B.Sc. PART I - SEMESTER I
Course Name: Analogue and Digital Electronics – I (MAJOR)

Subject code: UEL110T

Course Outline

Unit I

Passive components: Definition, types, identification and uses of electronic components: Resistors, Capacitors, Inductors. Introduction to Switches, Transformers and Relays. Introduction to surface mounting devices. Basics of CRO. Ideal Voltage and Current sources (Internal impedance of battery and its effect on its performance), Kirchoff 's current and voltage laws, Voltage and current divider circuits.

Unit II

Superposition, Thevenin, Norton, Maximum power transfer theorems (Statement and simple numerical based on DC circuits only). Introduction to semiconductors: Concept of energy band diagram (Conductor, Semiconductor, Insulator), Intrinsic and extrinsic semiconductor (P type, N type), diffusion junction, depletion layer, Barrier potential, Avalanche and Zener effect.

Unit III

Construction, working, characteristics and applications of PN Junction diode, Zener diode, and Light Emitting diode. Construction and working of BJT, Modes of B.J.T. (CE, CC, CB), transistor equation; α, β and their relationship, junction biasing, Input, output and transfer characteristics of BJT in CE mode, Transistor Biasing (Voltage divider and emitter biasing only), DC load line, Q point, transistor as switch.

Unit IV

Number Systems: Decimal, Binary, Octal, Hexadecimal, representation of integer, fraction and mixed numbers, Mutual conversions, Binary addition, Complement of binary numbers, Binary subtraction using 1's and 2's complement method, SM representation of binary numbers.
Binary codes- BCD, 8421, Excess 3, Parity and Gray code.

Unit V

Logic gates: Logic, symbol and truth table of OR, AND, NOT, NAND, NOR, XOR and XNOR gates. Boolean algebra: Boolean Laws, double inversion, Duality and De Morgan's theorems, Use of NAND and NOR gate as universal building blocks. Karnaugh Maps: Concept of standard SOP and POS, Pair, Quads, Octets, minterm, maxterm in K Map, K-map for 2,3 and 4 variables, , Simplification of SOP and POS logic expressions using K-map.

Unit VI

Combinational Logic Circuits: Half Adder, Full adder, Half subtracter and Full, subtracter, 4-bit Full adder/ subtracter, Concept and implementation of decimal to BCD encoder using logic gates,

Concept and implementation of 2:4, 3:8 and BCD to 7 segment decoder using logic gates, Parity generator and checker, Concept of multiplexer, 4:1 mux using logic gates , Concept of demultiplexer, 1:4 demultiplexer using logic gates.

B.Sc. I (SEM I) ELECTRONICS PRACTICALS (MAJOR)
Subject code: UEL110P

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of laws of series resistor and application as voltage divider.
2. Study of laws of parallel resistor and application as current divider.
3. Study of laws of series capacitor and application as voltage divider.
4. Study of laws of parallel capacitor and application as current divider.
5. Verification of Terman's equation for inductance. Reactance characteristics of inductor
6. Study of transformer.
7. Study of battery as practical (i) voltage source (ii) current source.
8. Study of maximum power transfer.
9. Study of Forward Bias characteristics of diode. (PN & LED)
10. Study of Reverse Bias characteristics of Zener diode.
11. Study of Characteristics of BJT. (Input, Output, Transfer)
12. Study of voltage divider biasing of transistor.
13. Verification of Norton's Theorem.
14. Verification of Thevenin's Theorem.

Section B

1. Study of basic logic gates.
2. Study of NAND as universal gate.
3. Study of NOR as universal gate.
4. Verification of Demorgan's Theorem.
5. Simplification of logic expressions using Boolean algebra.
6. Study of binary to gray code converter using K map.
7. Study of gray to binary code converter using K map.
8. Study of Multiplexer using gates.
9. Study of De Multiplexer using gates.
10. Study of Multiplexer using IC.
11. Study of De- Multiplexer using IC
12. Study of BCD to 7 segment decoder.
13. Construction and study of half adder and full adder.
14. Construction and study of half subtracter and full subtracter.
15. Verification of Boolean laws & Verification of duality theorem.

Reference books:

1. Basic Electronics solid state physics B. L. Theraja, S. Chand and company.
2. Electronic Devices and circuits Allen Mottershed, Prentice Hall of India Pvt. Ltd.
3. An Introduction to Electronics, R. G. Kale, U. K. Puranik, V. N. Pendse, A . A. Sakale, Kitab Mahal Publications.
4. Basic Electronics, Grob, Tata McGraw Hill
5. Electronic Devices, T. L. Floyd, Pearson Education Asia
6. Electronic Principles, Malvino, Tata McGraw Hill
7. Electronic components and materials, Madhuri Joshi, Schroff pub. And
8. Electronic components and materials, S. M. Dhir, TMH Network analysis, Van Valkenburg, PHI
9. Digital principles and applications, A. P. Malvino, D. P. Leach McGraw Hill Book
10. Principles of digital Electronics, M. B. Matsagar, V. S. Kale, Vision publication
11. Modern Digital Electronics, R. P. Jain Tata McGraw Hill publishing co.ltd
12. Digital Fundamentals, Floyd, Jain, Pearson
13. 2000 solved problems in digital Electronics, S. P. Bali, Tata McGraw Hill
14. Electronic circuits and systems: Analog and digital, Y. N. Bapat,Tata McGraw Hill
15. Digital Electronics and Logic Design, B. S. Nair, Prentice Hall.
16. Digital Computer Electronics, Malvino, Brown Tata McGraw Hill
17. Fundamentals of Digital Electronics C.V.Dhuley and V.M. Ghodki.

Web Resources:

Students are advised to make use of the resources available on the internet. Some useful links related to electronics are given below.

1. M.I.T. open course ware video lectures are available at http://ocw.mit.edu/OcwWeb/Electrical-Engineering-and-Computer-Science/6-002Spring-2007/VideoLectures/index.htm
2. www.electronics-tutorials.com
3. http://electronics .howstuffworks .com
4. www.science-ebooks.com/electronics
5. http://computer.howstuffworks.com
6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. http://101 science.com/eleclinks.htm www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
8. www.discovercircuits.com/resources/tutorials.html
9. www.electronics-lab.com/
10. www.glolab.com/links/links.html etc

B.Sc. PART I - SEMESTER I
Course Name: Analogue and Digital Electronics – I (MINOR)
Subject code: UEL111T

Course Outline

Unit I
Passive components: Definition, types, identification and uses of electronic components: Resistors, Capacitors, Inductors. Introduction to Switches, Transformers and Relays. Introduction to surface mounting devices. Basics of CRO. Ideal Voltage and Current sources (Internal impedance of battery and its effect on its performance), Kirchoff 's current and voltage laws, Voltage and current divider circuits.

Unit II
Superposition, Thevenin, Norton, Maximum power transfer theorems (Statement and simple numerical based on DC circuits only). Introduction to semiconductors: Concept of energy band diagram (Conductor, Semiconductor, Insulator), Intrinsic and extrinsic semiconductor (P type, N type), diffusion junction, depletion layer, Barrier potential, Avalanche and Zener effect.

Unit III
Construction, working, characteristics and applications of PN Junction diode, Zener diode, and Light Emitting diode. Construction and working of BJT, Modes of B.J.T. (CE, CC, CB), transistor equation; α, β and their relationship, junction biasing, Input, output and transfer characteristics of BJT in CE mode, Transistor Biasing (Voltage divider and emitter biasing only), DC load line, Q point, transistor as switch.

Unit IV
Number Systems: Decimal, Binary, Octal, Hexadecimal, representation of integer, fraction and mixed numbers, Mutual conversions, Binary addition, Complement of binary numbers, Binary subtraction using 1's and 2's complement method, SM representation of binary numbers.
Binary codes- BCD, 8421, Excess 3, Parity and Gray code.

Unit V
Logic gates: Logic, symbol and truth table of OR, AND, NOT, NAND, NOR, XOR and XNOR gates. Boolean algebra: Boolean Laws, double inversion, Duality and De Morgan's theorems, Use of NAND and NOR gate as universal building blocks. Karnaugh Maps: Concept of standard SOP and POS, Pair, Quads, Octets, minterm, maxterm in K Map, K-map for 2,3 and 4 variables, , Simplification of SOP and POS logic expressions using K-map.

Unit VI
Combinational Logic Circuits: Half Adder, Full adder, Half subtracter and Full, subtracter, 4-bit Full adder/ subtracter, Concept and implementation of decimal to BCD encoder using logic gates, Concept and implementation of 2:4, 3:8 and BCD to 7 segment decoder using logic gates, Parity generator and checker, Concept of multiplexer, 4:1 mux using logic gates , Concept of demultiplexer, 1:4 demultiplexer using logic gates.

B.Sc. I (SEM I) ELECTRONICS PRACTICALS (MINOR)
Subject code: UEL111P

Students are expected to perform at least 5 experiments from section A and 5 experiments from section B.

Section A

1. Study of laws of series resistor and application as voltage divider.
2. Study of laws of parallel resistor and application as current divider.
3. Study of laws of series capacitor and application as voltage divider.
4. Study of laws of parallel capacitor and application as current divider.
5. Verification of Terman's equation for inductance. Reactance characteristics of inductor
6. Study of transformer.
7. Study of battery as practical (i) voltage source (ii) current source.
8. Study of maximum power transfer.
9. Study of Forward Bias characteristics of diode. (PN & LED)
10. Study of Reverse Bias characteristics of Zener diode.
11. Study of Characteristics of BJT. (Input, Output, Transfer)
12. Study of voltage divider biasing of transistor.
13. Verification of Norton's Theorem.
14. Verification of Thevenin's Theorem.

Section B

1. Study of basic logic gates.
2. Study of NAND as universal gate.
3. Study of NOR as universal gate.
4. Verification of Demorgan's Theorem.
5. Simplification of logic expressions using Boolean algebra.
6. Study of binary to gray code converter using K map.
7. Study of gray to binary code converter using K map.
8. Study of Multiplexer using gates.
9. Study of De Multiplexer using gates.
10. Study of Multiplexer using IC.
11. Study of De- Multiplexer using IC
12. Study of BCD to 7 segment decoder.
13. Construction and study of half adder and full adder.
14. Construction and study of half subtracter and full subtracter.
15. Verification of Boolean laws & Verification of duality theorem.

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4. Basic Electronics, Grob, Tata McGraw Hill
5. Electronic Devices, T. L. Floyd, Pearson Education Asia
6. Electronic Principles, Malvino, Tata McGraw Hill
7. Electronic components and materials, Madhuri Joshi, Schroff pub. And
8. Electronic components and materials, S. M. Dhir, TMH Network analysis, Van Valkenburg, PHI
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12. Digital Fundamentals, Floyd, Jain, Pearson
13. 2000 solved problems in digital Electronics, S. P. Bali, Tata McGraw Hill
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2. www.electronics-tutorials.com
3. http://electronics .howstuffworks .com
4. www.science-ebooks.com/electronics
5. http://computer.howstuffworks.com
6. www.geocities.com/CapeCanaveral/1221/elec1.htm
7. http://101 science.com/eleclinks.htm www.electro-tech-online.com/blogs/gayan-soyza/23-useful-electronic-links.html
8. www.discovercircuits.com/resources/tutorials.html
9. www.electronics-lab.com/
10. www.glolab.com/links/links.html etc

Department of Electronics

Vocational Skill Course (VSC)

Basics of Electronic Components

Course code: UEL112P

Credits: 2 (4 Pr) No. of Practical Hrs.:60

Course description:

This course aims to provide students with a strong foundation in electronic components and circuit analysis, including an understanding of the fundamental laws used to solve circuits. Students will also become familiar with various measuring and testing instruments commonly used in electronics, as well as the basic techniques of assembling electronic circuits and troubleshooting common problems. In addition, this course will cover the fundamentals of semiconductor devices that power modern electronics. By the end of the course, students will have the skills and knowledge needed to design and build basic electronic circuits, and will be well-prepared to pursue further studies in the field of electronics.

Course Objectives:

1. Develop an understanding of the fundamental concepts of resistance, voltage, and current in electronic circuits.
2. Learn about the various electronic components used in circuits, including their symbols and basic properties.
3. Gain familiarity with testing and measuring instruments commonly used in electronics.
4. Acquire the skills needed to assemble electronic circuits and troubleshoot common problems that may arise during the assembly process.
5. Understand the basic principles of operation of semiconductor devices, which are the building blocks of modern electronic devices.

Course learning outcomes:

Upon completion of this course, learners will be able to:

1. Demonstrate an understanding of electronic components and their various types.
2. Identify and explain the use of different electronic components in various circuits.
3. Apply the concepts of resistance, voltage, and current to analyse electronic circuits.
4. Utilize resistors in various configurations to achieve specific circuit requirements.
5. Safely operate a Multimeter/Digital Multimeter to measure voltage, current, and resistance.
6. Apply Ohm's Law to calculate voltage, current, and resistance in electronic circuits.
7. Effectively use a Cathode Ray Oscilloscope (CRO) for circuit measurements and analysis.

Unit I: Basic Circuit Components:

Resistors: Introduction to Resistor and Colour Band Coding, Power Dissipation, Parallel and Series connection of resistors, Fixed and Variable resistors, find value of resistor using a meter,

Capacitors: Introduction to Capacitors, Characteristics of capacitor, Capacitors Behaviour, Capacitors in Series and Parallel, how to test a capacitor, Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic capacitor.

Inductors: Types, identification, use of inductance, Inductance in series and parallel, testing of resistance and inductance using multimeter.
Diode and Transistor: Identification of diode, types and application, types of transistors, identification and application

Unit II Measurement of Circuit Parameters:

Introduction to Resistance, Current, Voltage, Types of Circuits, Introduction to DMM, Volt Ohm Meter Basics Measuring Resistance, how to test Resistors, Measuring Current, Measuring Voltage, Peak, Peak to Peak, Root Mean Square and Average Values. Circuit Diagram Basics and symbols, Introduction to CRO, Measurement of voltage, frequency and phase by CRO, Oscilloscope probes.

Unit III: Network Theorems:

Statement: Ohm's Law, Kirchoff's laws, application of these laws, Node Analysis, Mesh Analysis simple examples based on these laws.

List of Practical:

1. Study of laws of series resistor and application as voltage divider.
2. Study of laws of parallel resistor and application as current divider.
3. Study of laws of series capacitor and application as voltage divider.
4. Study of laws of parallel capacitor and application as current divider.
5. Verification of Terman's equation for inductance. Reactance characteristics of inductor
6. Study of battery as practical (i) voltage source (ii) current source.
7. Study of voltage divider circuit.
8. Study of current divider circuit.
9. Measurement of Peak, Peak to Peak, Root Mean Square and Average Values of voltage by CRO
10. Measurement of frequency and phase by CRO.
11. Verification of KVL.
12. Verification of KCL.

Reference Books:

1. Basic Electronics solid state physics B. L. Theraja, S. Chand and company
2. Electronic Devices and circuits Allen Mottershed, Prentice Hall of India Pvt. Ltd.
3. An Introduction to Electronics, R. G. Kale, U. K. Puranik, V. N. Pendse, A. A. Sakale, Kitab Mahal Publications.
4. Basic Electronics, Grob, Tata McGraw Hill

5. Electronic Devices, T. L. Floyd, Pearson Education Asia
6. Electronic Principles, Malvino, Tata McGraw Hill
7. Electronic components and materials, Madhuri Joshi, Schroff pub. And Distributors
8. Electronic components and materials, S. M. Dhir, TMH

B.Sc. PART I - SEMESTER II
Course Name: Analogue and Digital Electronics – II

Subject code:

Course Outline

Unit I
Amplifier parameters, notations, concept and definition of h-parameters, open circuit and short circuit tests, Introduction to input impedance, output impedance, current, voltage and power gains using h parameters, classification of amplifiers (Descriptive ideas only). Construction, working, characteristics and applications of FET and MOSFET (depletion and enhancement type), Parameters of JFET and their relationship parameters of MOSFET and their relationship.

Unit II
Introduction to power transistor, difference between Voltage and power amplifiers, transformer coupled class A power amplifier and its efficiency, class B Push-pull amplifier, derivation for efficiency, complementary symmetry power amplifier with two power supplies.

Unit III
Construction, working, characteristics and applications of Silicon Controlled Rectifier (SCR), DIAC, TRIAC , UJT and UJT as relaxation oscillator.

Unit IV
Sequential Logic Circuits- Concepts of Edge and Level Triggering, Propagation Delay, Set up time, Hold time of FF, R-S Flip Flop, Clocked R-S Flip Flop, Limitations of R-S FF, D FF, JK FF, preset and clear terminals of FF, Race around Condition of JK FF, JKMS FF.

Unit V
Counters: Asynchronous, Up/down, Decade, Synchronous, Modified counter, Ring Counter, Johnson counter (Truth tables and timing diagrams up to 4 bit). Registers: Left shift, Right shift, SISO, SIPO, PISO and PIPO Registers.

Unit VI
Introduction to memories, classification, Memory expansion (word size and word capacity). Logic Families: Characteristics of digital ICs, construction and working of TTL NAND and NOR gates, construction and working of CMOS NAND and NOR gates, Tristate logic, comparison of TTL and CMOS logic families with respect to propagation delay, power consumption, noise immunity, noise margin, fan in and fan out.

B.Sc. PART I - SEMESTER II
Course Name: Analogue and Digital Electronics – II

Subject code:

Course Outline

Unit I
Amplifier parameters, notations, concept and definition of h-parameters, open circuit and short circuit tests, Introduction to input impedance, output impedance, current, voltage and power gains using h parameters, classification of amplifiers (Descriptive ideas only). Construction, working, characteristics and applications of FET and MOSFET (depletion and enhancement type), Parameters of JFET and their relationship parameters of MOSFET and their relationship.

Unit II
Introduction to power transistor, difference between Voltage and power amplifiers, transformer coupled class A power amplifier and its efficiency, class B Push-pull amplifier, derivation for efficiency, complementary symmetry power amplifier with two power supplies.

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Unit IV
Sequential Logic Circuits- Concepts of Edge and Level Triggering, Propagation Delay, Set up time, Hold time of FF, R-S Flip Flop, Clocked R-S Flip Flop, Limitations of R-S FF, D FF, JK FF, preset and clear terminals of FF, Race around Condition of JK FF, JKMS FF.

Unit V
Counters: Asynchronous, Up/down, Decade, Synchronous, Modified counter, Ring Counter, Johnson counter (Truth tables and timing diagrams up to 4 bit). Registers: Left shift, Right shift, SISO, SIPO, PISO and PIPO Registers.

Unit VI
Introduction to memories, classification, Memory expansion (word size and word capacity). Logic Families: Characteristics of digital ICs, construction and working of TTL NAND and NOR gates, construction and working of CMOS NAND and NOR gates, Tristate logic, comparison of TTL and CMOS logic families with respect to propagation delay, power consumption, noise immunity, noise margin, fan in and fan out.