Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc.-I (Electronics)

Syllabus

Academic Year: 2021-22

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

Curriculum Structure with effect from June, 2020

B.Sc. II (Electronics) Syllabi under Choice Based Credit System

Sr. No.	Course Code	Title	Credits	Lectures /Week	Marks		
		Semester I			CIA	SEE	Total
1	U-ELE-144	AC Fundamentals and Circuit Analysis-I	02	03	20	30	50
2	U-ELE-145	Semiconductor Devices and Instrumentation-II	02	03	20	30	50
3	U-ELE-146	Electronics Laboratory Course-I	01	03	20	30	50
		Semester II					
4	U-ELE-245	Power Supplies and Active Filters-III	02	03	20	30	50
5	U-ELE-246	Amplifiers and Number System-IV	02	03	20	30	50
6	U-ELE-247	Electronics Laboratory Course-II	01	03	20	30	50
		Total	10				300

Student Stay Hours: 09/Week

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Electronics) Semester I

Course Code: U-ELE-144

Course Title: AC Fundamentals and Circuit Analysis-I

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 45

Learning Objectives:

(1) To develop understanding about generation of single phase AC, definitions pertaining to alternating quantities,

(2) To clear the concepts of average and RMS values, determination of RMS and average value for different types of waveforms,

(3) To inculcate the knowledge about Kirchhoff's laws, voltage and power using Mesh and nodal analysis,

(4) To develop the strong foundation for electrical networks,

(5) To develop analytical qualities in electrical circuits by application of various theorems,

(6) To illustrate the idea of resonance in series LCR and parallel LCR electric circuits.

Course Outcomes:

Upon successfully studying this course, students will:

(1) Have strong basics for network theory,

(2) Analyze and solve electric circuits,

(3) be able to solve complicated networks by application of theorems,

(4) Understand and use the concept of impedance and reactance to analyze simple ac series circuits,

(5) Calculate the impedance, phase angle, power, power factor, voltage and/or current in series RLC circuit,

(6) Draw the relevant phasor diagrams and waveform diagrams of voltage and current, for pure resistance, inductance and capacitance.

Unit I: A.C. Fundamentals (Book 1, Ch. 11) (12 Lectures)

Introduction, generation of alternating voltage and currents, equation of alternating voltage and current, alternate method for the equations of alternating voltages and currents, simple and complex waveforms, cycle, time period, frequency and amplitude, different forms of emf equations, phase and phase difference, definition of RMS value, average value, form factor, peak value and amplitude factor, numerical problems.

Unit II: DC Network Theorems (Book 1, Ch. 2) (12 Lectures)

Introduction, electric circuits, Kirchhoff's laws, determination of voltage sign, assumed direction of current, ideal constant voltage source, ideal constant current source, Practical constant voltage source, Practical constant current source, Thevnins theorem,

Norton's theorem, Superposition theorem, Maximum power transfer theorem, duality theorem, numerical problems.

Unit III: Series AC Circuits (Book 1, Ch. 3) (15 Lectures)

Introduction, AC through resistance, inductance and capacitance, AC through R & L: power factor, active and reactive components of circuit current (I), active, reactive and apparent power, Q factor of coil, AC through RC, AC through R-L and C, resonance in R-L-C circuit, graphical representation of series resonance, resonance curve, half power band-width of a series LCR resonant circuit, Q factor of a series LCR resonant circuit, numerical problems.

Unit IV: Parallel AC Circuits (Book1, Ch. 14) (06 Lectures)

Introduction, resonance in parallel LCR circuits, graphical representation of parallel LCR resonant circuit, band width of a parallel LCR resonant circuit, Q factor of a parallel LCR resonant circuit, numerical problems.

Recommended Books:

1. A text book of electrical technology Vol-I: B.L. Theraja, A.K. Theraja, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010)

2. Basic Electronics: Solid State - B.L. Theraja, S. Chand and Company Ltd. Ramnagar, New Delhi (2009)

3. A text book of electrical technology, by B.L. Theraja Vol. I, Nirja Construction and Development Company

Reference Books:

4. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition

5. A Tex book applied electronics – R.S. Sedha, S. Chand and Company Ltd. (2004)

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Electronics) Semester I

Course Code: U-ELE-145

Course Title: Semiconductor Devices-II

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 45

Learning Objectives:

(1) To inculcate the knowledge about the components used in electronics, such as resistances, capacitors, diodes, transistors, UJT, FET, MOSFET and others.

(2) To develop the measurement ability among the students about the various electronic components,

(3) To make students familiar about the measurements of voltage, current, resistance, AC as well as DC using multimeters, also measurement of voltage and frequencies of the waves using CRO and VTVM.

Course Outcomes: After completion of course students will be able to:

(1) Select and measure the electronic components like resistors, capacitors, diodes, transistors, UJT, FET, MOSFET, etc.

(2) Handle multimeters, CRO and VTVMs and able to make accurate measurements.

(3) Know the characteristics of diodes and transistors

(4) Identify different models of BJT, regions of operations, and their IV-characteristics

(5) Demonstrate the knowledge of MOSFET (JFET) region models and their IV-characteristics

Unit I: Semiconductor Diode (Book1, Ch. 2, 3) (12 Lectures)

The unbiased diode, forward bias, reverse bias, V–I characteristics of diode, break down, energy levels, the energy hills, barrier potential and temperature, basic ideas; basic diode circuit, forward region, knee voltage, bulk resistance, maximum DC forward current, the ideal diode, the second approximation, the third approximation, bulk resistance, DC or static resistance of diode, dynamic or AC resistance of diode.

Unit II: Special Diodes (Book 2, Ch. 15) (08 Lectures)

Zener diode, Tunnel diode, Varactor diode, PIN diode, Schottky diode, Light emitting diode, Photodiode, Uses of each diode (qualitative analysis)

Unit III: Transistors (Book 2, Ch. 18) (12 Lectures)

A Bipolar Junction transistor, transistor biasing, important biasing rules, FF, RR, FR biasing, transistor circuit configurations, CB and CE configurations, relation between α and β, relation between transistor currents, transistor characteristics in C-E, C-B and C-C configurations, numerical problems.

Unit IV: Field Effect Transistors (Book 2, Ch. 26) (13 Lectures)

Introduction, J-FET: Construction, operation, static characteristics of JFET, JFET drain characteristics with VGS=0, JFET characteristics with external bias, transfer characteristics, small signal JFET parameters, common source JFET as an amplifier, advantages of JFET, MOSFET or insulated gate FET, depletion enhancement -MOSFET, schematic symbols for a depletion enhancement -MOSFET, static Characteristics of depletion enhancement-MOSFET, enhancement only n-channel MOSFET and its transfer characteristics, numerical problems.

Recommended Books:

1. Electronic Principles, Sixth Edition, A.P. Malvino, Tata McGraw-Hill Publications (Multicolor Illustrative Edition)

2. Basic Electronics Solid State: B.L. Theraja, S.Chand and Company Ltd.

3. Principles of Electronics: V.K. Mehta, Rohit Mehta, (2005) S. Chand and Company Ltd. Ramnagar, New Delhi.

Reference Books:

4. A Text Book of Applied Electronics: R. S. Sedha (2004), S. Chand and Company Ltd. Ramnagar, New Delhi.

5. Electronic Fundamentals and Applications (Integrated and Discrete system), John D. Ryder (1989) Prentice Hall of India, Pvt. Ltd. New Delhi – 110001

6. Electric Principles, Third Edition, A.P. Malvino, Tata McGraw-Hill Publications

7. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI P. Ltd , New Delhi

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Electronics) Semester I

Course Code: U-ELE-146

Course Title: Electronics Laboratory Course-I

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 45

Learning Objectives:

(1) To understand the use of basic instruments such as: Voltmeter, Ammeter, Multimeters, Signal generator, CRO, etc.

(2) To Study the characteristics and use of various semiconductor devices and electronic component such as diode, LED, JFET, Zener diode, Photodiode R, L, C and use of color code formula.

(3) To verify some network theorems such as maximum power transfer theorem and Thevenin theorem.

(4) Study of series resonance.

(5) Determination of values of resistors using color code formula and verification of it by multimeter.

Course Outcomes:

Upon successful completion of this lab work students get better knowledge and skills about

(1) Uses of semiconductor devices such as diode, LED, JFET, Zener diode, Photodiode,

(2) Handling and making use of CRO and signal generator for the measurement of frequency, time, amplitude, phase of signal also to differentiate AC and DC with the help of CRO,

(3) Handling the multimeter for various purposes such as for measurement of AC, DC, Resistance, Testing of continuity of circuit and semiconductor devices,

(4) Applying the circuit theorems for the determination of circuit current through resistance and voltage across the same,

(5) Illustrating the idea of resonance in electric circuits.

List of Experiments

1. Verification of maximum power transfer theorem for DC Circuits.

2. Verification of Thevnins theorem for DC Circuits

3. Determination of values of given resistors by using colour code and verification of them by multimeter.

4. Determination of amplitude, frequency and time period of given wave form using CRO.

5. Study of LED Characteristics
6. Study of Zener diode reverse characteristics
7. Study of Photodiode reverse characteristics
8. Study of n- channel JFET characteristics
9. Study of series LCR resonance circuit
10. Study of LCR parallel resonance circuit

Note: Each Student has to complete at least 6 experiments.

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Electronics) Semester I

Course Code: U-ELE-245

Course Title: Power Supplies and Active Filters-III

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 45

Learning Objectives:

(1) To develop understanding about the power supplies using AC mains,

(2) To inculcate the idea about the transformer and its working,

(3) To develop the skill of design of Regulated power supplies of different ratings and voltage ranges,

(4) To make students familiar about three terminal regulators and IC regulators of variable power supply voltages,

(5) To inculcate the idea about various filters like R-L filter, R-C pass band filter, Band reject filters, band stop filters, low pass filters and high pass filters.

Course Outcomes: After completion of this course student will be able to

(1) Construct the necessary power supplies of different ratings,

(2) Construct and use transformers,

(3) Explain usefulness of wave filter and their uses in electronic circuitry.

(4) Design regulated power supplies

Unit I: Transformers (Book1, Ch. 27) (12 Lectures)

Working principle of a transformer, transformer construction, elementary theory of an ideal transformer, emf equation of a transformer, voltage transformation ratio, losses in a transformer, efficiency of a transformer, condition for maximum efficiency, auto transformer, numerical problems.

Unit II: Unregulated Power Supplies (Book 2, Ch. 17) (12 Lectures)

Introduction, Unregulated power supply, steady & pulsating dc voltages, and rectifiers: half wave rectifier, full wave rectifier, full wave bridge rectifier, Filters: series inductor filter, shunt capacitor filter, LC filter, C-L-C (π) filter, numerical problems.

Unit III: Regulated Power Supplies (Book 2, Ch. 17) (12 Lectures)

Voltage regulation, Zener diode shunt regulator, transistor series voltage regulator, control transistor series regulator, transistor shunt voltage regulator, monolithic or IC voltage regulator, Fix voltage regulator using IC 74XX and 79XX, adjustable voltage regulator using IC LM 317, numerical problems.

Unit IV: Wave filters (Book 3, Ch. 17, Book 4) (09 Lectures)

Introduction, applications, different types of wave filters, low pass RC filter, low pass R-L filter, high pass R-C filter, high pass R-L Filter, R-C band pass filter, R-C band stop filter, numerical problems

Recommended Books:

1. A Text Book of Electrical Technology (SI Units), Vol II- B.L. Theraja, Publication Division (U-I) of Nirja Construction & Development Company Pvt. Ltd.

2. Basic Electronics Solid State, B.L. Theraja (2009) S. Chand and Company Ltd. Ramnagar, New Delhi

3. A Text Book of Electrical Technology (in SI Units) Vol. I, B.L. Theraja, A.K. Theraja, (2010) S. Chand and Company Ltd. Ramnagar, New Delhi

Reference Books:

1. A Text Book of Applied Electronics, R.S. Sedha, (2004) S. Chand and Company Ltd. Ram Nagar, New Delhi.

2. Principles of Electronics, V.K. Mehta, Rohit Mehta, (2005), S. Chand and Company Ltd. Ram Nagar, New Delhi.

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Electronics) Semester I

Course Code: U-ELE-246

Course Title: Amplifiers and Number Systems-IV

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 45

Learning Objectives:

(1) To develop the concepts about operating point,

(2) To develop the knowledge about types of biasing and its usefulness,

(3) To introduce small signal behavior of transistors,

(4) To inculcate the knowledge about h parameter equivalent circuits for the three transistor configurations CE, CB, CC,

(5) To familiarize the concepts of feedback amplifiers,

(6) To familiarize with different number systems and their applications.

Course Outcomes:

After successful completion of the course the students will be able to:

(1) Draw AC-DC load line and evaluate different parameters of amplifier,

(2) Explore use of biasing circuits in various applications,

(3) Solve the problems on small signal amplifiers,

(4) Draw the h parameter equivalent circuits for the transistor configurations CE, CB, CC,

(5) Compare CC, CE and CB with respect to Ri, Ro, Ai, and Av.

(6) Compare the four negative feedback topologies,

(7) Represent numerical values in various number systems and perform binary arithmetic and conversions between different number systems,

(8) Measure the bandwidth of an amplifier from a graph of voltage gain against frequency.

Unit I: Transistor Biasing (Book 1, Ch. 20) (12 Lectures)

Introduction, DC load line, Q point and maximum undistorted output, AC load line, need for biasing a transistor, factors affecting bias variations, stability factor, beta sensitivity, stability factor for CB & CE circuits, different methods for transistor biasing: base bias with emitter feedback, voltage divider bias, numerical problems.

Unit II: Small Signal Amplifiers (Book 2, Ch. 7) (12 Lectures)

Introduction, hybrid parameters, AC equivalent circuit using h-parameters, transconductance model, analysis of CE amplifier, CB amplifier, CC amplifier using h parameters, numerical problems.

Unit III: Feedback Amplifiers (Book 1, Ch. 25) (12 Lectures)

Introduction, principle of feedback amplifiers, advantages of negative feedback: gain stability, decreased distortion, increased bandwidth, forms of negative feedback: current – series feedback amplifier, voltage series negative feedback amplifier, numerical problems

Unit IV: Number Systems (Book 3, Ch. 1) (09 Lectures)

Introduction, Digital representation of analog quantities, types of number systems: binary number system, octal number system, hexadecimal number system, signed binary number representation, 1's complement representation, 2's complement representation, binary arithmetic: Binary addition and Binary subtraction, conversion of numbers from one system to another, numerical problems.

Recommended Books:

1. Basic Electronics (Solid-state) (Multicolor Illustrative Edition) B.L. Theraja. (S. Chand & Company Ltd)

2. Electric Fundamentals and Applications – John. D. Ryder (Prentice – Hall of India Pvt. Ltd.)

3. Modern Digital Electronics – R.P. Jain, Tata McGraw Hill Pub, Company (3rd edition)

Reference Books:

4. Digital fundamental- Floyd (2005) Pearson Education

5. A text book of Applied Electronics- R. S. Sedha. (2008) S. Chand Publishing

6. Digital Electronics with practical Approach, G.N. Shinde, Shivani Publications (2003)

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Electronics) Semester I

Course Code: U-ELE-247

Course Title: Electronics Laboratory Course-II

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 45

Learning Objectives:

(1) To inculcate the idea of rectification with the help of P-N junction diode and types of rectification,

(2) To develop the understanding about voltage regulation using Zener shunt regulator and transistor series regulator,

(3) To familiarize students with frequency filters such as RC Low pass and High pass filter,

(4) To develop better idea of transformer (Static devices),

(5) To equip the students with transistor characteristics and transistor amplifier under CE configuration.

Course Outcomes:

After successful completion of this lab work students get better knowledge and ideas about

(1) Full process of rectification, Difference between AC and DC,

(2) Is the rectification is sufficient for the conversion of AC and DC?

(3) The working of transistor in three different regions (Cut off, Saturation and active),

(4) How transistor is used for amplification of weak signals.

List of Experiments

1) V-I characteristics CE NPN transistor

2) Single stage CE amplifier (Frequency Response)

3) Study of step down transformer

4) Study of half wave rectifier with and without filter

5) Study of full wave rectifier with and without filter

6) Study of Zener shunt regulator

7) Study of Transistor series regulator

8) Study of passive low pass RC filter

9) Study of passive high pass RC filter

*** Note: At least six experiments should be performed.**

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Electronics) Semester I and II

Question Paper Pattern

Continuous Internal Assessment

Unit Test I	Home Assignment	05 Marks
Unit Test II	Activity based Test (Surprise test, Seminar, Group discussion, Poster presentation etc.)	10 Marks (20 Marks converted into 10 Marks)
Attendance	Attendance	05 Marks
	Total	20 Marks

Semester End Examination Question Paper Pattern for Core Course: Electronics I / II

Marks: 30 Time: One and half Hour

Q.1. Solve any three of the following.

A) One long question/ Two short questions on Unit I 10 Marks

Or

One long question/ Two short questions on Unit I 10 Marks

B) One long question/ Two short questions on Unit II 10 Marks

Or

One long question/ Two short questions on Unit II 10 Marks

C) One long question/ Two short questions on Unit III 10 Marks

Or

One long question/ Two short questions on Unit III 10 Marks

D) One long question/ Two short questions on Unit IV 10 Marks

Or

One long question/ Two short questions on Unit IV 10 Marks