Faculty of Science and Technology

PRATAP COLLEGE, AMALNER (AUTONOMOUS)

Affiliated to Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon

Syllabus

For

F. Y. B.Sc. (Electronics)

(*As per NEP*)

(With effect from June 2023)

Program Objectives

The overall Objectives of the B.Sc. (Degree) / B.Sc. (Honors) Electronics program are:

To provide students with learning experiences that develop broad knowledge and understanding of key concepts of electronics and equip students with advanced Scientific/ technological capabilities for analyzing and tackling the issues and problems
in the field of electronics.

B.Sc. (Degree & Hon) Electronics Curriculum – NEP 2021-22

- Develop ability in students to apply knowledge and skills they have acquired to solve specific theoretical and applied problems in electronics.
- Develop abilities in students to design and develop innovative solutions for benefits of society.
- Provide students with skills that enable them to get employment in industries or Pursue higher studies or research assignments or turn as entrepreneurs.

Program Outcome

- Aptitude to apply Logic thinking and Basic Science knowledge for problem solving in various fields of electronics both in industries and research.
- To acquire experimental skills, analyzing the results and interpret data.
- Ability to design / develop/manage/ operation and maintenance of sophisticated electronic gadgets / systems / processes that conforms to a given specification within ethical and economic constraints.
- Capacity to identify and implementation of the formulate to solve the electronic related issues and analyze the problems in various sub disciplines of electronics.
- Capability to use the Modern Tools/Techniques.

Board of Studies (Electronics),
Pratap College, Amalner
(Autonomous)

Pratap College, Amalner (Autonomous)

Syllabus of F. Y. B. Sc. Electronics

Semester I

ELECTRONICS-DSC 1, DSC 2
(Credits: Theory-02)
DSC 3
(Credits: Practicals-02)

Course description:

This course is aimed at introducing the fundamentals of Electronics, Network Theorems Electronic Devices to Under Graduate students and provides them practical exposure.

Course objectives:

1. To impart knowledge of basic concepts in Electronics.
2. To provide the knowledge and methodology necessary for building electronics circuits.
3. To provide exposure of linear and digital electronics circuits.
4. To have practical exposure of electronic circuits.
5. To predict the behavior and characteristics of electronics devices and circuits using simulation tools.

Course outcome:

Learner will be able to ….

1. Apply knowledge to develop circuits using electronic devices.
2. Apply the concept and knowledge of electronics devices to real life problems.
3. Simulate complex circuits and understand the behavior of the systems.
4. Understand and analyze, linear and digital electronic circuits.
5. Review, prepare and present technological developments.

Major Subjects Sem I

DSC 1 - ELE-111 N: Analog Electronics I (30 clock hour)

Unit 1: Basic Circuit Components

Resistors: Introduction of resistor, Resistive circuits: Series circuit, characteristics of series circuit, series voltage divider, open and short in series circuit, Parallel circuit, laws of parallel circuit, open and short in parallel circuit, series-parallel circuits

Inductors: Self and mutual inductance, Inductance in series and parallel

Capacitors: Principles of capacitance, capacitors in series and parallel

Transformers –Step-up and Step-down Transformers, Turn-Ratio, Voltage and Current Ratio. Types of Transformer (introduction only)

Relays and Switches- Electromagnetic Relay, Relay as Switch, Concept of Pole and Throw, Types of Switches – SPST, SPDT, DPST and DPDT. **(8 hour, 16 Marks)**

Unit 2: Circuit Analysis

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Star and Delta networks, Star-Delta Conversion. Problems based on KCL, KVL and Problem on Star-Delta conversion. **(7 hour, 14 Marks)**

Unit 3: Network Theorems

Principal of Duality. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem. Problems based on these theorems. **(7 Hour 14 Marks)**

Unit 4: AC Fundamentals

Types of Alternating Waveforms, Basic AC Generator, Definitions of Cycle, Time Period, Frequency and Amplitude, Characteristics of a Sine Wave, Audio and Radio Frequencies, Different Values of Sinusoidal Voltage and Current, Phase of an AC ,Phase Difference, Vector Representation of an Alternating Quantity, AC through pure resistance , inductance and capacitance. Concept of Reactance and Impedance, RL, RC and RLC circuits, Passive RC filters (Low pass, high pass and band pass filters). Series and parallel resonance **(8 hour, 16 Marks)**

Reference Books:

- Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)
- Electrical Circuits, K.A. Smith and R.E. Alley (2014) Cambridge University Press
- Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
- Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.
- Alternating Current Fundamentals, Stephen Herman et.al.

DSC 2 - ELE-112N: Digital Electronics I **(Credits 2, 30 clock hour)**

Unit 1: Number System and Codes: Introduction, Concept of Radix, Number Systems: Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Base conversion

Codes: BCD Code, Excess-3 Code, ASCII code. **(8 hour, 16 Marks)**

Unit 2: Logic Gates: Concept of Positive and Negative Logic, Basic Gates (Symbol and Truth table): OR Gate, AND Gate, NOT Gate, Derived Gates: NAND gate, NOR Gates, EX-OR Gate, EX-NOR Gate, NAND and NOR as Universal Logic Gates

Applications of XOR gate: Controlled inverter, Parity Tester **(6 hour, 12 Marks)**

Unit 3: Binary Arithmetic and Boolean algebra

Binary Arithmetic: Addition and Subtraction, 1's Complement, 2's Complement of binary number, Binary Subtraction**:** Using 1's Compliment & 2's Complement, Half adder and Full Adder, Basic Laws of Boolean Algebra, De Morgan's Theorems, Simplifications of Boolean expression (Numerical) **(8 hour, 16 Marks)**

Unit 4: Combinational logic Circuits: Introduction, Standard representation of Canonical forms: Sum of Product (SOP), Product of Sum (POS), Minterms and Maxterms, Conversion between SOP and POS

Karnaugh Map (K Map) Simplification: K map structure, Plotting K map, Representation of Boolean expression using K map (Grouping-Pair, Quad and Octet, overlapping and rolling), Don't care condition, Minimization of SOP expression (Up to 4 variables)

Numerical based on above topics **(8 hour, 16 Marks)**

Reference Books:

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- Digital Principles and Applications, A.P. Malvino, D. P. Leach and Saha, 7th Ed., (2011)
- Tata McGraw Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, (2009) PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, (2011) Tata McGraw Hill.
- Digital Fundamentals, Thomas L. Flyod, , Pearson Education Asia (1994)
- Digital Principles, R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994)

ELECTRONICS LAB: DSC 3, ELE-103N – ELE 113 N LAB

(Credits 2, 60 clock hour)

(**Section A experiments are compulsory,** and students should perform at least **04** experiments from each **Section B & C** means total **10** experiments.)

Course Objectives:

Students are expected to:

1. Familiarize with basic electronics components, testing and measuring instruments.
2. Understand the practical use of various networks theorems
3. Study the electronics circuits analysis and verification of the circuits
4. Have the knowledge of passive filters and skill to build and test the circuits
5. Familiarize with logic gate ICs and have the knowledge of truth tables of logic gates.
6. Study various digital combinational circuits.

Section A: Circuit Components and Network Analysis	
1.	To familiarize with basic electronic components (Switch, fuse, Batteries, R, C, L, transformer, Relays, diodes, LED, transistors etc.), digital Multimeter, Function Generator and Oscilloscope.
2.	Measurement of AC (Amplitude, Frequency and Phase Difference) and DC (Voltage) signal parameters using Oscilloscope
Section B: Network Analysis and Semiconductor diode	
1.	Verification of Thevenin's theorem.
2.	Verification of Norton's theorem
3.	Verification of Superposition Theorem
4.	Verification of Reciprocity Theorem.
5.	Verification of the Maximum Power Transfer Theorem
6.	To study the properties of delta-star connection
7.	To study the characteristics of sine wave
8.	To study of passive low pass filter
9.	To study of passive high pass filter
10.	To study of passive band pass filter
11.	To study the series resonance circuit
12.	To study the series RL Circuit
13.	To study the series RLC Circuit
14.	To study the Parallel RLC Circuit

Section C: Basics of Digital Electronics	
1.	Verification of truth table of logic gates OR, AND, NOT, NOR, NAND, XOR using ICS
2.	(a) Verification of Universal gates (NAND) (b) Verification of Universal gates (NOR)
3.	Verification of D-Morgan's Theorem
4.	(a) To design a combinational logic system for a specified Truth Table. (b) To convert Boolean expression into logic circuit and design it using logic gate ICs. (c) To minimize a given logic circuit
5.	Study of Half Adder and Full Adder
6.	Study of Full Subtractor

Reference Books:

- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005)
- Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India.
- J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
- Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation.
- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011) Tata McGraw
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994)
- Digital Electronics, S.K. Mandal (2010) 1st edition, McGraw Hill

Course Outcomes (COts):

	Course Outcomes	Cognitive level
	Handle various electronics devices	L2
	Build and test electronic circuits	L2
	Verify various network theorems	L2, L3
	Handle digital ICs and circuits	L2

Major Subjects Sem II

DSC 4, DSC 5 (Credits: Theory-02)
DSC 6 (Credits: Practicals-02)

Course description:

This course is aimed at introducing the concepts of integrated circuits including linear and digital chips to Under Graduate students and provide hands on training of handling integrated circuit chips.

Course objectives:

1. To impart knowledge of electronics devices and digital integrated circuits.
2. To provide the knowledge and methodology necessary for using digital integrated circuit chips.
3. To have practical exposure of handling Electronics devices and IC chips.

Course outcome:

Learner will be able to ….

1. Apply the concept and knowledge of digital integrated circuit chips to develop new systems.
2. Apply practical knowledge to solve real life problems of the society.
3. Understand of the course and create scientific temperament and give exposure to the students for independent use of digital integrated circuit chips for innovative applications.
4. Model complex circuits and simulate them.
5. Handle simulation software to analyze analog and digital electronics circuits.

DSC 4 - ELE 121N : Analog Electronics – II (Credits 2, 30 Clock Hours)

Unit 1: Junction Diode

PN junction diode –formation/construction, Formation of Depletion Layer, forward and reverse biasing, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, Zener diode- I-V characteristics, Zener and avalanche breakdown, Reverse saturation current. **(8 hour, 15 Marks)**

Unit 2: Applications of Junction Diodes

Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, PIV, ripple factor and efficiency (Derivation not expected). Comparison of rectifiers, Filter-Shunt capacitor filter, its role in power supply, output waveform, and working. Zener diode as a voltage regulator, Problems on Zener regulator **(8 hour, 15 Marks)**

Unit III: Bipolar Junction Transistor

Construction and operation of BJT (NPN and PNP), CB, CE and CC configuration, characteristics of transistor in CE and CB configurations, h parameter definitions for CE, Regions of operation (active, cut off and saturation), Current gains α and β, Relations between α and β, Need of dc biasing, Biasing methods, dc load line and Q point.

(8 hour, 15 Marks)

Unit 4: Unipolar Devices

JFET. Construction, working and I-V characteristics (output and transfer), Pinch off voltage. JFET as an amplifier, Concept of MOSFET, UJT, basic construction, working, equivalent circuit and I-V characteristics. UJT as a relaxation oscillator. **(6 hour, 15 Marks)**

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
- Electronic Circuits: Discrete and Integrated, D.L. Schilling et. al. , Tata McGraw Hill
- Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, (2014), 6th Edn., Oxford University Press.
- J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)
- J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)
- Basic Electronics, Bernod Grob, McGra-Hill, India.

DSC 5 - ELE-122N: Digital Circuits II (30 clock hour, 2 Credits)

Unit 1: Data Processing circuits

Idea of Multiplexing and DeMultiplexing, Multiplexer: 2 to 1, 4 to 1, DeMultiplexer: 1 of 2, 1 of 4, IC's of Multiplexer and Demultiplexer, Decoder: BCD to decimal decoder, Encoder: Decimal to BCD encoder using OR-gates. **(6 hour, 12 Marks)**

Unit 2: Flip-Flops

Introduction to sequential logic circuit, Comparison of Combinational and Sequential logic circuits, 1-bit memory cell, RS-FF using NAND and NOR gates, Clocked RS - FF, D- FF, JK - FF, Level and Edge triggered FF, PRESET and CLR, Race around condition, Master Slave J-K FF, T-FF, Difference between latch and flip flop **(8 Hours, 16 marks)**

Unit 3: Shift Register

Introduction to Shift Register, Classification of Register and Types of Registers: Serial in Serial out (SISO), Serial in Parallel out (SIPO), Parallel in Serial out (PISO), Parallel in Parallel out (PIPO), Universal shift register, Applications of Shift Register, Ring counter.

(6 Hours, 12 marks)

Unit 4: Counters

Concept of counter, Asynchronous counter (3-bit), Decade counter, Synchronous counter (3-bit), Comparison between Synchronous and Asynchronous counter, Down counter, Up-Down counter. **(5 Hours, 10 marks)**

Unit-5: Data Converters

Introduction, Need of ADC and DAC, Types of converters, Digital to analog converters (DAC): weighted resistor type and R-2R ladder type converter. Drawbacks of weighted resistor type DAC, Binary or R-2R type D to A convertor, Analog to Digital Converter: Simultaneous or Parallel ADC, Successive approximation type ADC. **(5 Hours, 10 marks)**

Reference Books:

- Digital principles and applications - A. P. Malvino & D. P. Leach
- Modem digital electronics - R. P. Jain
- Digital Electronics - William Gothman
- Digital fundamentals (3rd Edition)- Thomas Floyd
- Digital Systems: Principles and Applications, R.J.Tocci, N.S.Widmer, (2001) PHI Learning.

DSC 6, ELE 123 LAB-2 (Credits 2, 60 clock hour)

(Students should perform at least any **05** experiments from each **Section A and B** means total **10** experiments.)

Course Objectives:

Students are expected to:

1. Familiarize with various Semiconductor devices.
2. To understand the behavior of semiconductor devices.
3. Understand the practical use of various semiconductor devices.
4. Familiarize with combinational and sequential circuit ICs.
5. Design of various combinational and sequential circuits.
6. Study various data processing circuits.

Section A: Analog Electronics	
1.	Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
2.	Study of (a) Half wave rectifier (b) Centre-taped Full wave rectifier and (c) Bridge Full wave rectifier.
3.	To study Zener diode as a voltage regulator on the output of FWR.
4.	Study of the I-V Characteristics of BJT in CE configuration.
5.	Study of the I-V Characteristics of UJT.
6.	To design and Study of the UJT relaxation oscillator
7.	Study of the output characteristics of common source JFET.
8.	To study Transistor as a switch (LED ON/OFF)
Section B: Digital Circuits	
1.	Study of clocked R-S / D-type flip flop using logic gates.
2.	Study of JK / T- flip flop using logic gates/ICs.
3.	Study of 4:1 line multiplexer and 1:4 line demultiplexer.

4.	Study of decade counter using IC7490.
5.	Study of Up-down- counter using IC74191.
6.	Study of shift register using IC 7495.
7.	Study of DAC using R-2R ladder.
8.	To study BCD to Seven Segment Decoder using IC-7447/7448

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
- Basic Electronics, Bernod Grob, McGra-Hill, India.
- Applied Electronics, R. S. Sedha, S. Chand and Company, New Delhi.
- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
- Solid State Electronic Devices, Ben G Streetman and S. Banerjee, Pearson Education
- Integrated Electronics, J. Millman and C. C. Halkias, Tata McGraw Hill (2001).
- Electronic Devices and Circuits, Allen Mottershead, Goodyear Publishing Corporation.
- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011) Tata McGraw
- Digital Principles, R. L. Tokheim, Schaum's Outline Series, Tata McGraw- Hill (1994)
- Digital Electronics, S.K. Mandal (2010) 1st edition, McGraw Hill
- Digital System Design, M. Morris Mano, Pearson Education Asia,(Fourth Edition)

Course Outcomes (COts):

	Course Outcomes	**Cognitive level**
	Handle various semiconductor devices	L2
	Test basic electronic circuits	L2
	Understand the behavior and applications of semiconductor devices	L2, L3
	Handle digital ICs and circuits	L2

Minor subjects Sem – I

MIN-1, ELE-114N Analog and Digital Electronics – 1 (Credits 2, 30 Clock Hours)

Unit 1: Basic Circuit Components

Resistors: Introduction of resistor, Resistive circuits: Series circuit, characteristics of series circuit, series voltage divider, open and short in series circuit, Parallel circuit, laws of parallel circuit, open and short in parallel circuit, series-parallel circuits

Inductors: Self and mutual inductance, Inductance in series and parallel

Capacitors: Principles of capacitance, capacitors in series and parallel

(8 hour, 16 Marks)

Unit 2: Circuit Analysis & Network Theorems

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Problems based on KCL, KVL Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Maximum Power Transfer Theorem. Problems based on these theorems.

(7 Hour 14 Marks)

Unit 3: Number System and Binary Arithmetic

Introduction, Concept of Radix, Number Systems: Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Base conversion, BCD Code

Binary Arithmetic: Addition and Subtraction, 1's Complement, 2's Complement of binary number, Binary Subtraction: Using 1's Compliment & 2's Complement, (6 hour, 14 Marks)

Unit 4: Logic Gates & Boolean algebra

Concept of Positive and Negative Logic, Basic Gates (Symbol and Truth table): OR Gate, AND Gate, NOT Gate, Derived Gates: NAND gate, NOR Gates, EX-OR Gate, EX-NOR Gate, NAND and NOR as Universal Logic GatesHalf adder and Full Adder

Basic Laws of Boolean Algebra, De Morgan's Theorems, Simplifications of Boolean expression Numerical) (8 hour, 16 Marks)

MIN-2, ELE-115N Laboratory Analog and Digital Electronics – I (Credits 2, 60 Hours)

Course Objectives:

Students are expected to:

1. Familiarize with basic electronics components, testing and measuring instruments.
2. Understand the practical use of various networks theorems
3. Study the electronics circuits analysis and verification of the circuits
4. Have the knowledge of passive filters and skill to build and test the circuits
5. Familiarize with logic gate ICs and have the knowledge of truth tables of logic gates.
6. Study various digital combinational circuits.

Section A: Circuit Components	
	To familiarize with basic electronic components (Switch, fuse, Batteries, R, C, L, transformer, Relays, diodes, LED, transistors etc.), digital Multimeter, Function Generator and Oscilloscope.
	Measurement of AC (Amplitude, Frequency and Phase Difference) and DC (Voltage) signal parameters using Oscilloscope
Section B: Network Analysis	
	Verification of Thevenin's theorem.
	Verification of Norton's theorem
	Verification of the Maximum Power Transfer Theorem
	To study the characteristics of sine wave
	To study of passive low/high pass filter
	To study of passive band pass filter
	To study the series resonance circuit
	To study the series RL Circuit
Section C: Basics of Digital Electronics	
	Verification of truth table of logic gates OR, AND, NOT, NOR, NAND, XOR using ICS
	(c) Verification of Universal gates (NAND) (d) Verification of Universal gates (NOR)
	Verification of D-Morgan's Theorem
	(d) To design a combinational logic system for a specified Truth Table. (e) To convert Boolean expression into logic circuit and design it using logic gate ICs. (f) To minimize a given logic circuit
	Study of Half Adder and Full Adder
	Study of Full Subtractor

Reference Books:

	• Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India. • J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001) • Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation. • Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., (2011) Tata McGraw

Course Outcomes (COts):

	Course Outcomes	**Cognitive level**
	Handle various electronics devices	L2
	Build and test electronic circuits	L2
	Verify various network theorems	L2, L3
	Handle digital ICs and circuits	L2

MINOR Subjects Sem II

MIN 3, ELE 124N Analog and Digital Electronics II (Credits 2, 30 Hours)

Unit 1: Junction Diode and its Applications

PN junction diode –formation/construction, Formation of Depletion Layer, forward and reverse biasing, Diode Equation and I-V characteristics.Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, PIV, ripple factor and efficiency (Derivation not expected), Filters (6 hour, 12 Marks)

Unit 2: Bipolar & Unipolar Junction Devices

Construction and operation of BJT (NPN and PNP), CB, CE and CC configuration, characteristics of transistor in CE and CB configurations, h parameter definitions for CE, Regions of operation (active, cut off and saturation), Current gains α and β, Relations between α and β, Need of dc biasing, Biasing methods, dc load line and Q point.

JFET. Construction & working, Concept of MOSFET, UJT:construction, working, UJT as a relaxation oscillator. (9 hour, 18 Marks)

Unit 3: Data Processing circuits

Idea of Multiplexing and DeMultiplexing, Multiplexer: 2 to 1, 4 to 1, DeMultiplexer: 1 of 2, 1 of 4, IC's of Multiplexer and Demultiplexer, Decoder: BCD to decimal decoder, Encoder: Decimal to BCD encoder using OR-gates. (6 hour, 12 Marks)

Unit 4: Flip-Flops,Shift Registers and Counters

Introduction to sequential logic circuit, Comparison of Combinational and Sequential logic circuits, 1-bit memory cell, RS-FF using NAND and NOR gates, Clocked RS - FF, D- FF, JK - FF, Level and Edge triggered FF, PRESET and CLR, Race around condition, Master Slave J-K FF, T-FF, Difference between latch and flip flop

Introduction to Shift Register, Classification of Register and Types, Concept of counter, Asynchronous counter (3-bit), Decade counter, Synchronous counter (3-bit)(9 Hours, 18 marks)

Reference Books:

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

Electronic Circuits: Discrete and Integrated, D.L. Schilling et. al. , Tata McGraw Hill

Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, (2014), 6th Edn., Oxford University Press.

J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001)

J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991)

Digital principles and applications - A. P. Malvino & D. P. Leach

Modem digital electronics - R. P. Jain

Digital Electronics - William Gothman

Digital fundamentals (3rd Edition)- Thomas Floyd

MIN 4, ELE 125N Laboratory Analog and Digital Electronics – I (Credits 2, 60 Hours)

(Students should perform at least any **05** experiments from each **Section A and B** means total **10** experiments.)

Course Objectives:

Students are expected to:

7. Familiarize with various Semiconductor devices.
8. To understand the behavior of semiconductor devices.
9. Understand the practical use of various semiconductor devices.
10. Familiarize with combinational and sequential circuit ICs.
11. Design of various combinational and sequential circuits.
12. Study various data processing circuits.

Section A: Analog Electronics	
1.	Study of the I-V Characteristics of (a) p-n junction Diode, and (b) Zener diode.
2.	Study of (a) Half wave rectifier (b) Centre-taped Full wave rectifier and (c) Bridge Full wave rectifier.
3.	To study Zener diode as a voltage regulator on the output of FWR.
4.	Study of the I-V Characteristics of BJT in CE configuration.
5.	Study of the I-V Characteristics of UJT.
6.	To design and Study of the UJT relaxation oscillator
7.	Study of the output characteristics of common source JFET.
8.	To study Transistor as a switch (LED ON/OFF)
Section B: Digital Circuits	
1.	Study of clocked R-S / D-type flip flop using logic gates.
2.	Study of JK / T- flip flop using logic gates/ICs.
3.	Study of 4:1 line multiplexer and 1:4 line demultiplexer.

4.	Study of decade counter using IC7490.
5.	Study of Up-down- counter using IC74191.
6.	Study of shift register using IC 7495.
7.	Study of DAC using R-2R ladder.
8.	To study BCD to Seven Segment Decoder using IC-7447/7448

Reference Books:

- Electronic Devices and Circuits, David A. Bell, 5th Edition (2015), Oxford University Press.
- Basic Electronics, Bernod Grob, McGra-Hill, India.
- Applied Electronics, R. S. Sedha, S. Chand and Company, New Delhi.
- Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
- Solid State Electronic Devices, Ben G Streetman and S. Banerjee, Pearson Education
- Integrated Electronics, J. Millman and C. C. Halkias, Tata McGraw Hill (2001).
- Electronic Devices and Circuits, Allen Mottershead, Goodyear Publishing Corporation.

Course Outcomes (COts):

	Course Outcomes	**Cognitive level**
	Handle various semiconductor devices	L2
	Test basic electronic circuits	L2
	Understand the behavior and applications of semiconductor devices	L2, L3
	Handle digital ICs and circuits	L2

OE/GE Sem I

OE 1, OE - ELE -01N Agro Electronics (Credits 2, 30 Hours)

Learning Objectives:

1. To learn core components, Devices, process and functionalities of Electronics.
2. To understand the basic measuring equipments required to perform electronic experiments.
3. To understand the importance of Electronics in day-to-day life.
4. To understand the role of Electronics in consumer, medical, industry products etc.

Course Outcome:

After studying the course, the student shall be motivated to pursue the course for higher education. The course will also help the student to select the future area of work. Further, the student will be able to have a comprehensive understanding of electronic devices and circuits and their application in various fields.

General and Agriculture Electronics

Unit-I: What is Electronics

The Historical Evolution of Electronics Electric current & Voltage; Introduction to Basic Components of Electronics and their applications (Resistor, Capacitor, Inductor); IIntroduction to Integrated Circuits (ICs); Introduction to Electronic Equipment (Power Supply (AC/DC), Multimeter) (6H,12M)

Unit-II: Electronic Home appliances

Radio, Smart LED TV, Personal computer, Printer, Washing machine, Microwave ovens (A qualitative treatment only); Video monitoring, Security and alarms, CCTV (6H,12M)

Unit III Introduction to Electronic Communication

Telephony, Telecom network spectrum, Mobile phones and Satellite communication.
Electronics in Healthcare: Digital Thermometers, BP measurement, Digital X-Ray,
MRI, USG, ECG (Basic principle only). (6H,12M)

Unit IV:Agriculture Electronics

Smart-irrigation in Automation,Introduction to Remote Sensing and Application, Atmospheric investigation, visual image interpretation, GIS/GPS positioning system for farming, Yield monitoring and mapping, soil sampling and analysis, Role of electronics in farm machinery (6H,12M)

Unit V: Advanced Agricultural Technologies

Difference between traditional and modern agricultural practices; Internet of Things (IoT), Online Marketing of agrobased products, Agricultural Drones for disease detection and survey, & Robotics, Artificial Intelligence (AI) based farming. (6H,12M)

Text Books and Reference Books:

1. Bhatia, S.L. "Handbook of Electrical Engineering". Khanna Publications.
2. Bsown, R.H., "Farm Electrification". McGraw Hills, 1956.
3. Considine T..M. "Process/Industrial Instruments and Controls· Handbook", McGraw Hill 1993. 4. Kuhar, John. E. 1977. The precision farming guide for agriculturalist. Lori J. Dhabalt, USA 5. Barret, E.C. and Curits, L.F. "Introduction to Environmental Remote Sensing". John Wiley and Sons Inc. New York, 1976. 6. Megh R. Goyal, “Emerging Technologies in Agricultural Engineering” Apple Academic Press.

OE/GE Sem II

OE 2, OE - ELE - 02N Computer and Networking (Credits 2, 30 Hours)

Unit 1 Basics of computers

Introduction to computer, computer system hardware, memory, input and output devices, data representation (6 Hrs, 12 M)

Unit 2 Operating system

Objectives of OS, Types of OS, Functions of OS, Process management , File management, device management, protection and security, examples of OS (6 Hrs, 12 M)

Unit 3. Computer network

Network types, LAN, MAN, WAN, topologies - bus ring star, Communication protocols, introduction to http https , Network devices : Repeater, bridges, Hub, switch, router gateway.
(6 Hrs, 12 M)

Unit 4 Internet and internet services

Introduction, history of internet, Internet services : www, email, FTP (6 Hrs, 12 M)

Unit 5 Security threats

Introductio, security and attack, Malicious software: virus worms trojan horses java script applets and active x controls, introduction to hacking, Firewalls and types, user identification and authentication, smart card, biometric technique (6 Hrs, 12 M)

References

Computer fundamentals by Anita Goel , Pearson
Computer Networks Tanenbaum Pearson,
Computer fundamentals and applications Ashok Arora Pragat prakashan
Computer fundamentals D. P. Nagpal, S Chand Publications