Sant Gadge Baba Amravati University, Amravati

Faculty of Science and Technology

Programme: B.Sc. Electronics Science

Program Outcomes (POs):

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

1) Utilize the basic knowledge in Electronics science.

2) Identify electronic components and ICs.

3) Design system components that meet the requirement of public safety and offer solutions to the societal and environmental concerns

4) Apply research based knowledge to design and conduct experiments

5) Construct, choose and apply the techniques, resources and modern electronics tools required for Electronics applications.

6) Apply the contextual knowledge to assess societal, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional electronics practice.

7) Examine the impact of electronics solutions in global and environmental contexts and utilize the knowledge for sustained development.

8) Develop consciousness of professional, ethical and social responsibilities as experts in the field of Electronics and Communication.

9) Perform effectively as a member/leader in multidisciplinary teams.

10) Demonstrate resourcefulness for contemporary issues and lifelong learning.

Program Specific Outcomes:

Upon completion of the programme successfully, students would be able to

1. acquire knowledge in fundamental aspects of all branches of Electronics
2. create inquisitiveness and problem-solving skills
3. apply the principles of Electronics in solutions to real world problems
4. get prepared for higher education and career in Electronics
5. develop skills in the proper handling of apparatus and components
6. apply Electronics in their day to day life
7. act as a responsible citizen
8. Select and apply cutting-edge engineering hardware and software tools to solve complex Electronics and Communication Engineering problems
9. Apply the fundamental concepts of electronics and communication science to design a variety of components.

Employability Potential in Electronics:

Bachelor of Science in Electronics is a technical course comprising the study of electronic devices, the materials used in the manufacturing and production of these devices and their composition. A degree in electronics can give you the skills and knowledge to understand the various features of electronic devices and circuits and how they function. Course is Divided across six semesters, the course may include subjects such as basic mathematics, the fundamentals of electricity, electronics and electronic communication, physics, environmental studies and value education. Depending on the college and its syllabus, students can also pick other elective subjects such as Mathematics , Physics, Computers, Statistics etc.

1. Field service engineer

2. Electrical technician

3. Sound technician

4. Telecommunications engineer

5. Technical support executive

6. Electronic sales manager

7. Electrical supervisor

8. Software test engineer

9. Software engineer

10. Automation engineer

Areas of employment include but not limited to:

- IT companies
- Hardware manufacturing industry
- Telecommunication industry
- Defense sector
- Banking sector
- Tourism industry

Further studies after B.Sc. in Electronics

- M.Sc. (Master of Science) in Electronics Instrumentation
- M.Sc. (Master of Science) in Applied Electronics
- M.Tech. (Master of Technology) Electronics and communication
- Ph.D in Electronics Science
- Diploma in Bio-Medical Electronics
- Diploma in Mechatronics

Key skills required for jobs after B.Sc. in Electronics

A bachelor's degree in electronics can lead you to job opportunities in both the public and private sectors. Apart from the technical knowledge and skills that you may gain during the course of your professional degree, graduates in electronics may require soft skills to excel, regardless of the industry or field they choose to work in. Some of these soft skills include:

- problem-solving skills
- methodical thinking
- critical thinking
- communication skills
- time management skills
- ability to plan and prioritise work
- leadership skills
- dependability
- ability to work in a team
- adaptability
- good work ethics

Semester I
DSC -1S- Electronics
Course Title - Basic Electronics

Unit I : Passive Components and Network theorems (12L)

Introduction to Resistors, Capacitors, Inductors and Transformers, Concept of ideal dc voltage and current source, KVL, KCL, Thevenin's, Norton's, maximum power transfer, Millman's theorem (statement, proof, simple numerical application for dc only).

UNIT II: Measuring Instruments : (12L)

Principles of voltmeter, ammeter, ohmmeter, Multirange DC voltmeter, ohm per volt rating, loading effect, Multirange DC Ammeter, Series & shunt type ohmmeter, Multimeter (uses & drawback). CRO Block diagram & explanation, CRT construction & working, uses of CRO (measurement of frequency , amplitude& phase.)

Unit III : Semiconductor Diode and Regulated power supply: (12L)

Operation and characteristics of PN junction diode, Avalanche and Zener breakdown mechanism, Half wave and full wave rectifiers (ripple factor, efficiency, PIV ratings), C, L and p filters, Concept of unregulated and regulated power supply, Zener diode voltage regulator, Three terminal IC regulator.

Unit IV : Bipolar Transistors: (12L)

NPN and PNP transistor (construction and working) CB, CE & CC configuration, leakage currents, Input and output characteristics of CE mode, relation between a and b Load line and operating point, Amplification action of CE amplifier, biasing and stability, Self and fixed bias circuit.

Unit V : Switching and Optoelectronic devices : (12L)

Construction, working and characteristics of FET, MOSFET, UJT, SCR, relation of FET parameters, Construction, working & characteristics of LDR, LED, photodiode, photovoltaic cell(Solar cell).

Unit VI : Integrated Circuits: (12L)

Introduction to IC technology, advantages and disadvantages, Classification of ICs, Basic steps in fabrication of monolithic ICs, Fabrication of diode, resistor & transistor. Scale of integration upto V2LSI',Basic concept of Embedded systems.

Unit VII : DSC-1S-SEM (18L)

- Identification of testing tools.
- Idea of Phase, Neutral and Ground of AC mains.
- Use of soldering iron.
- Use of Desoldering pump.
- Identification of Active and Passive electronic components in simple way.
- Identification of step-up and step down transformer.
- Measurement of voltage.
- Measurement of current.
- Measurement of resistance.
- Identify and measurement of capacitance of various capacitors.
- Identify the control and functional switches in CRO .
- Study of Resistors and Capacitors in series.
- Study of Resistors and Capacitors in parallel.
- Testing and fault finding of transistor.

COURSE OUTCOMES
DSC-1S

Sr.No.	Topic	What the student will be able to do at the end of Module/Unit (Knowledge/ Skill achieved OR Application of Knowledge /Skill to do what) /**COs**
1	**Unit I : Passive Components and Network**	At the end of this unit, students will be able

	theorems Introduction to Resistors, Capacitors, Inductors and Transformers, Concept of ideal dc voltage and current source, KVL, KCL, Thevenin's, Norton's, maximum power transfer, Millman's theorem (statement, proof, simple numerical application for dc only).	to know passive and active components, analysis and verification of network theorems with numericals. Also students will be able to select and identify electronic components such as resistors capacitors etc. of required value.
2	**UNIT II: Measuring Instruments :** Principles of voltmeter, ammeter, ohmmeter, Multirange DC voltmeter, ohm per volt rating, loading effect, Multirange DC Ammeter, Series & shunt type ohmmeter, Multimeter (uses & drawback). CRO Block diagram & explanation, CRT construction & working, uses of CRO (measurement of frequency , amplitude& phase.)	After this unit, students will be able to understand principle and working of different meters and CRO . They will be able to handle and connect the measuring instruments such as Voltmeter, Ammeter etc. at appropriate place
3	**Unit III : Semiconductor Diode and Regulated power supply:** Operation and characteristics of PN junction diode, Avalanche and Zener breakdown mechanism, Half wave and full wave rectifiers (ripple factor, efficiency, PIV ratings), C, L and filters, Concept of unregulated and regulated power supply, Zener diode voltage regulator, Three terminal IC regulator.	At the end of this unit, students will be able to know function of diodes, rectifiers and voltage regulators. They will be able to design simple dc power supply.
4	**Unit IV : Bipolar Transistors:** NPN and PNP transistor (construction and working) CB, CE & CC configuration, leakage currents, Input and output characteristics of CE mode, relation between and Load line and operating point, Amplification action of CE amplifier, biasing and stability, Self and fixed bias circuit.	After completion of this unit, students will be able to know types transistor and their working in different modes, amplification and biasing, faults detection in electronic circuits. Also they will be able to design and construct simple amplifiers.
5	**Unit V : Switching and Optoelectronic devices :** Construction, working and characteristics of FET, MOSFET, UJT, SCR, relation of FET parameters, Construction, working & characteristics of LDR, LED, photodiode, photovoltaic cell(Solar cell). concept of Embedded systems.	At the end of this unit, students will be able to know Switching and Optoelectronic devices and their working. They will be able to use these active devices for many applications.
6	**Unit VI : Integrated Circuits :** Introduction to IC technology, advantages and disadvantages, Classification of ICs, Basic steps in fabrication of monolithic ICs, Fabrication of diode, resistor & transistor. Scale of integration upto V2LSI',Basic	After completion of this unit, students will be able to know design and fabrication process of ICs and their scale of integration

Books Recommended:

1) Basic electronics by B.L.Thereja (S.Chand and Company)
2) Digital and Analog technique by Navneet, Kale and Gokhale
3) Element of electronics by Bagde and Singh (S.Chand and Company)
4) Principles of electronics by V.K.Mehta
5) Introduction to digital electronics by Mohinder Singh
6) Electrical and electronics measurement and Instrumentation by A.K.Sawhney
7) Text book of Electrical Technology by B.L.Thereja

Practicals: Minimum Ten experiments at least one on each of the following aspects.

1. Active and Passive components.
2. Network theorems, voltmeter, Ammeter, ohmmeter multimeter and CRO.

3. Regulated power supply, rectifiers, filters, IC regulators.
4. Bi-polar devices and its applications.
5. Uni-polar and optoelectronic devices and its applications.
6. IC testing, IC know how, IC connection, simple IC circuits, mounting of IC on PCB and checking of voltage at each pin.

Semester II
DSC -2S- Electronics
Course Title - Digital Electronics

Unit I : Binary Arithmetic & Logic gates : (12L)
Binary, Octal & Hexadecimal number system and their interconversion**,** Binary arithmetic (addition and subtraction using 1's & 2's compliment), multiplication & division. Binary codes : 8421 BCD, Excess-3 & Gray code. NOT, OR, AND, NAND, NOR gates (definition and truth table). EXNOR & EXOR gates, Half adder, full adder , 4 bit binary full adder.

Unit II : Boolean Algebra & Logic families: (12L)
Boolean laws, De-Morgan's theorem, Simplification of Boolean equations using Boolean algebra, Fundamental products & sum terms, K-map (K-map upto 4 variable). Classification of logic families, characteristics (Fan-in, Fanout, Noise immunity, Propagation delay, Power dissipation), DTL,TTL & CMOS logic.

Unit III : Multivibrators and Flip Flops: (12L)
Construction & working of Astable, monostable and Bistable transistorised multivibrators, RS, CK-RS, D, JK, JKMS and T Flip Flops (Logic diagram, Truth table, construction &
working), Concept of edge trigger Flip-Flop, Concept of preset & clear terminal.

Unit IV : Counters and Shift registers: (12L)
Asynchronous & synchronous Counter, Up-down counters (up to 4-bits), modified asynchronous counter (Mod - 7 ,Mod- 10,and Mod-13). Types of shift registers, SISO, SIPO, PISO & PIPO, IC version of Mod -10 shift registers (Construction & working), IC
version of shift register – 7495, Application of shift register. Ring counter, Johnson's counter.

UNIT V: Combinational logic circuit: (12L)
Encoder: Binary to BCD, Decimal to BCD, IC 74147, Decoder: 2 to 4 line, BCD to decimal, BCD to 7 segment, IC 7447, Multiplexer: 4X1, 8X1, De multiplexer: 1X4, 1X8, (Definition, construction, operation and application of above)

Unit VI : Semiconductor Memories: (12L)
Concept of memory, primary and secondary memory, classification of memories, volatile and non volatile memories, memory Hierarchy, semiconductor memory: RAM, ROM, PROM, EPROM, EEPROM, flash memory.

Unit VII : DSC-2S-SEM (18L)

- Illustrate to practice the digital trainer kit with safety.
- Identify various digital ICs.
- To test IC using digital IC tester.
- Identification of ICs NOT, OR and AND.
- Identification of ICs NAND,NOR,EXNOR and EXOR.
- Skill to convert decimal number in to binary by using 8421 BCD code.
- Skill to convert the given number into the specified number system.
- Identification of base or radix of Binary, Octal, Decimal and Hexadecimal number system.
- Construct and verify the truth table of all gates using NOR and NAND gates.
- Skill of Subtraction by using 1s compliment.
- Skill of Subtraction by using 2s compliment.
- Construct an adder cum subtractor circuits and verify the truth table.
- Study of Boolean algebra.
- Study of De-Morgan's theorem.
- Study Characteristics of logic families Noise margin, Power dissipation, Figure of merit, Fan in and Fan out.
- Skill the K-map reduction technique for the Boolean expression.
- Study of IC 7483 adder.
- Construct Encoder and Decoder by using IC74147,IC7447 and verify the truth

table.

- Construct multiplexer and demultiplexer circuits and verify the truth table.
- Triggering methods- edge trigger and level trigger.
- Construct and verify Asynchronous, Synchronous and Up-Down counter.
- Construct and verify the truth table of SR Flip Flop, Clocked SRFF with preset and clear.
- Construct and verify shift registers SISO, SIPO, PISO and PIPO.
- Identification of primary memory.
- Identification of secondary memory.

COURSE OUTCOMES

DSC-2S

Sr.No.	Topic	What the student will be able to do at the end of Module/Unit (Knowledge/ Skill achieved OR Application of Knowledge /Skill to do what) / **COs**
1	**Unit I : Binary Arithmetic & Logic gates :** Binary, Octal & Hexadecimal number system and their inter- conversion**,** Binary arithmetic (addition and subtraction using 1's & 2's compliment), multiplication & division. Binary codes : 8421 BCD, Excess-3 & Gray code. NOT, OR, AND, NAND, NOR gates (definition and truth table). EXNOR & EXOR gates, Half adder, full adder , 4 bit binary full adder.	After completion of this unit, students will be able to know number systems and binary codes, their interconversion and arithmetic, logic gates, use of logic gates in adders. They will be able to design and construct logic circuits using logic gates.
2	**Unit II : Boolean Algebra & Logic families**: Boolean laws, De-Morgan's theorem, Simplification of Boolean equations using Boolean algebra, Fundamental products & sum terms, K-map (K-map upto 4 variable). Classification of logic families, characteristics (Fan-in, Fan- out, Noise immunity, Propagation delay, Power dissipation), DTL,TTL & CMOS logic.	At the end of this unit, students will be able to understand Boolean algebra, De'Morgan's theorem, logic equations, K-map and logic families like DTL,TTL etc. They will be able to minimise logic equation, design and construct logic circuits using logic gates.
3	**Unit III : Multivibrators and Flip Flops**: Construction & working of Astable, monostable and Bistable transistorised multivibrators, RS, CK-RS, D, JK, JKMS and T Flip Flops (Logic diagram, Truth table, construction & working), Concept of edge trigger Flip-Flop, Concept of preset & clear terminal.	At the end of this unit, students will be able to know construction and working of multivibrators and flip-flops. Also they will be able to design and construct different types of flip-flops using logic gates.
4	**Unit IV : Counters and Shift registers**: Asynchronous & synchronous Counter, Up-down counters (up to 4-bits), modified asynchronous counter (Mod -7 ,Mod- 10,and Mod-13).Types of shift registers, SISO, SIPO, PISO & PIPO, IC version of Mod -10 shift registers (Construction & working), IC version of shift register – 7495, Application of shift register. Ring counter, Johnson's counter.	At the end of this unit, students will be understand the construction and working of different types of counters and shift registers and their IC version. They will be able to design and construct different types of counters and shift registers using flip-flops and logic gates.
5	**Unit V : Combinational logic circuit**: Encoder: Binary to BCD, Decimal to BCD, IC 74147, Decoder: 2 to 4 line, BCD to decimal, BCD to 7 segment, IC 7447, Multiplexer: 4X1, 8X1, De multiplexer: 1X4, 1X8, (Definition, construction, operation and application of above) concept of Embedded systems.	After this unit, students will be know the construction and working of different types of encoders, decoders, multiplexers and demultiplexers and their IC version. They will be able to design and construct different types of encoders, decoders, multiplexers and demultiplexers using logic gates.
6	**Unit VI : Semiconductor Memories:**	At the end of this unit, students will be able

	Concept of memory, primary and secondary memory, classification of memories, volatile and non-volatile memories, memory Hierarchy, semiconductor memory: RAM, ROM, PROM, EPROM, EEPROM, flash memory.	to know different types of memories and their working. They will be able to access these memories in serial and parallel mode (to read and write operations).

Books Recommended:

1. Digital and analog technique by Navneet, Kale and Gokhale (Kitab mahal prakashan)
2. Introduction to digital electronics by Mohinder Singh
3. Digital principle and application by Malvino and Leach
4. Modern digital electronics by R. P. Jain
5. Pulse, digital and switching waveforms by Millman and Taub

Practicals: Minimum Ten experiments at least one on each of the following aspects.

1. Half adder, full adder, code converter, Identification and verification of logic gates, 4-bit binary full adder(IC versions)
2. De'Morgan's theorems, K-map, TTL and CMOS logic, knowing characteristics of logic families.
3. Transistorized Astable, Bistable and monostable multivibrator, JK and JKMS flipflops, Data Flipflop, RS , CK RS Flipflop.
4. 4-bit binary counter, modifying counter, ring and Johnson's Counters (Using ICs), SISO, SIPO, PISO and PIPO.
5. Decoder, multiplexer, IC74147 mounting and testing.
6. Study of memories.

General Interest Course (GIC-1)
(Level: B.Sc. I)

Calibration and Equipment Maintenance Techniques

Total Hours: 30 **Credits: 02**

Description: This GIC is about the medical Equipment Technician to calibrate and help in equipment maintenance.

Scope: This units covers the following:

- Calibrating and helping in equipment maintenance.

Performance Criterion:

To be competent, the user/ individual on the job must be able to:

- Test and calibrate parts and equipment
- Calibrated equipment according to the manufacturer's recommendations, study protocols.
- Maintain calibration record for the equipment.
- Maintain the calibration sheet for inspection by the regulatory authorities and other relevant authorities.
- Help in equipment maintenance.
- Keep records of maintenance and repairs.

Knowledge and Understanding:

The user/ individual on the job needs to know and understand:

- Relevant legislation, standards, policies and procedures followed by the provider.
- How to follow established protocols as defined in organization's policy while keeping and maintaining medical records.

Technical Knowledge

The user/ individual on the job must be able to:

- Test the equipment.
- Calibrate the equipment.
- Record calibration on relevant sheet.
- Review technical manuals and regularly attend training sessions.
- Explain and demonstrate correct operations of medical equipment.

Core Skills/ Generic Skills:

Writing Skills:

The user/individual on the job needs to know and understand how to:

- Use effective written communication protocols.
- Communicate information (for example, facts, ideas or messages) in brief, clear and organized manner.
- Produce written information, which may include technical material, that is appropriate for intended audience.

Reading Skills:

The user/ individual on the job needs to:

- Understand and interpret written material, including technical materials, rules, regulations, instructions, reports, charts, graphs or tables.

Problem Solving:

The user/ individual on the job needs to:

- Detect the fault and take corrective measures.

Analytical Thinking:

The user/ individual on the job needs to know and understand how to:

- Analyze information and use logic to address work-related issues and problems.

Critical Thinking:

The user/ individual on the job needs to know and understand how to:

- Analyze, evaluate and apply the information gathered from observation, experience, reasoning or communication to act efficiently.
- Demonstrate the ability to adapt to rapidly changing situations, e.g.: responds appropriately to critical situations, retains composure in stressful situations, applies existing skills to new situations.