circuit emulator 2. Debugger.

Recommended Books:

1) Mazidi & Mazidi, " 8051 Microcontroller & Embedded Systems". Pearson education. (Latest edition) 2) Keneth H. Ayala, "The 8051 Microcontroller", Penram International

3) Rajkaml, “Embedded System-architecture, Programming And Design”, TMH Publications, edition 2003 4) David Simon, “An Embedded Software Primer”, Pearson education, Asia
5) John Peatman, “Design With PIC Microcontroller”, Pearson education, Asia 6) Jonarttan W. Valvano, Brooks, Cole “Embedded Microcomputer Systems-Realtime Interfacing”, Thomson Learning

SEM III/XII

3ELE4 - COMPUTER HARDWARE AND INTERFACING

UNIT-I : CPU AND MEMORY CPU:

essentials – processor modes – modern CPU concepts – Architectural performance features – the Intel’s CPU , Essential memory concepts – memory organizations – memory packages – modules logical memory organizations – memory considerations – memory types – memory techniques – selecting and installing memory.

UNIT II : MOTHERBOARDS:

Active motherboards – sockets and slots – Intel D850GB – Pentium4 mother board – expansion slots – form factor – upgrading a mother board – chipsets , CMOS – CMOS optimization tactics – configuring the standard CMOS setup – motherboard BIOS – POST – BIOS features – BIOS and Boot sequences – BIOS shortcomings and compatibility issues – power supplies and power management – concepts of switching regulation – potential power problems – power management. UNIT III: STORAGE DEVICES The floppy drive – magnetic storage – magnetic recording principles – data and disk organization – floppy drive – hard drive – data organization and hard drive – sector layout – IDE drive standard and features – Hard drive electronics – CD-ROM drive – construction – CDROM electronics – DVDROM – DVD media – DVD drive and decoder.

UNIT IV: I/O PERIPHERALS:

Parallel port – signals and timing diagram – IEEE1284 modes – asynchronous communication - serial port signals – video adapters – graphic accelerators – 3D graphics accelerator issues – DirectX – mice – modems – keyboards – sound boards – audio bench marks.

UNIT V : BUS ARCHITECTURE:

Buses – Industry standard architecture (ISA), peripheral component Interconnect (PCI) – Accelerated Graphics port (AGP) – plug-and-play devices – SCSI concepts – USB architecture.

Recommended Books :

1. Stephen J.Bigelow, “Trouble Shooting, maintaining and Repairing PCs”, Tata McGraw-Hill, New Delhi, 2001.
2. Mike Meyers, “Introduction to PC Hardware and Trouble shooting”, Tata McGraw-Hill, New Delhi, 2003.
3. B.Govindarajulu, “IBM PC and Clones hardware trouble shooting and maintenance”, Tata McGraw-Hill, New Delhi, 2002.

Sem. IV/ Paper XIII

4 ELE 1- VLSI Design and VHDL Programming

UNIT-1 : Introduction to CMOS / VLSI Circuits, MOS transistor switch, Realization of universal gates and compound gates using MOS transistors, Fundamentals of circuit characterization and performance estimation, Basics of R, L and C estimation, CMOS circuits and Logic design, Transistor sizing, basic physical design of simple logic gates.
UNIT2 : CMOS system design And Design Methods, CMOS testing, CMOS subsystem design, Floor planning, Placement ,Physical design flow, Information Formats, Global Routing, Detailed Routing, Special Routing.
UNIT 3 : ASIC construction And CMOS Design:-Physical design, CAD tools, System Partitioning, Estimating ASIC size, Power dissipation, FPGA partitioning methods,
UNIT 4 : Introduction to VHDL, Behavioral Modeling, sequential Processing, data types, attributes, configurations, synthesis and synthesis issues, RTL simulation, place and route. Introduction to VERILOG.
UNIT 5 : Design of combinational blocks such as multibit address, ALU, MUX, DEMUX , encoders, decoders, Design of Sequential circuits, asynchronous and synchronous design Issues
Recommended Books :
1) Neil Weste - K. Eshraghian : Principle of CMOS / VLSI Design (Person Education).
2) J. Bhaskar : "VHDL Primer", (Person Education)
3) Douglas L. Perry : VHDL (3rd Ed.) , McGraw Hill
Sem-IV/Paper XIV
4ELE2- Virtual Instrumentation
Unit I : Virtual Instrumentation Traditional bench top instruments, general functional description of a digital instrument, block diagram of a virtual instrument, user interface, advantages of virtual instrument over conventional instruments, architecture of a virtual instrument & its relation to the operating system, data flow techniques, other virtual programming environments
Unit II : Virtual Instrument Programming Techniques VIs and sub VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, instrument drivers.
Unit III : Data Acquisition Basics Introduction to data acquisition on PC, concepts of data acquisition and terminology, sampling fundamentals, I/O techniques and buses, ADC, DAC, digital I/O, counters and timers, DMA, buffered I/O, real time data acquisition, calibration, resolution, data acquisition interface requirements
Unit IV : Virtual Instrument Chassis Requirements Common instrument interface: Current loop, RS232/RS485, GPIB systems basics; interface basics: USB, PCMCIA, VXI, SCXI, PXI, Firewire; PXI system controllers; Ethernet control of PXI;
Unit V : Virtual Instrument Analysis Toolsets Distributed I/O modules, Applications of VI, Instrument control, simulations of systems, Fourier Transform, power spectrum, correlation methods, windowing & filtering, P, PI, and PID module handling, virtual system design in temperature, pressure, humidity, image acquisition and processing, motion control, database programming.
Recommended Books:

1. Virtual Instrumentation using Lab VIEW : Sanjay Gupta and Joseph John (TMH, New Delhi, 1st edition, 2005)
2. Virtual Instrumentation using Lab VIEW : Jovitha Jerome (PHI Learning Pvt. Ltd., New Delhi, 2007)
3. Lab VIEW for Everyone: Lisa K. Wells & Jeffrey Travis (Prentice Hall, New Jersey, 1997)
4. Lab VIEW Graphical Programming: Gary Johnson (Second edition MGH, New York, 1997)
5. Lab VIEW for Data Acquisition: Bruce Mihura (PHI, New Delhi)
6. PC Based Instrumentation: Concepts & Practice: N. Mathivanan (PHI, New Delhi, 2007)

Sem-IV/Paper XV

4ELE3- Numerical Methods and C Programming

Unit I : Basic structure of C programme, programming style, executing C programme, constants, variables & data types, operators, I/P and O/P operations, Branching & looping.

Unit II : Arrays : One dimensional, two dimensional , multidimensional , their declaration & initialization. Character & Strings : Declaring & initializing string variables , reading & writing of string variables, arithmetic operations on characters, comparison of strings. User-defined function : Need, definition, return values & their types, function calls, declaration, nesting of functions, passing arrays & string to function .

Unit III : Structures : Definition , declaration initialization , copying and comparing structure variable ,arrays of structure, structures and functions, size of structures. Pointers : Introduction , accessing the address of variables , initialization of pointer variables , chain of pointer, pointer expression , pointers & arrays , pointers & character strings , pointer to function & structure File management in C .

Unit IV : Roots of Nonlinear equation : Introduction , method of solution , Iterative method , false position method, Newton Rapson method. Direct solution & Linear equation : Need and scope, existence of solution, solution by elimination , Basic Gauss elimination method with pivoting, Jacobi's Iteration method, Gauss seidel method .

Unit V : Curve fitting : Interpolation: introduction, polynomial, forms , linear interpolation , spline interpolation . Regression : Introduction, fitting linear equation, fitting transcendental equation, fitting a polynomial function. Numerical Differential Integration : Need & S Need & Scope, Differentiating, continuous function, Differentiating Tabulated function, Trapezoidal Rule, Taylors series method, Euler's method.

Recommended Books :

1) E. Balguruswami : ANCII C
2) E. Balguruswami : Numerical Methods
3) Shastri : Numerical Methods

Sem-IV/Paper XVI

4ELE4- Fuzzy logic and Neural Networks

Unit I : Introduction: Utility of Fuzzy systems, uncertainty and information, fuzzy sets and Membership, chance versus fuzziness. Classical set and fuzzy sets: Classical set, operation on classical set, properties of classical set, fuzzy

set, fuzzy set operation, properties of fuzzy sets, non interactive fuzzy sets. Classical Relation and Fuzzy relation: Cartesian product, crisp relation, operation on crisp relation, properties of crisp relations, operation on fuzzy relations, properties of fuzzy relation.

Unit II : Properties of membership function, Fuzzification & Defuzzification: Features of the membership function, fuzzification, defuzzification to crisp set. Logic & Fuzzy Systems: Classical Logic, Fuzzy Logic, Fuzzy(rule-based) systems, graphical techniques of inference. Development of membership function: Membership value assignment, membership function generation.

Unit III : Fuzzy Systems simulation: introduction, fuzzy relational equations, non-linear simulation using fuzzy systems, Fuzzy Associative Memories (FAMs). Rule-Base reduction methods: Fuzzy systems theory and rule reduction methods. Decision making with fuzzy information: introduction, fuzzy synthetic evaluation, fuzzy ordering, non transitive ranking, preferences and consensus, multiobjective decision making, fuzzy Bayesian decision making, decision making under fuzzy states and fuzzy actions.

Unit IV : Neural and Fuzzy machine Intelligence: Neural and fuzzy systems as function estimators, neural network as trainable dynamical system. Neural network Theory: Neurons as functions, signal monotonicity, biological activation & signals, Neuron fields, neuronal dynamical system, additive neural dynamics, additive neural feedback, additive activation model, additive Bivalent model.

UNIT V : Unsupervised learning in Neural Networks: Four unsupervised learning laws, probability spaces and random processes, stochastic unsupervised learning and stochastic equilibrium, signal Hebbian learning, competitive learning, differential Hebbian learning.

Recommended Books:

1. Fuzzy Logic with Engineering Applications, 2e. Timothy Ross, Wiley India. (ISBN: 978-81-265-1337-3)
2. Fuzzy sets and Fuzzy Logic Theory and Applications, George J. Klir, Bo Yuan, PHI (ISBN: 978-81-203-11367)
3. Neural Networks and Fuzzy systems, Bart Kosko, PHI(ISBN: 81- 203-0868-9)