Curriculum for B.Sc. / B.Sc.(Hons.)

as per

NEP 2020

2021-22

and onwards

SUBJECT: ELECTRONICS

Contents

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18.	ELE-OE2.4: Mobile Application Programming	
19.	ELE-OE2.5: Digital Electronics, Computer fundamentals and C- Programming	
20.	SECT:1.1 Basic Electronics Skills	
21.	SECP:1.1 Basic Electronics Skills	
22.	SECT:2.1 Digital Electronics Skills	
23.	SECP:2.1 Digital Electronics Skills	

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APPENDIX- 2: Syllabus

Semester- I Paper code: 331171

ELE-CT1: ELECTRONIC DEVICES AND CIRCUITS

(Credits: Theory – 04, Practical – 02) **Total Teaching hours: 60**

Course Objectives

Upon completing the course, ELE-CT1, the student will be able to understand various fundamental principles of network analysis, number systems and Boolean algebraand become familiar with the basic operation of electronic devices and circuits whichare the building blocks of all electronic circuits, devices and gadgets.

UNIT-1

15 HOURS

Electronic Components: Electronic passive and active components, types and their properties, Concept of Voltage and Current Sources, electric energy and power(Qualitative only).

Network Theorems: Thevenin's, Norton's, Maximum Power Transfer, Superposition and Reciprocity and Millaman's Theorems. DC analysis RLC series and parallel Resonant Circuits.

PN junction diode: Ideal and practical diodes, Formation of Depletion Layer, and I-V characteristics. Idea of static and dynamic resistance, Zener diode, Reverse saturation current, Zener and avalanche breakdown.

Rectifiers-Half wave and Full wave (center tap and bridge) rectifiers, expressions for ripple factor and efficiency, Shunt capacitor filter. (Numerical examples wherever applicable).

UNIT-2

15 HOURS

Voltage regulator: Block diagram of regulated power supply, Line and Load regulation, Zener diode as voltage regulator – circuit diagram and working. Fixed and Variable IC Voltage Regulators (78xx, 79xx, LM317 and LM337), Clippers-Positive and Negative Clippers (shunt type) and clampers (-Positive and Negative Clampers (Qualitative treatment only).

Bipolar Junction Transistor: Symbol, types and Construction. CE,CB and CC configurations (mention only), Regions of operation (active, cut off and saturation), Input and Output characteristics of a transistor in CE mode, leakage currents (mention only), Current gains α & β and their inter-relations, dc load line and Q point. Applications of transistor as amplifier (CE Amplifier only) and switch - circuit diagram and working. (Numerical examples wherever applicable).

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UNIT-3 **18 HOURS**

Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor. Transistor as a two-port network, h-parameters, h-parameter equivalent circuit.

Amplifier: Classification of amplifiers, Small signal analysis of single stage CE amplifier using h-parameters. Input and Output impedances, Current and Voltage gains. Class A, B and C Amplifiers (qualitative).Types of coupling, Two stage RC Coupled and transformer coupled amplifier(complementary symmetry Class-B Push pull amplifier) – circuit, working and Frequency Response.

Feedback and Oscillators: Negative and positive feedback, advantages of negative feedback(Qualitative Study). Barkhausen criterion, Hartley, Colpitt's and Crystal Oscillators(Using Transistors).

UNIT-4 **12 HOURS**

Special semiconductor diodes: Varactor diode, Schottky diode, step-recovery diode and Tunnel diode - symbol, construction, working, V-I characteristics and applications for each.

Opto-Electronic Devices- LED, LCD, LDR, solar cell and Opto-Coupler – construction, operation and applications, 7-segment display, concept of common anode and common cathode types.(Numerical problems, whereverapplicable)

Course Outcomes

At the end of this course, students will be able to

- Study and analyze basic networks using network theorems in a systematicmanner.
- Build simple electronic circuits used in various applications.
- Describe the behavior of basic semiconductor devices
- Reproduce the I-V characteristics of diode/BJT devices
- Describe the frequency response of BJT amplifiers.
- Explain the behavior, characteristics and applications of Varactor diode,Schottky diode, step-recovery diode ,Tunnel diode, LED, LCD and solar cells.
- Apply standard device models to explain/calculate critical internal parametersof semiconductor devices.

Reference Books:

1. Robert L Boylestad, "Introductory circuit analysis", 5th edition., UniversalBook 2003.
2. R.S.Sedha, "A Text book of Applied Electronics", 7th edition., S. Chand andCompany Ltd. 2011
3. A.P. Malvino, "Principles of Electronics", 7th edition .TMH, 2011.
4. Electronic devices and circuit theory by Boylestad, Robert Nashelsky
5. David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni.Press, 2015
6. Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)
7. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7thEd., 2011, Tata McGraw
8. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI LearningPvt. Ltd.
9. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
10. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHILearning.
11. M. Nahvi& J. Edminister, "Electrical Circuits", Schaum's Outline SeriesTMGH2005
12. S. A. Nasar," Electrical Circuits", Schaum's outline series, Tata McGraw Hill,2004
13. J. Millman and C. C. Halkias, "Integrated Electronics", Tata McGraw Hill,2001
14. A.S. Sedra, K.C. Smith, A.N. Chandorkar "Microelectronic circuits", 6th Edn.,Oxford University Press, 2014
15. J. J. Cathey, "2000 Solved Problems in Electronics", Schaum's outline Series,TMG1991

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ELE-CP1: Electronic Devices and Circuits – Lab

(Hardware / Circuit Simulation Software)

Minimum of Twelve Experiments to be performed excludingdemonstration experiments

1. **Demonstration Experiment:** Familiarization with
   a) Electronic components
   b) Resistance in series, parallel and series-parallel
   c) Capacitors and inductors in series and parallel
   d) Multimeter and LCR meter – checking of components / measurements.
   e) Voltage sources in series, parallel and series-parallel
   f) Voltage and current dividers
   g) Measurement of Amplitude, Frequency & Phase difference usingOscilloscope
2. Verification of Thevenin's Theorem.
3. Verification of Norton's Theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Verification of Superposition Theorem.
6. Verification of Reciprocity Theorem
7. Verification of Millaman's Theorem
8. Study of the I-V Characteristics of p-n junction Diode,
9. Study of the I-V Characteristics of Zener diode.
10. Study of the I-V Characteristics of LEDs of two different colours
11. Study of 7-segment display.
12. Study of Half wave rectifier without and with shunt capacitor filter– ripplefactor for different values of filter capacitors.
13. Study of full wave bridge rectifier without and with shunt capacitor filter –ripple factor for different values of filter capacitors.
14. Study of Zener diode as a Voltage Regulator
15. Study of Clipping(Positive and Negative Clipper)
16. Study of Clamping(Positive and Negative Clamper)
17. Construction and testing of fixed positive voltage regulators using78xx ICs
18. Construction and testing of fixed negative voltage regulators using 79xx series ICs
19. Construction and testing of variable voltage regulator using IC LM317
20. Construction and testing of variable voltage regulator using IC LM337
21. Study of Transistor as a Switch.
22. Study of Transistor characteristics in CE configuration – determination of h-parameters
23. Study of Fixed Bias circuit– different Q-points.
24. Study of Voltage divider bias circuit– for different Q-points.
25. Study of single stage CE amplifier (frequency response and Bandwidth)
26. Study of two-stage RC-coupled CE amplifier –frequency response and Bandwidth.
27. Study of Series Resonance circuit – determination of its Resonant frequency, Bandwidth, Quality Factor
28. Study of Parallel Resonance circuits– determination of its, Resonant frequency, Bandwidth, Quality Factor
29. Construction and study of Hartley Oscillator using transistor.
30. Construction and study of Colpitts Oscillator using transistor.

I & II Sem

ELE-OE1.1: Domestic Equipment Maintenance
(Credits: Theory – 02, Demonstration Lab– 01) Total Teaching hours: 60

Unit-1 **15 Hours**

Geyser: Construction and working, parts and manufacturing process, types. Common faults and their troubleshooting: Dripping geyser overflow, overheating, steam or hot water escaping from overflow, water leaking through the ceiling, no hot water, water not hot enough, poor hot water pressure. Induction cooker: Construction and working, parts and manufacturing process, types.

Common faults and their troubleshooting: Cooker fuse blown, cooker buttons not working, cooktop shuts off while cooking, food not get cooked or heated properly, overheating and uneven heating, display keep flashing, weird noises–crackling, fan noise, humming sound, clicking.

Microwave Oven: Working, raw material and manufacturing process, types, Common faults and their troubleshooting: Microwave does not heat, runs then stops, buttons do not work, plate do not spin, bulb does not turn ON during operation, sparking inside, shuts OFF after few seconds

Unit – 2 **15 Hours**

Refrigerator: Working, raw material and manufacturing process, electrical wiring diagram, types of refrigerator. Common faults and their troubleshooting: fridge not cooling, fridge not defrosting, leaking water, freezing food light not working, freezer is cooled but fridge stays warm, dead refrigerator, not enough cooling, keeps running, leakage, makes noise. Replacement procedure for: seal (gasket), evaporator fan motor, PTC relay, thermostat, compressor, bulb.

Air Conditioner: Working, raw material and manufacturing process, electrical wiring diagram, types. Common Faults and their troubleshooting: Faults in following parts of AC: Filter, thermostat, refrigerant leaks, breakers, capacitors, compressor, evaporator coils, condenser coils, warm contactor. General faults :AC unit has an odour, shuts ON and OFF repeatedly, does not blow cold air, repeatedly tripping a circuit breaker, indoor unit is leaking water inside the room, outdoor unit is making an unusually loud sound, room is not getting cold enough, AC not turning ON.

Demonstration Experiments: **30 Hours**

1. Working of Air Conditioner
2. Working of Refrigerator
3. Working of Geyser
4. Working of Microwave Oven
5. Working of Induction Cooker

References:

1. Electronic instruments and systems: Principles, maintenance and troubleshooting by R. G. Gupta Tata McGraw Hill
2. Modern electronic equipment: Troubleshooting, repair and maintenance by Khandpur, Tata McGraw Hill
3. Electronic fault diagnosis by G. C. Loveday, A. H. Wheeler publishing

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Semester II

ELE-CT2: ANALOG AND DIGITAL ELECTRONICS

(Credits: Theory – 04, Practical – 02) **Total Teaching hours: 60**

Course Objectives

Upon completing the syllabus contents of ELE-CT2, the student will become familiar with various working principles of widely used electronic devices, linear and digital ICs which help the students to build small projects and also be able to answer some basic questions that appear in competitive examinations.

UNIT-1

10 HOURS

JFET–Types - p-channel and n-channel, Construction, working and I-V characteristics(n-Channel only). JFET-parameters and their relationships, Comparison of BJT and JFET.

MOSFET: E – MOSFET, D – MOSFET –(n-channel and p-channel) symbols, Construction, working drain and transfer characteristics, CMOS – inverter, circuit and working.

UJT - basic construction, working, equivalent circuit and I-V characteristics, intrinsic stand-off ratio, relaxation oscillator.

UNIT-2

15 HOURS

Op-Amp: Differential Amplifier, Operational Amplifier(Op-Amp)-Symbol, pin configuration. Block diagram of Op-Amp, characteristics of an Ideal Op-Amp. Op-Amp parameters-CMRR, Slew Rate and concept of Virtual Ground.

Applications of Op-Amp: Inverting and non-inverting amplifiers(DC input only), Summing and Difference Amplifier, Differentiator, Integrator, Comparator. Phase shift and Wein bridge oscillators,

Filters: First order active low pass, high pass and band pass filters.

IC 555Timer: Introduction, Pin configuration, Block diagram, Astable and Monostable multivibrator circuits. (Numerical Examples wherever applicable)

UNIT-3

15 HOURS

Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, Base conversions. Binary arithmetic: addition and subtraction. 1`s and 2`s complement of a number, subtraction by 2's complement method, Codes- BCD Code, Excess-3 Code and Gray code(binary to Gray and Gray to binary conversion). Representation of signed and unsigned numbers.

Logic Gates and Boolean algebra: Logic symbols and Truth Tables and of OR, AND, NOT, NOR, NAND, XOR, XNOR gates. Universal Gates, Laws and theorems of Boolean algebra. De Morgan's theorems. Simplification of Boolean expressions. Standard representation of logic functions (SOP and POS forms), Minimization Techniques (Karnaugh map minimization method up to 4 variables for SOP expressions).

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UNIT-4

Combinational Logic Analysis and Design: Arithmetic logic circuits: Half Adder, Full Adder, Half Subtractor, and Full Subtractor. 4-bit parallel binary adder, 2-bit magnitude comparator. Encoder, decimal to BCD encoder. Decoder, 2:4 decoder using AND gates, BCD to decimal decoder, BCD to 7-Segment decoder, Multiplexer – (4:1MUX) De-multiplexer –(1:4 DMUX) - logic diagram, working and truth table. **20 HOURS**

Sequential Logic Circuits: Flip-Flops – SR, D-flip flop, JK Flip-Flops. Preset and Clear operations. Race- around conditions in JK Flip-Flop. Master- Slave JK and T Flip-Flops

Registers and Counters: Types of Shift Registers, Serial-in-Serial-out, Serial-in- Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits) Asynchronous Counters: Logic diagram, working, Truth table and timing diagrams of 4 bit ripple counter,4-bit Up-Down counter. 4-bit Synchronous Counter. Design of Mod 3, Mod 5 and decade Counters.

Data converters: Digital to Analog converter- DAC with binary weighted resistor and R-2R ladder network. Analog to Digital converter: Successive approximation method

Logic Families: Characteristics of TTL and CMOS logic families.

Course Outcomes

At the end of this course, students will be able to

- Reproduce the I-V characteristics of various MOSFET devices,
- Apply standard device models to explain/calculate critical internal parameters of semiconductor devices.
- Perform experiments for studying the behavior of semiconductor devices.
- Calculate various device parameters' values from their I-V characteristics.
- Interpret the experimental data for better understanding the device behaviour.
- Understand and represent numbers in powers of base and converting one from the other, carry out simple arithmetic operations.
- Understand the basic knowledge of Digital system building blocks, effectively can construct simple digital designs with the knowledge of Boolean algebra.
- Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions
- Analyze combinatorial and sequential circuits

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Reference Books:

(1) Electronic devices and circuit theory by Boylestad, Robert Nashelsky

(2) Electronic Devices Conventional Current Version by Thomas L. Floyd

(3) David A. Bell " Electronic Devices and Circuits", 5th Edition, Oxford Uni.Press, 2015

(4) OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn, 2000, Prentice Hall

(5) Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011,Oxford University Press.

(6) R.S.Sedha, "A Text book of Applied Electronics", 7th edition.,S.Chand andCompany Ltd. 2011

(7) Thomas L. Floyd, Digital Fundamentals, Pearson Education Asia (1994)

(8) Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7thEd., 2011, Tata McGraw

(9) Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHILearning Pvt. Ltd.

(10) Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

(11) Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer,2001, PHI Learning.

(12) R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)

(13) Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill

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ELE-CP2: ANALOG AND DIGITAL ELECTRONICS - Lab

(Hardware/Circuit Simulation Software)

PART A (Any SIX)

1. Study of JFET/MOSFET characteristics – determination of parameters.
2. Study of single stage JFET amplifier.(frequency response and band width)
3. UJT characteristics
4. UJT relaxation oscillator
5. Design of inverting and non-inverting amplifier using Op-amp(DC input /different loads)
6. Frequency response of Inverting Op-Amp
7. Frequency response of Non-Inverting Op-Amp
8. Op-amp adder(Two inputs only)
9. Op-Amp subtractor
10. Study Op-Amp comparator.
11. Op-Amp differentiator
12. Op-Amp integrator
13. Wien bridge oscillator using op-amp.
14. RC phase shift oscillator using op-amp.
15. First order low-pass filter using op-amp.
16. First order High-pass filter using op-amp.
17. Astable multivibrator using IC555 timer.
18. Monostable multivibrator using IC555 timer.

PART B (Any SIX)

1. Design of Combinational logic system for specified Boolean Express and verification of its truth table
2. Verification of truth tables of OR, AND, NOT gates using ICs
3. Verification of truth table of NAND,NOR, XOR and XNOR gates using ICs.
4. NAND gate as Universal gate (OR,AND and NOT gates)
5. NOR gate as Universal gate (OR,AND and NOT gates)
6. Verification of De Morgan' Theorems
7. Binary to Gray and Gray to Binary conversion(3 or 4 bit nos)
8. Half Adder and Half Subtractor
9. Full Adder using and Full Subtractor
10. 4 bit parallel binary adder.
11. Construction and truth table verification of Decoder using IC74138
12. Study of BCD to decimal decoder using IC7447
13. Study of the Encoders Using ICs.
14. Study of Multiplexer using ICs
15. Study of Demultiplexer using ICs.

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16. Study of 2-bit magnitude comparators using IC7485.
21. Study of RS Flip-flop
22. Study of D and JK Flip-Flops using NAND gates/ICs
23. Study of 4-bit parallel binary counter (Counts observation in LEDs)
24. Study of 4-bit Shift Register – SISO, modification to ring counter using IC 7495.
25. Digital to Analog converter using binary weighted resistor/R-2R method.

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ELE-OE2.1: Consumer Electronics

(Credits: Theory – 02, Demonstration Lab– 01)Total Teaching hours: 60

Unit – 1

10 Hours

Audio Systems: PA system, Microphones, Amplifier, Loudspeakers, Radio Receivers, AM/FM, Audio Recording, and reproduction, Cassettes, CD and MP3.

Unit – 2

10 Hours

TV and Video Systems: Television standards, BW/Colour, CRT/HDTV, video system, VCR/VCD/DVD players, MP4 players, set top box, CATV and Dish TV, LCD, Plasma and LED TV, Projectors: DLP, Home Theatres, Remote controls.

Unit – 3

10 Hours

Landline and Mobile Telephony: Basic landline equipment, CL1, cordless intercom/EPABX system, mobile phones: GPRS and Bluetooth, GPS Navigation system, smart phones, Office Equipment: Scanners, Barcode / flat bed, printers, Xerox, Multifunction units (Print, Scan, fax, and copy)

Unit – 4

10 Hours

Electronic gadgets and Domestic Appliances: Digital Clock, Digital Camera, Handicam, Home security system, CCTV, Air conditioners, Refrigerators, washing machine / Dish washer, Microwave oven, Vacuum cleaners.

Suggested Books:

1. R.P.Bali, Consumer Electronics, Pearson Education (2008)
2. R.G. Gupta, Audio and Video systems, Tata McGraw Hill (2004)

Consumer Electronics Lab:

20 Hours

1. Study of PA systems for various situations – Public gathering, Closed theatre /Auditorium, Conference room, Prepare bill of material (Costing)
2. Installation of Audio/Video systems – site preparation, electrical requirements,cables and connectors
3. Market survey of products (at least one from each module)
4. Identification of block and tracing the system, Assembly and Disassembly of system using toolkit.

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ELECTRONICS-SECT-1.1: BASIC ELECTRONICS SKILLS

(Credits: 02)

Theory: 30 Lectures

The aim of this course is to enable the students to know different analog electronics components and their applications in electronic appliances through hands-on mode

UNIT-I: Semiconductor Physics: Classification of materials as Conductors, Insulators and Semiconductors-Definitions and Energy band diagrams. Types of semiconductor- Intrinsic and extrinsic. Doping. Trivalent and penta-valent impurities-examples.Formation of n and p type semiconductors.

(10 Lectures)

UNIT-II: P-N Junction Diode and BJT: formation, symbol of pn junction p-n junction under forward and reverse bias. V-I characteristics of p-n junction (Qualitative only). Zener diode-Definition and symbol. V-I Characteristics(Qualitative).

Bi-junction Transistor: Definition, terminals, types and their symbols. Working (npn transistor only). Transistor as a electronic switch.

(10 Lectures)

UNIT-III: Semiconductor Devices and Applications: P-N junction diode-as rectifier (HWR, FWR: centre tapped & Bridge rectifier), diode as a switch. Zener diode as voltage regulator (Qualitative). **Power supply:** Shunt capacitance filter, LC and CLC filter (Qualitative only).Block diagram of dc regulated power supply.

(10 Lectures)

PRACTICAL-SECP:1.1 BASIC ELECTRONICS SKILLS

(Credits: 01)

30Hours

(At Least 06 Experiments must be conducted from the following)

1. V-I Characteristics of p-n junction diode
2. V-I Characteristics of Zener diode (Reverse bias only)
3. Half wave rectifier with and without filter.
4. Centre tapped full wave rectifier with and without filter
5. Bridge rectifier with and without filter
6. P-N junction diode as switch
7. Zener diode as voltage regulator
8. Transistor as ON-OFF switch.
9. Design of dc regulated power supply

ELECTRONICS-SEC T-2.1 : DIGITAL ELECTRONICS SKILLS

(Credits: 02)

Theory: 30 Lectures

The aim of this course is to enable the students to know different digital electronics principles and their applications in electronic appliances through hands-on mode

UNIT-I Number system: Introduction, decimal, binary, octal and hexadecimal numbers. Inter conversions. Binary arithmetic: addition, subtraction, multiplication and division of binary numbers.1's and 2' complement of a number. subtraction of binary numbers by 1's and 2' complement method. Hexa-decimal arithmetic (Addition & Subtraction).

Codes: Gray code and Excess-3 codes-simple examples

(14 Lectures)

UNIT-II Boolean Algebra: Laws of Boolean algebra, simple Boolean identities, De Morgan's Theorems.

(04 Lectures)

UNIT-III Digital building blocks: Logic gates definition, AND, OR, NOT, NAND,NOR ,XOR and XNOR gates-symbols and truth tables: Mention the IC Nos). Universal logic gates, NAND and NOR as Universal logic gate. OR and AND gates using diodes, NOT gate using transistor.

Arithmetic Circuits: Half adder, full adder, half subtractor, full subtractor

(12 Lectures)

Text Books:

1. Digital Fundamental, Floyd, CBS Publication (Unit-I).
2. Digital Principles & Applications: Malvino & Leach- TMH 3rd Edition

Reference Books:

1. Modern digital Electronics, RP Jain, TMH Publication, 2nd Edition.
2. Digital Logic& Computer Design: M. Morris Mano-PHI, New Edition.
3. Digital Systems- Principles & Applications, Ronald J Tocci, -III, 9th Edition, Pearson Education (Unit II-VI).
4. igital Computer Electronics: Malvino- III edition, TMH, New Delhi.
5. gital Computer Fundamentals: Thomas C Bartee-IV edition, TMH.
6. periments in Digital Principles: Malvino & Leach-V edition TMH.

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PRACTICAL-SECP:2.1 *DIGITAL ELECTRONICS SKILLS*

(Credits-01) **30 Hours**

(At Least 06 Experiments must be conducted from the following)

1. Construction and Verification of truth table of diode OR , gate.
2. Construction and Verification of truth table of diode AND gate.
3. Construction andVerification of truth table of NOT gate using transistor.
4. Verification of truth tables of OR , AND and NOT gates using ICs.
5. Verification of truth tables of NAND and NOR gates using ICs.
6. Verification of truth tables of XOR and XNOR gates using ICs.
7. Construction and verification of truth tables of OR , AND and NOT gates using NAND gate (IC 7400)
8. Construction and verification of truth tables of OR , AND and NOT gates using NOR gate (IC 7402)
9. Study of De Morgan's Theorems.
10. Realization and Verification of Boolean expression using ICs.
11. Construction and Verification of truth table of Half adder
12. Construction and Verification of truth table of full adder
13. Construction and Verification of truth table of Half Subtractor
14. Construction and Verification of truth table of Full subtractor.

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The UG BOS Meeting was held on 09.11.2022 in the Department of Electronics, Government College (Autonomous),Kalaburgi. The following members were present in the meeting.

S.No	Name of the BOS member	Designation in the BOS	Signature
13.	Dr. Nagraj Kulkarni	Chairman	
14.	Prof. Dr. S.N Mulgi	University Nominee	
15.	Dr. H.K Manjunathreddy	Member	
16.	Smt. Shaheen Fatima	Member	
17.	Dr. Syeda Rafath Ara	Member	
18.	Sri Srinivas Ramacharya	Member	
19.	Dr. Rekha J Annigeri	Member	
20.	Dr. R.B Konda	External Member	
21.	Sri. Y.N Ravindra	External Member	
22.	Sri. R.L Alawandi	External Member(Alumni)	
23.	Sri Shivakumar Kalaburgi	External Member	

The BOS Regulations:

1. The UG BOS meeting is conducted in the department of Electronics on 09.11.2022 As per the guidelines given by the Dean UG section Government College (Autonomous),Kalaburgi.
2. The B.Sc Syllabus for B.Sc III and IV semester has been prepared by referring the Electronics syllabus submitted by state level syllabus committee NEP-2020. The existing syllabus is partially modified within 20% in order to implement the Syllabus effectively.
3. If any suitable or modifications need to be incorporated, the Chairman BOS has authorized to do so.
4. The Question paper model (Note-If the examination branch/College prepares common Question paper model it will be followed) and the List Examiners in the Electronics subject is Prepared to carry out the confidential work of the course.
5. The meeting is ended with thanks by the Chairman to all the internal, external and University members and also who are directly or indirectly helped in preparing the syllabus and participated in the meeting through online/offline mode.

Paper Code :- 333171

ame	BSc in Electronics	Semester	Third Semester
Course Title	Programming in C and Digital Design using Verilog (Theory)		
Course Code:	ELE CT3.1	No. of Credits	4
Contact hours	60 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Objectives: After the successful completion of the course, the student will be able to:

- The ability to code and simulate any digital function in Verilog HDL.
- Know the difference between synthesizable and non-synthesizable code.
- Understand library modelling, behavioural code and the differences between simulator algorithms and logic verification using Verilog simulation.
- Learn good coding techniques required for current industrial practices.
- Gain the knowledge of programming the system using C programming language.

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO 1. Apply the acquired knowledge of digital circuits in different levels of modelling using Verilog HDL.
CO2. Apply the acquired knowledge of digital circuits in different levels of modelling using Verilog HDL.
CO3. Design and verify the functionality of digital circuit/system using testbenches.
CO4. Develop the programs more effectively using directives, Verilog tasks and constructs.
CO5. Design and analyse algorithms for solving simple problems.
CO6. Write and execute and debug C codes for solving problems.

Contents	
nit–1:	60Hrs
	15 Hrs

Programming: Introduction, Importance of C, Character set, Tokens, keywords, identifier, constants, ic data types, variables: declaration & assigning values. Structure of C program

ithmetic operators, relational operators, logical operators, assignment operators, increment and crement operators, conditional operators, bitwise operators, expressions and evaluation of expressions, e cast operator, implicit conversions, precedence of operators.

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Arrays: Basics of arrays, declaration, accessing elements, storing elements, two-dimensional and multi-dimensional arrays. Input output statement – sprintf(), scanf() and getch(), and library functions (math and string related functions).

Unit -2: 15 Hrs

Decision making, branching, and looping: if, if-else, else-if, switch statement, break, for loop, while loop and do loop.

Functions: Defining functions, function arguments and passing, returning values from functions, example programs.

Pointers: Pointer declaration, assigning values to pointers, pointer arithmetic, array names used as pointers, pointers used as arrays.

Structures: Structure type declarations, structure declarations, referencing structure members, referencing whole structures, initialization of structures, structure bit fields.

Unit -3: 15 Hrs

Overview of Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL flow, Trends in HDLs.

Hierarchical Modelling Concepts: Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block, Lexical conventions. Data types, system tasks, compiler directives.

Modules and Ports: Module definition, port declaration, connecting ports, hierarchical name referencing.

Gate-Level Modelling: Modelling using basic Verilog gate primitives, Description of and/or and buf/not ype gates, Rise, fall and turn-off delays, min, max, and typical delays. Combinational logic circuit design sing Gate level modelling

nit -4: 15 Hrs

ataflow Modelling: Continuous assignments, delay specification, expressions, operators, operands, erator types.

havioral Modelling: Structured procedures, initial and always, blocking and non-blocking statements. lay control, generate statement, event control, conditional statements, Multiway branching, loops, uential and parallel blocks.

ks and functions: Differences between tasks and functions, declaration, invocation, automatic tasks unctions. Combinational and sequential logic circuit design using all three modelling

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References	
1	Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis," 2nd Edition, Prentice Hall PTR, 2006.
2	E. Balagurusamy, "Programming in ANSI C", 4th Edition, Tata McGraw-Hill, 2008.
3	Donald E. Thomas, Philip R. Moorby, "The Verilog Hardware Description Language", 5th Edition, Springer, 2002.
4	Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", 2nd Edition, Pearson Education, 2010.
5	Padmanabhan, Tripura Sundari, "Design through Verilog HDL", Wiley Eastern, 2016.
6	Nazeih M. Botors, "HDL Programming VHDL and Verilog ", 1st Edition, Dreamtech Publication, New Delhi, 2006.
7	Yashavant P. Kanetkar, "Let us C", 18th Edition, BPB Publications, 2021.
8	T Jeyapoovan, "A First Course in Programming with C," Vikas Publishing Pvt LTD, 2004.
9	Kevin Skahill, "VHDL for Programmable Logic,"Pearson Education, 2006.
10	Cyril P R, "Fundamentals of HDL Design," Pearson, 2010.

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Program Name	BSc in Electronics	Semester	Third Semester
Course Title	Programming in C and Digital Design using Verilog (Practical)		
Course Code:	ELE CP5.1	No. of Credits	2
Formative Assessment Marks	25	Summative Assessment Marks	25
Note: Minimum of 10 programmes to be written and executed in each section			

Part -A: Programming in C Laboratory

Write and execute C Program to

1. Program to find the Area of Square
2. Program to find the addition of two numbers
3. Program to find the subtraction of two numbers
4. Program to find the multiplication of two numbers
5. Program to find the division of two numbers
6. Program to find the Area of Rectangle
7. Program to find the Area of Circle
8. Find the area and circumference of a circle
9. Program to find the largest of two numbers
10. Program to find the smallest of two numbers
11. and smallest elements in a series
12. Program to find the factorial of a given number
13. Check the prime number in a series
14. Find the roots of quadratic equation
15. Find the gross salary of an employee
16. Remove all vowels from a string
17. Upper case and lower-case conversion and vice-versa
18. Reverse a string using library functions
19. Reverse a string without using library
20. Check whether the string is palindrome or not
21. Arrange the array in ascending and descending order using bubble sort
22. To perform arithmetic operations for a matrix
23. Display prime numbers between intervals 0 to 100

24. Find GCD of two numbers.

25. Program to find whether the given number is even or odd

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Part – B: Verilog HDL Laboratory

Write and execute Verilog code to realize

1. Realization of logic gates(AND,OR and NOT gates)
2. Realization of NAND Gate
3. Realization of NOR Gate
4. Realization of XOR Gate
5. Realization of XNOR Gate
6. Encoder without priority and with priority.
7. Multiplexer
8. De-multiplexer.
9. Two bit Comparator,
10. Code converters – Binary to Gray and vice versa.
11. Half adder and half subtractor
12. Full adder
13. 4-bit parallel adder and 4-bit ALU/8-bit ALU.
14. SR and D,
15. JK and T-flip-flops.
16. To realize counters: Up counter(Binary).
17. To realize counters: Down counter(Binary).
18. 4-bit Binary counter, BCD counters (Synchronous reset) and any arbitrary sequence counters.
19. 4-bit Binary counter, BCD counters (Asynchronous reset) and any arbitrary sequence counters.
20. Modelling of Universal shift registers.

Program Name	BSc in Electronics	Semester	Third Semester
Course Title	Application of Electronics-1 (Theory)	No. of Credits	3
Course Code:	ELE OE 3.2	Contact hours	45 Hours
Formative Assessment Marks	40	Summative Assessment Marks	60
OE Paper is to be offered for the Students other than Science stream			

Theory Contents	
Unit–1: Basic Electronics	12 Hrs
Introduction to circuit components- Resistors, capacitors, inductor, transformer, diode and transistor. Symbols. LED and LCD display, relay, fuse, switches, wires. AC and DC applications.	
Unit -2: Applied Electronics	13 Hrs
Electronic instruments: DMM, CRO, Biomedical instruments-ECG, EEG, pH meter, X-ray, sphygmomanometer, Glucometer, Digital thermometer. Sensor-OMR, MICR, Scanner, Barcode reader.	
Unit -3: Power Supplies	10 Hrs
Dc power supply, Rectifiers-principle, Types Inverter and UPS. Adopter and SMPS. Inverter and UPS. Mobile chargers.	
Unit -4: Electronic calculators	10 Hrs
Types, Functions of Basic calculators-block diagram, Keypad using, use of calculator.	

References

1	Basic Electronics-Solid State – B L Theraja - S Chand And Company Ltd
2	Electronic Devices And Circuit Theory – Robert L Boylestad And Louis Nashelsky (PHI)

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Paper code : 333172

Program Name	**BSc in Electronics**	Semester	**Fourth Semester**
Course Title	**Electronic Communication-I (Theory)**		
Course Code:	**ELE CT 4.1**	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Objectives:

- To understand the communication system, Principle and working communication system, means and medium of communication.
- To understand the Principle and working of different modulation techniques.
- Will be able to differentiate between analog and digital communication.
- To understand the Principle and working of Satellite and optical fibre communication.

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

CO1. Know the basic concept of Analog Communication, means and medium of communication.

CO2. Understand the principle of Analog and digital modulation.

CO3. Familiar with "AM" and "FM "techniques.

CO4. Understand the basic concept of Pulse Modulation, Carrier Modulation for digital transmission and able to construct simple pulse modulation.

CO5. Understand the basic concept of Satellite Communication

CO6. Understand the basic concept of Optical Fibre Communication

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Contents	**60Hrs**
Unit–1:	15 Hrs

Electronic communication: Introduction to communication –Block diagram of an electronic communication system. Electromagnetic communication spectrum, band designations and usage.. Concept of Noise, signal-to-noise (S/N) ratio.

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Propagation of "EM" Wave: Introduction, Ground Wave, Sky-wave and Space-wave propagation. Ionosphere and its effects.

Communication medium: Transmission lines, coaxial cables and wave guides (Qualitative only)

Antenna: Introduction, Antenna parameters, Dipole and Folded Dipole antenna Yagi-Uda antenna, Dish-antenna, Ferrite rod antenna, Working and applications only.

Unit -2:

15 Hrs

Analog Modulation: Need for modulation. Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation) and AM transmitter. Amplitude Demodulation (diode detector) AM Super heterodyne receiver. Concept of Single side band generation.

Frequency Modulation (FM), modulation index and frequency spectrum. Generation of FM using VCO, FM detector (slope detector).FM transmitter. Comparison between AM and FM. Phase Modulation (PM-Qualitative only),

Analog Pulse Modulation: Channel capacity, sampling theorem, Basic Principles- PAM, PWM, PPM, modulation and detection technique for PAM only.

Unit -3:

15 Hrs

Digital Pulse Modulation: Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques (Qualitative only).

Introduction to Communication and Navigation systems: Satellite Communication Introduction, geosynchronous satellite orbits, geostationary satellite and its advantages. Transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink.

Unit -4:

15 Hrs

Optical Fiber Communication: Optical Fibers: Structure, and wave guides. Basic optical laws and definitions, optical fiber types, Rays and modes. Signal degradation in optical fibers, attenuation, scattering losses, radiative losses, absorption losses, core and cladding losses, group delay, dispersion. Splices and Connectors. Block diagram of FOC system.

Optical sources: LEDs, structure, source materials, Laser diodes: Structures, threshold conditions, modal properties.

Optical Receiver Operations: Fundamental receiver operations, digital signal transmission, receiver noise, analog receivers.

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References	
1	Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
2	Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
3	Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
4	K.D Prasad, "Antenna and Wave Propagation", Satyaprakashan, New Delhi.
5	Sanjeev Gupta, "Electronic Communication Systems", Khanna Publishers, New Delhi.
6	Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
7	Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
8	Communication Systems, S. Haykin, 2006, Wiley India Electronic Communication system, Blake, Cengage, 5th edition.
9	Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press
10	Gerd Keiser, "Optical Fibre Communication ", McGraw Hill, 3rd Edn.

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Program Name	**BSc in Electronics**	Semester	**Fourth Semester**
Course Title	**Electronic Communication-I (Practical)**		
Course Code:	**ELE CP 4.1**	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Note: Minimum of 10 Experiments are to be performed using hardware.

List of Experiments

1. Construct amplitude modulator using transistor / I. C. Determination the modulation index.
2. Study of Squelch Circuit 1
3. Study of Blocking Oscillator 2
4. To study Pre and De Emphasis circuits 3
5. Construct AGC circuit for AM detector and trace the response curve 4
6. Frequency response of Loud Speaker 5
7. Construct frequency modulator circuit – determine the modulation index.
8. "AM" Liner Diode detector- trace the input and output waveforms.
9. Frequency response of Crossover Network 6
10. Study of Twin –T network 7
11. Frequency mixer circuit – Verify output frequency for different input frequencies.
12. "FM" Detector – Plot the frequency response curve.
13. Study of Balanced demodulator
14. Study of IF amplifier circuit.
15. Pulse amplitude modulation (PAM) – trace the output waveforms.
16. Pulse width modulation (PWM) – trace the output waveforms.
17. Pulse position modulation (PPM) – trace the output waveforms.
18. Characteristics of LED 8
19. Characteristics of Photodiode 9
20. Study of Numerical aperture
21. Study of OFC losses.
22. Setting up simple OFC Link.

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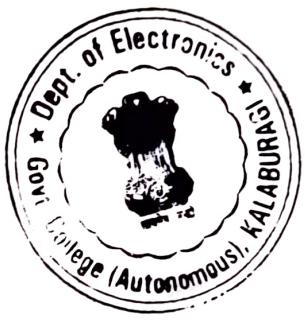
23. Study of Amplitude Shift Keying(ASK) – trace the output waveforms

24. Study of Frequency Shift Keying(FSK) – trace the output waveforms

25. Study of Phase Shift Keying(PSK) – trace the output waveforms



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Semester V Paper code: 336171

Program Name	**BSc in Electronics**	Semester	**Fifth Semester**
Course Title	**Communication -II**		
Course Code:	DSC-ELE51	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Objectives:

- To understand the various microwave devices and their working
- To understand the Principle and working of different RADAR Systems.
- To understand principle and working of different digital modulation techniques.
- To understand the Principle and working of Cellular communication and different wireless techniques.

Course Outcomes:

- Know the various microwave devices, their working and applications.
- Understand the principle and working of different RADAR Systems.
- Familiar with ASK, FSK, PSK, BPSK, QPSK Digital modulation techniques.
- Understand the basic concept of cell phone hand set, working principle of cellular communication and wireless technologies.

Contents	**60Hrs**
Unit 1	15 Hrs

Microwave devices for Communication: RF/Microwaves, EM spectrum, Wavelength and frequency, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators, GUNN diode, READ diode, IMPATT diode, BARITT diode, PIN diodes, Schottky barrier diodes, Multicavity Klystron, Magnetron, block diagram of Microwave communication and working, Applications.

Unit 2	15 Hrs

RADAR Communication Systems: RADAR principles, frequencies and powers used in RADAR, maximum Unambiguous range, detailed block diagram of pulsed RADAR system, RADAR range equation-derivation, factors influencing maximum range, effect of ground on RADAR antenna characteristics, doppler effect, expression for Doppler frequency. MTI RADAR-block diagram, working, CW RADAR-block diagram, working, advantages, applications and limitations, FM CW RADAR-block diagram, numerical examples wherever applicable

Unit 3	15 Hrs

Digital communication: Block diagram of digital transmission and reception, Bit Rate, Baud Rate Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK).Advantage and

disadvantages of digital transmission, characteristics of data transmission circuits – Shannon limit for information capacity, bandwidth requirements, data transmission speed, noise, cross talk, echo suppressors, distortion and equalizer, MODEM– modes, classification.	
Unit 4	15 Hrs
Cellular Communication and Wireless LANs: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, Multiplexing, FDMA, CDMA, TDMA, OFDMA, GSM .Wireless LAN requirements- Bluetooth, Wi-Fi, MIMO, LTE and 5G technology. Comparative study of GSM and CDMA, simplified block diagram of cellular phone handset, Major components of local area network-Primary characteristics of Ethernet-mobile IP, OSI model.	

Reference Books	
1	D Roddy and J. Collen, "Electronics communications", 4th edition, PHI, 2008
2	B. P. Lathi and Zhi Ding, "Modern Digital and Analog communication Systems", Oxford University Press, 4th Edition, 2010
3	Bernard Skla 'Digital Communications: Fundamentals and Applications, Pearson Education, 2nd edition, 2009.
4	David Tse, Pramod Viswanath 'Fundamentals of Wireless Communication', Cambridge University Press,1st edition, 2005
5	Wayne Tomasi "Advanced Electronic Communication systems", - 6th edition, Low priced edition- Pearson education
6	Wayne Tomasi –"Electronic Communication systems, Fundamentals through Advanced", Vth edition.
7	Kennedy & Davis "Electronic Communication systems" , IVth edition-TATA McGraw Hill.

Program Name	BSc in Electronics	Semester	Fifth Semester
Course Title	Communication-II Practicals		
Course Code	DSC-ELE51P	No. of Credits	2
Formative Assessment Marks	25	Summative Assessment Marks	25
Note: Minimum of 8 Experiments from Part A and 4 Experiments from Part B			

Part - A

1. Study of ASK generation and Detection — 03
2. Study of FSK generation and Detection — 03
3. Study of PSK generation and Detection — 03
4. Study of Time Division Multiplexing and Demultiplexing
5. Study of Frequency Multiplier.
6. QPSK modulator and demodulator
7. Determination of V-I Characteristics curve of a Gunn Diode
8. Study of notch filter. (Twin-T-[illegible]) — 03
9. Class C tuned amplifier — 03
10. Study of Switched mode regulator using PWM.

Part- B

Simulation Experiments using MATLAB/SCILAB

1. Simulate NRZ, RZ, half-sinusoid and raised cosine pulses and generate eye diagram for binary polar signalling.
2. Pulse code modulation and demodulation system.
3. Computations of the Probability of bit error for coherent binary ASK, FSK and PSK for an AWGN Channel and compare them with their Performance curves.
4. DPSK Transmitter and receiver
5. QPSK Transmitter and Receiver.

Paper Code : 336172

Program Name	**BSc in Electronics**	Semester	**Fifth Semester**
Course Title	**Embedded Controllers**		
Course Code:	DSC-ELE52	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Objectives:

- To know the importance of microcontrollers and its applications
- Understand the basics of Embedded Systems hardware and software concepts.
- Acquire knowledge about 8051 and PIC Microcontrollers and its peripherals.

Course Outcomes:

- Identify and understand function of different blocks of 8051 microcontrollers.
- Develop program for I/O port operations, Timers, Serial port and Interrupts using C.
- Gain the knowledge to interface LCD, Keyboard, ADC, DAC, DC motor, etc.
- Design and develop small scale embedded systems.

Contents	**60Hrs**
Unit 1	15 Hrs

Introduction: Embedded Systems, Examples of Embedded Systems, Design Parameters of Embedded Systems, Microcontrollers, Memory: Information Storage Device, Read Only Memory, Random Access Memory, Aligned and Unaligned Memory Accesses, The Microprocessor, Microprocessor Architecture Classification, Instruction Set Architecture, Memory Interface-Based Architecture Classification, Performance Comparison of Different Architectures, Software System and Development Tools, Software Sub-Systems, Software Development Tools, Debugging Tools and Techniques, Manual Methods, Software-Only Methods, Software-Hardware Debugging Tools.

Unit 2	15 Hrs

8051 Microcontroller: Architecture-Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing. Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to use these instructions. 8051 Stack. Stack and Subroutine instructions. Assembly language program examples on subroutine and

involving loops.	
Unit 3	15 Hrs
8051 Microcontroller Hardware Programming in C:Data types and time delays, I/O Programming, Timer Programming, Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, UASRT Serial port programming, Interrupt programming, Keyboard and LCD Interfacing, ADC, DAC interfacing, Using Flash and EEPROM memories for data storage, Stepper motor and DC motor interfacing.	
Unit 4	15 Hrs
PIC18 Microcontrollers: Overview of the PIC18 Family, Architecture and features of 18F458, Status register, Data memory and Special Function Registers, Data memory map, Access RAM, Indirect addressing and accessing tables in data memory, Program memory, Program memory map, Program Counter , Configuration registers, Stacks, Automatic Stack operations, Programmer access to the Stack, Fast Register Stack, Interrupts, Context saving with interrupts, Power supply and reset, Power supply, Power-up and Reset, Oscillator sources. Clock source switching, Parallel Ports, Parallel Slave Port, Watchdog Timer, Capture/Compare/PWM (CCP) Modules, MSSP Serial Port, Low-Voltage Detect, Nano-watt technology, Enhanced Peripherals.	

Reference Books	
1.	Muhammad Tahir and KashifJaved, "ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing," 1st Edition, CRC Press, 2017.
2.	Kenneth J. Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson/Cengage Learning, 1997
3.	Muhammad Ali Mazidi and Janice Gillespie and Rollin D, "The 8051 Microcontroller and Embedded Systems using assembly and C,"1st Edition, Pearson, 2006.
4.	Tim Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers: Principles and applications", First Edition, Elsevier, 2007.
5.	Muhammad Ali Mazidi and Rolin D, Mckinlay, "PIC Microcontroller and Embedded Systems using assembly and C for PIC18," 1stEdition, Pearson, 2008.
6.	John Pitman, "Design with PIC Microcontrollers," 1st Edition,Prentice Hall, 1997.

Program Name	BSc in Electronics	Semester	Fifth Semester
Course Title	Embedded Controllers Practicals		
Course Code	DSC-ELE52P	No. of Credits	2
Formative Assessment Marks	25	Summative Assessment Marks	25
Note: Minimum of 8 Experiments from Part A and any 4 either using 8051 or PIC from Part B			

Part -A

Conduct the experiments by writing C programs using KeiluVision IDE for 8051

1. To read 10 data from port P0 and store in internal RAM.
2. Find the square of a numbers (1to10) using look-up table
3. To read data from port P0 and send the data to P1 if it is even else send to P2 repeatedly.
4. To read data from port P0 convert it to decimal and send to P1 and P2 repeatedly.
5. To toggle P0 bit for every 500ms continuously use TIMER 0 to generate time delay.
6. To read switch status connected to P1.0 if switch is on, turn on LED connected P2.0 on or ifswitc is off, turn off LED.
7. To read switch status connected to P1.0 if switch is on set P2.0 on or if switch is off set P2.0off.
8. To stop/start toggling of LED connected to P0, when there is an external hardware interrupt.
9. To control traffic lights interface.
10. To transmit data "Hello Computer" to PC and receive data "Hi Microcontroller", from PC using USART Serial port.

Part – B

Using and Keil vision IDE for 8051

1. To rotate stepper motor clockwise 180^0.
2. To display numbers from 0 to F on seven segment display.
3. To display text "Electronics" on 16x2 LCD display.
4. To put a main function at ROM address 0x100 and data "HELLO" at ROM address 0x200.
5. To convert analog data to digital using ADC.

Using MP Lab IDE for PIC

1. To monitor nit PC5, if it is High send 55H to PORT B; otherwise send AA to Port D
2. To convert Packed BCD ox29 ASCII and display The bytes on PORTB and PORTC
3. To send out the vale 44H serially one bit at a time via RC0, the LSB should go out first.
4. To convert analog signal to digital from external ADC and display the result on P2(any unused)p
5. To control DC motor interfacing.

Semester VI

Program Name	BSc in Electronics	Semester	Sixth Semester
Course Title	Signals and Systems		
Course Code:	DSC-ELE61	No. of Credits	4
Contact hours	60 Hours	Duration of SEA/Exam	2 Hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Objectives:

- Gain the knowledge on Signals and Systems
- Understand the operations on Signals
- Know the frequency domain representation of signals
- Know the Laplace Transform and its properties

Course Outcomes:

- Distinguish between continuous-time and discrete-time signals and systems
- Do basic operations on signals
- Apply Laplace transform technique
- Find DTFS and IDTFS of the Signals

Contents	60Hrs
Unit 1	15 Hrs

Introduction to continuous-time and discrete-time signals: Understanding signals and systems, some real-world examples of signals and systems.mathematical and graphical representation of signals, Classification of signals: 1- and 2-D, continuous and discrete, periodic and non-periodic, symmetries (even-odd) etc., related problems to enhance understanding of different signal types, elementary signals – unit impulse, unit step, exponential and sinusoidal signals. Introduction to continuous-time and discrete-time systems, examples of systems, interconnections of systems, Properties of systems: Linear, Non-linear, time variance-invariance, causal-noncausal, memory-memoryless systems, feed-back in systems, stability, inverse systems.

Unit 2	15 Hrs

Operations on signals: amplitude scaling, shifting, folding, time scaling, addition of two signals etc., Time-domain representation of systems, Linear time-invariant systems, Convolution integral and convolution sum, impulse and step response of systems, differential equation representation of LTI systems, properties and stability of LTI systems, solving differential equations.

Unit 3	15 Hrs

Frequency domain representation of systems, magnitude and phase spectrum, Introduction to transforms, need for transforms.Laplace transforms, unilateral Laplace transforms, Properties, Inverse Laplace transforms,application of Laplace transforms for analysis of systems, solving differential equations, stability analysis of systems.

Unit 4	15 Hrs
Continuous-time Fourier series representation of periodic signals, convergence of Fourier series representation, properties of continuous-time Fourier series and problems Discrete-time Fourier Series properties of discrete-time Fourier series and problems IDFS.	

Reference Books	
1	Alan V Oppenheim, Alan s. Willsky and Hamid Nawab, "Signals and systems", Pearson edition Asia/PHI, 2nd Edition, 2002.
2	Simon Haykin and Barry Van Veen, "Signals & Systems," Wiley, 2nd Edition, 2021.
3	M J Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB,", TMG,
	Vinay Ingle, and John G. Proakias, "Digital Image Processing using MATLAB,"

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**Signals and Systems Practicals**		
Course Code	DSC-ELE61P	No. of Credits	2
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**
Note: Minimum of 10 programmes to be written and executed.			

Write and execute following program using MATLAB/OCTAVE/SCILAB, etc.

1. Generate and plot unit sample, unit step, ramp, real sequences
2. Generate and plot sinusoidal, cosinusoidal and periodic sequences
3. Generate even & odd components of a sequence
4. Perform amplitude scaling, time scaling, folding and time-shifting operations on signals
5. Perform Upsampling and downsampling operation on a given sequence
6. Perform addition, subtraction and multiplication operation on signals
7. Find the linear convolution of two finite duration sequences.
8. Find the cross-correlation of two finite duration sequences
9. Evaluate & plot auto-correlation of a sequence
10. Compute the DTFS of a sequence and plot the magnitude and phase response
11. Compute the IDTFS of a sequence
12. Verify the sampling theorem

Program Name	BSc in Electronics		Semester	Sixth Semester
Course Title	Internet of Things			
Course Code:	DSC-ELE63		No. of Credits	4
Contact hours	60 Hours		Duration of SEA/Exam	2 Hours
Formative Assessment Marks		40	Summative Assessment Marks	60

Course Objectives:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.
- Acquire practical skills in designing and implementing IoT applications.
- Develop an understanding of IoT security and privacy considerations.

Course Outcomes:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.
- Acquire practical skills in designing and implementing IoT applications.
- Develop an understanding of IoT security and privacy considerations.

Contents	60Hrs
Unit 1	15 Hrs
Definition and evolution of the Internet of Things.IoT architecture and components.IoT communication protocols: MQTT, CoAP, HTTP.IoT application domains and use cases.	
Unit 2	15 Hrs
Overview of IoT devices: microcontrollers, sensors, actuators.Types and characteristics of sensors used in IoT applications. Interfacing sensors with microcontrollers. Data acquisition and sensor fusion techniques.	
Unit 3	15 Hrs
Wireless communication technologies for IoT: Wi-Fi, Bluetooth, Zigbee, LoRaWAN, etc.IoT network topologies: star, mesh, and hybrid networks.oT data management and storage.IoT protocols for device-to-device and device-to-cloud communication.	
Unit 4	15 Hrs
IoT application development platforms and frameworks.Design and implementation of IoTapplications.IoT security challenges and solutions.Privacy and ethical considerations in IoT.	

Reference Books	
1	Internet of Things: Principles and Paradigms by RajkumarBuyya, Amir VahidDastjerdi, Anton Y. Dongarra.
2	Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry by MaciejKranz.
3	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet Things by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, and Robert Barton.
4	Internet of Things with Arduino Cookbook" by Marco Schwartz
5	Arduino Home Automation Projects" by Marco Schwartz and Oliver Manickum