Sant Gadge Baba Amravati University,
AmravatiFaculty of Science and Technology

Programme: M.Sc. Electronics Science (NEP-2020)

Programme: M. Sc. II Electronics Science

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 with appropriate 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 inindependent 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

Sant Gadge Baba Amravati University, Amravati

Name of the Programme :-M.Sc. **Subject**: Electronics Science

Programme Specific Outcome (PSO)

Name of the course (Paper) : 3SEM **1(M.Sc. II Semester III) (NEP-2020)**

Syllabus:

M.Sc. Second Year Electronics Semester-III

Paper-I: DSC I.3: Advance Research Methodology
Paper-II: DSC II.3: Antenna and Mobile Communications
Paper-III: DSC III.3: Power Electronics
Paper-IV: DSE-III/MOOC 1 (Advanced Microcontroller and Embedded system)
Paper-V: DSE-III/MOOC 2 (Computer Hardware and interfacing)

M.Sc. II (Sem-III) NEP-2020

Paper-I: DSC I.3: Advance Research Methodology

DSC-I.3 3ELE1 IoT

Course Outcomes
Upon completing this course, the student will be able to
1. Introduction to IOT
2. Arduino Simulation Environment
3. Sensor & Actuators with Arduino
4. Basic Networking with ESP8266 Wi-Fi module
5. Cloud Platforms for IOT
6. Explore various protocols of sensor networks.
7. Program and configure Arduino boards for real world connectivity.

UNIT I
Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, IOT Architecture and protocols, Sensing, Actuation. (10 Hrs)
UNIT II
Basics of Networking, Communication Protocols, Sensor Networks. Various Platforms for IoT, Real time Examples of IoT, Overview of IoT components and IoT Communication Technologies, Challenges in IOT (10 Hrs)
UNIT III
Arduino Simulation Environment

Arduino Uno Architecture , Setup the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD (08 Hrs)

UNIT IV
Sensor & Actuators with Arduino Overview of Sensors working, Analog and Digital Sensors,

Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor, Arduino Interfacing of Actuators with Arduino. Interfacing of Relay Switch and Servo Motor with Arduino Basic Networking with ESP8266 WiFi module Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library, Web server- introduction, installation, configuration, Posting sensor(s) data to web server (10 Hrs)

UNIT V

Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi . Introduction to Python programming, Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, (12Hrs)

UNIT VI

Cloud Platforms for IOT Virtualization concepts and Cloud Architecture, Cloud computing, benefits, Study of IOT Cloud platforms, Thing Speak API and Blynk Mobile API, Interfacing ESP8266 with Web services (10Hrs)

TEXT BOOKS

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1 st Ed., Maker Media, 2014.

REFERENCES

1. Internet of Things: A Hands-on Approach, by Arshdeep Bahga and Vijay Madisetti.
2. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013.
3. Programming The Internet Of Things: An Introduction To Building Integrated, Device-To-Cloud IoT Solutions, by Andy King ,O'REILLY publications

Paper-II: DSC II.3: Antenna and Mobile Communications

Course outcome:

Upon completing this course students will learn

1. Design of antennas, Antenna parameters -radiation, current elements, radiation resistance, antenna gain, directivity, effective length, antenna aperture.
2. Broadside and end fire arrays, Yagi-Uda array; travelling wave antenna, rhombic antenna and antenna measurements
3. Cellular mobile systems, frequency reuse, channel assignment, Causes of propagation loss, causes of fading
4. Modulation techniques: BPSK, QPSK, QAM and GMSK, GSM channels types, GSM frame structure

Unit I: Antennas

Theory and design of antennas, Antenna parameters -radiation, current elements, radiation resistance, antenna gain, directivity, effective length, antenna aperture; reciprocity theorem and

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; travelling 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, Causes of propagation loss, causes of fading.

Unit IV: Mobile Radio Environment and Multiple access techniques

Modulation techniques: BPSK, QPSK, QAM and GMSK; fundamentals of equalization, space polarization, frequency and time diversity techniques, channel coding. Introduction to digital system, digital cellular system, GSM & CDMA systems- service features, GSM architecture, GSM channels types, GSM frame structure, intelligent cell concept and applications.

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

Paper-III: DSC III.3: Power Electronics

Course outcome:

Upon completing this course students will learn

1. Power Electronic Systems Block Diagram, Types of Converter Circuits, Peripheral Effects,
2. Turn On and Turn Off Methods . i) Power Diodes-PIN DIODE, SHOTTKEY DIODE, BJT, POWER MOSFET,IGBT
3. Three Phase Bridge Rectifier with R and RL Load, Three Phase Fully Controlled Bridge Rectifier with R and RL Load, Phase Control, Single Phase Bidirectional Controller with R and RL Load,

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.

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

Paper-IV: DSE-III/MOOC 1 Advanced Microcontroller and Embedded system

Course outcome:

Upon completing this course students will learn

1. Architecture (PIC 16C6X), registers, instruction set, addressing modes, timers, Temp. Sensors, ADC, UART
2. RISC, ARM design philosophy, ARM fundamentals, instruction sets, thumb instruction sets,
3. Introduction to Embedded system, features of embedded system, components of embedded system, processor selection,

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 : 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. Interfacing: I/O devices (LCD, Keyboard, ADC, DAC, Stepper motor, PWM, etc.),

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

Paper-IV: DSE-III/MOOC 2 Computer Hardware and interfacing

Course outcome:

Upon completing this course students will learn

1. Essentials, processor modes, modern CPU concepts, Architectural performance features, the Intel's CPU, Essential memory concepts memory techniques, selecting and installing memory.
2. Active motherboards, sockets and slots, Intel D850GB, Pentium4 mother board, expansion slots, form factor, motherboard BIOS, POST BIOS features
3. The floppy drive, magnetic storage, magnetic recording principles, data and disk organization, floppy drive, hard drive, data organization and hard drive DVDROM, DVD media, DVD drive and decoder.

UNIT-I : CPU AND Memory:

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 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.

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.