Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

BoS in Electronics

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

(w.e.f. Academic Year 2017-18)

SYLLABUS FOR B.Sc.-I EXAMINATION

B.Sc.-I, ELECTRONICS

JUNE -2017

Rajarshi Shahu Mahavidyalaya Latur
(Autonomous)
Department of Physics and Electronics (w.e.f. 2017-18)
Structure of B.Sc. I Electronics Syllabi under
Choice Based Credit System

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

B.Sc. I -Sem I
Course Code- U-ELE-144

AC Fundamentals and Circuit Analysis-I

No. of hrs/wk: 3, Marks: 50, Credits: 2, Total periods -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 and parallel 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 Periods)

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 Periods)

Introduction, electric circuits, Kirchhoff's laws, determination of voltage sign, assumed direction of current, ideal constant voltage source, ideal 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 Periods)

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 resonant circuit, Q factor of a series resonant circuit, numerical problems.

Unit – IV: Parallel AC Circuits (Book1, Ch 14): (6 Periods)

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

Recommended Books:

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

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

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

Reference Books:

4. Basic Electronics, Tenth Edition – Bernard Grob, Tata Mc-Graw Hill Publications

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

B.Sc. I -Sem I

Course Code- U-ELE-145

Semiconductor Devices -II

No. of hrs/wk: 3, Marks: 50, Credits: 2, Total periods -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:

(1) After completion of course students are able to select and measure the electronic components like resistors, capacitors, diodes, transistors, UJT, FET, MOSFET etc.

(2) Students will be able to handle multimeters, CRO and VTVMs and able to make accurate measurements.

Unit – I: Semiconductor Diode (Book1, Ch2, 3) (12 Periods)

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) (8 Periods)

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, Ch18) (12 Periods)

A bipolar Junction transistor, transistor biasing, important biasing rules, FF, RR, FR biasing, transistor circuit configurations, CB and CE configurations, relation between dc & dc, 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 Periods)

Introduction, J-FET: Construction, operation, static characteristics of JFET, JFET drain characteristics, with $V_{GS} = 0$, 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 & Company Ltd.

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

References:

4. A Text Book of Applied Electronics: R. S. Sedha (2004), S. Chand & 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

B.Sc. I -Sem I
Course Code- U-ELE-146, Paper- II
Electronics Laboratory Course-I
No. of hrs/wk: 3, Marks: 50, Credit: 1

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) Practically verification of 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.
2. Verification of Thevnins theorem
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. LED Characteristics
6. Zener diode characteristics
7. Photo diode characteristics
8. Study of JFET characteristics
9. Study of series resonance circuit

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

B.Sc. I Semester: II
Course Code- U-ELE-245
Power Supplies and Active Filters-III
No. of hrs/wk: 3, Marks: 50, Credits: 2, Total Periods-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, high pass filters.

Course Outcomes:

(1) After completion of this course student will be able to construct the necessary power supplies of different ratings,

(2) Students will be able to construct and use transformers,

(3) Students will be able to explain usefulness of wave filter and their uses in electronic circuitry.

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

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 Periods)

Introduction, Unregulated power supply, steady & pulsating dc voltages, 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 Periods)

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

Unit – IV Wave filters (Book 3, Ch.17, Book 4) (9 Periods)

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 pas 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 & 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 & Company Ltd. Ramnagar, New Delhi

References:

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

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

B.Sc. I Semester: II
Course Code- U-ELE-246
Amplifiers and Number Systems-IV
No. of hrs/wk: 3, Marks: 50, Credits: 2, Total periods -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, Av,

(6) Compare the four negative feedback topologies,

(7) Represent numerical values in various number systems and perform binary arithmetic and number 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 Periods)

Introduction, DC load line, Q point and maximum undistorted input, 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, AC load line, numerical problems.

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

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 Periods)

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

Unit – IV : Number Systems (Book 3, Ch.1) (9 Periods)

Introduction, types of number systems: decimal number system, binary number system, octal number system, hexadecimal number systems, binary arithmetic: 1's and 2's compliment, octal addition and subtraction, hex addition & 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:

1. Digital fundamental- Floyd

2. A text book of Applied Electronics- R. S. Sedha.

B.Sc. I Sem II
Course Code- U-ELE-247
Electronics Laboratory Course-II
No. of hrs/wk: 3, Marks: 50, Credit: 1

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 filter such as RC Low pass and High pass,

(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) Further they know rectification is not only sufficient for the perfect conversion of AC to DC the conversion but also voltage regulation and filtering is must for obtaining DC from AC and stabilizing with the help of transistor series regulator,

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

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

List of Experiments

1) CE transistor characteristics
2) Single stage CE amplifier (Frequency Response)
3) Study of transformer
4) Study of half wave rectifier
5) Study of full wave rectifier
6) Study of Zener shunt regulator
7) Study of Transistor series regulator
8) Study of low pass RC filter
9) Study of high pass RC filter

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

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Continuous Internal Assessment

Unit Test I : MCQ based Test - 30 marks

Unit Test II: Activity based Test - 30 marks

(Surprise test, Seminar, Group discussion, Poster presentation etc.)

Attendance: 05 marks

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End Semester 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
Or **10 Marks**
One long question/ Two short questions on Unit I

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

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

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