Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Structure and Curriculum of B.Sc. (Degree) in Electronics Programme with Multiple Entry and Exit Options

Undergraduate Programme of Science and Technology

B.Sc. (Degree) in Electronics

Board of Studies in Electronics
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

w.e.f. June, 2023
(In Accordance with NEP-2020)

Academic Year: 2023-24

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc. (Degree) in Electronics** Programme to be effective from the **Academic Year 2023-24.** It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 09/08/2023

Place: Latur

NEP Cell
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the Curriculum of **B.Sc. (Degree) in Electronics** Programme to be effective from the **Academic Year 2023-24.**

Date: 14/07/2023
Place: Latur

Dr. A. A. Yadav
Chairperson
Board of Studies in Electronics
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

Shiv Chhatrapati Shikshan Sanstha's

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(Autonomous)

Members of Board of Studies in the Subject Electronics

Under the Faculty of Science and Technology

Sr. No.	Name	Designation	In position
1	**Dr Abhijit Yadav** Head, Department of Physics and Electronics, Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Chairperson	HoD
2	**Dr Ganesh Shinde** Principal, Yashwant Mahavidyalaya, Nanded	Member	V.C. Nominee
3	**Dr S.D. Gothe** HoD Electronics Sangmeshwar College, Solapur (Autonomous)	Member	Academic Council Nominee
4	**Dr G.S. Shahane** DBF Dayanand college, Solapur	Member	Expert from outside for Special Course
5	**Dr R.V. Dhekale** Perfect Electronics, Dattanagar Wai, Satara.	Member	Expert from Industry
6	**Dr Rangrao Suryawanshi** Azad College, Ausa	Member	P.G. Alumni
7	**Dr Renuka Londhe** Rajarshi Shahu Mahavidyalaya, Latur (Autonomous)	Member	Faculty Member
8	**Dr Dayanand Raje**	Member	Member from Same Faculty
9	**Mr Atul More**	Member	Member from Same Faculty
10	**Mr Swapnil Undalkar**	Member	Member from Same Faculty
11	**Miss Mayuri Hawaldar**	Member	Member from Same Faculty
12	**Miss Vishakha Patil**	Member	Member from Same Faculty
13	**Mr. Suraj Gund**	Member	Member from Same Faculty

From the Desk of the Chairperson…

"Electronics is clearly the winner of the day"

- John Ford

We have immense pleasure to share that our department is with the state-of-the-art facilities and has highly qualified and dignified faculty. This specific program is in accordance with NEP 2020 which enables electronics graduates to develop the technological and competitive skills needed in the design and operating modern telecommunication systems and networks. I take great pride in sharing that this programme follows outcome-based education in the teaching learning process. The department strives to provide a favorable environment for the students to develop electronic insights and practical skills and apply them to real world problems. In order to motivate the students, the department organizes regular trainings in various aspects of Electronics and to enrich their knowledge, the department arranges various workshops, national and international conferences every year. Faculty visits to leading universities in the globe are very much encouraged and appreciated. Awards, scholarships and recognitions speak a long way about the quality of faculty and students with the constant support and encouragements of the Management of the College.

Our Electronics curriculum which is in accordance with NEP 2020 integrates the Science and technology of all that makes communication through electronic devices. Electronics students design, build and manage systems that transmit process and store information as electrical or optical signals, addresses the critical challenges to face the society, industry and the academia. It is worthwhile to express our care and commitment to our students, guiding them to learn, grow, develop and achieve their goals in their pursuits so as to excel in their career in a every influencing domain. Let me take the opportunity to thank and wish you all a great success.

Dr. A. A. Yadav
Chairperson
Board of Studies in Electronics

Shiv Chhatrapati Shikshan Sanstha's

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(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Structure for Undergraduate Degree Programme in Electronics with Multiple Entry and Exit (In accordance with NEP-2020)

Year & Level	Sem	Major		Minor	GE/OE	VSC/ SEC (VSEC)	AEC/ VEC	OJT, FP, CEP, RP	Credit per Sem.	Cum./Cr. per exit
		DSC	DSE							
1	**2**	**3**		**4**	**5**	**6**	**7**	**8**	**9**	**10**
I 4.5	I	DSC I: 04Cr. DSC II: 04Cr.	NA	NA	GE-I: 04Cr.	VSC-I: 02Cr. SEC-I: 02Cr.	AEC-I MIL: 02Cr. VEC-I: 02Cr.	CC-I: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-I: 02Cr. (SES-I)/ OJT: 02Cr. / Mini Project: 02Cr.	22	44Cr. UG Certificate
	II	DSCIII: 04Cr. DSC IV: 04Cr. (IKS)	NA	NA	GE-II: 04Cr.	VSC-II: 02Cr. SEC-II: 02Cr.	AEC-II MIL: 02Cr. VEC-II: 02Cr.	CC-II: 02Cr. (NSS, NCC, Sports, Cultural)/ CEP-II: 02Cr. (SES-II)/ OJT: 02Cr. / Mini Project: 02Cr.	22	
	Cum. Cr.	16	-	-	08	04+04= 08	02+02+ 02+02= 08	04	44	
Exit Option: Award of UG Certificate in Major with 44 Credits and Additional 04 Credits Core NSQF Course/Internship or continue with Major and Minor										

Abbreviations:

1.	DSC	: Discipline Specific Core (Major)
2.	DSE	: Discipline Specific Elective (Major)
3.	DSM	: Discipline Specific Minor
4.	OE	: Open Elective
5.	VSEC	: Vocational Skill and Skill Enhancement Course
6.	VSC	: Vocational Skill Courses
7.	SEC	: Skill Enhancement Course
8.	AEC	: Ability Enhancement Course
9.	MIL	: Modern Indian Languages
10.	IKS	: Indian Knowledge System
11.	VEC	: Value Education Courses
12.	OJT	: On Job Training
13.	FP	: Field Projects
14.	CEP	: Fostering Social Responsibility & Community Engagement (FSRCE)
15.	CC	: Co-Curricular Courses
16.	RP	: Research Project/Dissertation
17.	SES	: Shahu Extension Services

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Faculty of Science and Technology

Department of Physics and Electronics

B.Sc. (Degree) in Electronics

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.
I 4.5	I	101ELE1101 (DSC-I)	AC Fundamentals and Circuit Analysis	03	45
		101ELE1103	Lab Course-I	01	30
		101ELE1102 (DSC-II)	Semiconductor Devices and Instrumentation	03	45
		101ELE1104	Lab Course-II	01	30
		101ELE1501 (VSC-I)	Domestic Electrical Appliances and their Maintenance	02	45
		GE-I	From Basket	04	60
		(SEC-I)	From Basket	02	30
		(AEC-I)	From Basket	02	30
		(VEC-I)	Constitution of India	02	30
		AIPC/OJT-I	Field Project	02	60
	Total Credits			**22**	
	II	101ELE2101 (DSC-III)	Power Supplies and Active Filters	03	45
		101ELE2103	Lab Course-III	01	30
		101ELE2102 (DSC-IV)	Amplifiers and Number Systems	03	45
		101ELE2104	Lab Course-IV	01	30
		101ELE2501 (VSC-II)	Mobile Repairing	02	45
		GE-II	From Basket	04	60
		(SEC-II)	From Basket	02	30
		(AEC-II)	From Basket	02	30
		(VEC-II)	FSRCE (CBPR)	02	30
		AIPC/OJT-II	IKS	02	60
	Total Credits			**22**	
Total Credits (Semester I & II)				**44**	

Programme Outcomes (POs) for B.Sc. Programme	
PO No.	Upon completion of this programme the students will be able to
PO1	Distinguish core knowledge on various courses of Physics.
PO2	Recognize the concepts which help them in understanding physical phenomenon in nature
PO3	Classify skills and competencies to conduct scientific experiments related to Physics.
PO4	Identify their area of interest and further specialize in the Physics.
PO5	Operate advanced knowledge and skills in job market for various technical industries.
PO6	Relate their knowledge and skills in carrying out independent work
PO7	Analyze situations, search for truth and extract information, formulate and solve problems in a systematic and logical manner.
PO8	Discuss debate and communicate in a clear and logical way, with graduates in Physics and other fields
PO96	Demonstrate relevant generic skills and global competencies.

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Faculty of Science and Technology

Department of Physics and Electronics

Programme Specific Outcomes (PSOs) for B.Sc. (Degree) Electronics	
PSO No.	Upon completion of this programme the students will be able to
PSO1	Attain a sound level of basic Electronics and lay a secure foundation for research and higher studies.
PSO2	Develop problem-solving skills, experimental and data analysis skills in Electronics.
PSO3	Learn various concepts which help them in understanding the construction and working of electronic equipment.
PSO4	Develop problem solving skills and learn various concepts which help in developing logical tools and models used to solve various real-life problems.
PSO5	Analyze situations, search for truth and extract information, formulate and solve problems in a systematic and logical manner.
PSO6	Help formulate graduate attributes, qualification descriptors, program learning outcomes, and course learning outcomes that are expected to be demonstrated by the holders of qualification.
PSO7	Maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility.
PSO8	Provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning level, and periodic review of programme and academic research.

Curriculum

Major and VSC Courses

Semester - I

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Faculty of Science and Technology

Department of Physics and Electronics

Course Type: DSC-I
Course Title: AC Fundamentals and Circuit Analysis
Course Code: 101ELE1101
Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To develop understanding about generation of single-phase AC, definitions pertaining to alternating quantities,

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

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

LO 4. To develop the strong foundation for electrical networks,

LO 5. To develop analytical qualities in electrical circuits by application of various theorems,

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

LO 7. To develop the skill for solving electrical networks problems.

Course Outcomes:

After completion of the course, the student will be able to-

CO 1. Understand and apply fundamental concepts of network theory to analyze electrical circuits.

CO 2. Solve complex electrical networks using various circuit theorems.

CO 3. Analyze AC circuits using impedance, reactance, and phasor techniques.

CO 4. Calculate and interpret key parameters such as power, phase angle, and power factor in RLC circuits with supporting waveform and phasor diagrams.

Unit No.	Title of Unit & Contents	Hrs.
I	**A.C. Fundamentals**	**12**
	1. Introduction, Generation of Alternating Voltage and Currents, 2 Equation of Alternating Voltage and Current, Alternate Method for The Equations of Alternating Voltages and Currents, 3. Simple and Complex Waveforms, Cycle, Time Period, Frequency and Amplitude, 4. Different Forms of Emf Equations, Phase and Phase Difference, Definition of RMS Value, Average Value, Form Factor, Peak Value and Amplitude Factor,	

	AC Through Resistance, Inductance and Capacitance.	
	Unit Outcomes: UO1. Have strong basics for network theory, UO2. Construct experimental AC circuits using schematics and perform tests and measurements with a multimeter and signal generator.	
II	**DC Network Theorems**	**12**
	1. Introduction, Electric Circuits, 2. Kirchhoff's Laws, Determination of Voltage Polarities, Assumed Direction of Current, 3. Ideal Constant Voltage Source, Ideal Constant Current Source, Practical Constant Voltage Source, Practical Constant Current Source, 4. Thevnin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Duality Theorem, 5. Delta/Star and Star/Delta Transformation. 6. Numerical Problems.	
	Unit Outcome: UO1. Understand the fundamental concepts of electric circuits and apply Kirchhoff's laws to analyze circuit behavior. UO2. Apply network theorems and transformation techniques to simplify and solve electrical circuits effectively.	
III	**Series AC Circuits**	**15**
	1. Introduction, AC Through Resistance, Inductance and Capacitance, AC Through R & L, 2. Power Factor, Active and Reactive Components of Circuit Current (I), 3. Active, Reactive and Apparent Power, Q Factor of Coil, 4. AC Through RC, AC Through R-L And C, Resonance In R-L-C Circuit, 5. Graphical Representation of Series Resonance, Resonance Curve, Half Power Band-Width of A Series LCR Resonant Circuit, 6. Q Factor of a Series LCR Resonant Circuit, 7. Numerical Problems.	
	Unit Outcomes: UO1. Calculate the impedance, phase angle, power, power factor, voltage and/or current in series RLC circuit, UO2. Understand and use the concept of impedance and reactance to analyze simple ac series circuits,	
IV	**Parallel AC Circuits**	**06**

	1. Introduction 2. Resonance in Parallel LCR Circuits, 3. Graphical Representation of Parallel LCR Resonant Circuit, Band Width of a Parallel LCR Resonant Circuit, 4. Q Factor of a Parallel LCR Resonant Circuit, Series-Parallel Circuits. 5. Numerical Problems.	
	Unit Outcomes: UO 1. Draw the relevant phaser diagrams and waveform diagrams of voltage and current, for pure resistance, inductance and capacitance. UO 2. Demonstrate the phase and amplitude information of RLC in frequency domain.	

Learning Resources:

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
4. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition
5. A Text book applied electronics – R.S. Sedha, S. Chand and Company Ltd. (2004).
6. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI Pvt. Ltd, New Delhi.
7. Electronic Fundamentals and Applications (Integrated and Discrete system), John D. Ryder (1989) Prentice Hall of India, Pvt. Ltd. New Delhi – 110001.
8. Electrical machines and Appliances theory-Tamilnadu Textbook corporation,College Road, Chennai - 600 006
9. Electric Principles, Third Edition, A.P. Malvino, Tata McGraw-Hill Publications
10. Principal of Electronics, V.K.Mehta and Rohit Mehta, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010).

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Faculty of Science and Technology

Department of Physics and Electronics

Course Type: Lab Course
Course Title: Lab Course –I (Based on DSC-I)
Course Code: 101ELE1103
Credits: 01 **Max. Marks: 50** **Hours: 30**

Learning Objective:

LO 1. To develop practical skills in the use of laboratory equipment and experimental techniques for studying basic instruments such as: Voltmeter, Ammeter, Multimeters, Signal generator, CRO, etc.

Course Outcomes:

After completion of course, the student will be able to-

CO 1. Understand the working and applications of semiconductor devices such as diodes, LEDs, JFETs, Zener diodes, and photodiodes.

CO 2. Operate and utilize CROs and signal generators for measuring signal parameters like frequency, time, amplitude, and phase.

CO 3. Use digital multimeters for measuring electrical quantities and testing circuit continuity and semiconductor components.

CO 4. Apply circuit theorems to analyze electrical circuits and illustrate the concept of resonance in AC circuits.

Practical No.	Unit
1	Verification of maximum power transfer theorem for DC Circuits.
2	Verification of Thevenin's 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 waveform using CRO.
5	Study of LED Characteristics
6	Study of Zener diode reverse characteristics
7	Study of Photodiode reverse characteristics
8	Study of LCR Series resonance circuit (digital AC current meter)
9	Study of LCR parallel resonance circuit (digital AC current meter)

Learning Resources:

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
4. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition
5. A Text book applied electronics – R.S. Sedha, S. Chand and Company Ltd. (2004).
6. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI Pvt. Ltd, New Delhi.
7. Electronic Fundamentals and Applications (Integrated and Discrete system), John D. Ryder (1989) Prentice Hall of India, Pvt. Ltd. New Delhi – 110001.
8. Electrical machines and Appliances theory-Tamilnadu Textbook corporation,College Road, Chennai - 600 006
9. Electric Principles, Third Edition, A.P. Malvino, Tata McGraw-Hill Publications
10. Principal of Electronics, V.K.Mehta and Rohit Mehta, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010).

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Faculty of Science and Technology

Department of Physics and Electronics

Course Type: DSC-II
Course Title: Semiconductor Devices
Course Code: 101ELE1102
Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

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

LO 2. To develop the measurement ability among the students about the various electronic components.

LO 3. To make students familiar about the measurements of voltage, current, resistance, AC as well as DC using multi meters.

LO 4. To make students familiar about the measurements of voltage and frequencies of the waves using CRO.

LO 5. To develop the measurement ability among the students about the various electronic Instruments like Dual power supply, Function Generators.

LO 6. To develop the strong foundation for electrical networks,

Course outcomes:

After completion of the course, the student will be able to-

CO 1. Identify and measure basic electronic components such as resistors, capacitors, diodes, transistors, UJT, FET, and MOSFET.

CO 2. Operate electronic instruments like multimeters, CROs, and VTVMs for accurate measurement and testing.

CO 3. Analyze the characteristics and working principles of diodes, BJTs, and MOSFETs in different regions of operation.

CO 4. Design and implement simple electronic circuits, including BJT biasing and diode-based applications.

Unit No.	Title of Unit & Contents	Hrs.
I	**Semiconductor Diode**	**12**
	1. The Unbiased Diode, Forward Bias, Reverse Bias, 2. V–I Characteristics of Diode, 3. Energy Levels, The Energy Hills, Barrier Potential and Temperature, 4. Basic Ideas; Basic Diode Circuit, Forward Region, Knee Voltage, Maximum DC Forward Current,	

	5. The Ideal Diode, The Second Approximation, The Third Approximation, 6. Bulk Resistance, DC or Static Resistance of Diode, Dynamic or AC Resistance of Diode. Load Lines. 7. Numerical Problems.	
	Unit Outcomes: UO1. Analyze the characteristics and theories in semiconductor materials in terms of crystal structures, charge carriers and energy bands. UO2. Explain how to find the fermi energy level and carrier density in n-type and p-type semiconductors.	
II	**Special Diodes**	**08**
	1. Introduction, 2. Zener Diode, 3. Tunnel Diode, Varactor Diode, 4. PIN Diode, Schottky Diode 5. Light Emitting Diode, Photodiode, 6. Uses of Each Diode (Qualitative Analysis), 7. Optoelectronic Devices. Numerical Problems,	
	Unit Outcomes: UO1. Know the characteristics of various diodes. UO2. Interpret various applications of diode.	
III	**Transistors**	**12**
	1. Introduction, Bipolar Junction Transistor, The Unbiased Transistor, 2. Transistor Biasing, Important Biasing Rules, FF, RR, FR Biasing, Voltage Divider Bias, 3. Transistor Circuit Configurations, CB And CE Configurations, Relation Between A and B, Relation Between Transistor Currents, 4. Transistor Characteristics In C-E, C-B And C-C Configurations, 5. Numerical Problems.	
	Unit Outcomes: UO1. Design a simple BJT bias circuit for a given specification UO2. Identify different models of BJT, regions of operations, and their IV-characteristics	
IV	**Field Effect Transistors**	**13**
	1. Introduction, 2. J-FET: Construction, Operation,	

	3. Static Characteristics of JFET, JFET Drain Characteristics with V_{GS}=0, JFET Characteristics with External Bias, Transfer Characteristics, 4. Small Signal JFET Parameters, Common Source JFET As an Amplifier, Advantages Of JFET, MOSFET Or Insulated Gate FET, Power FET's, 5. Depletion Enhancement -MOSFET, Schematic Symbols for A Depletion Enhancement -MOSFET, 6. Static Characteristics of Depletion Enhancement-MOSFET, Enhancement Only N-Channel MOSFET And Its Transfer Characteristics,	
	Unit Outcomes: UO1. Analyze (calculate voltages and currents) a simple MOSFET (JFET) bias circuit and find its Q-point. UO2. Demonstrate the knowledge of MOSFET (JFET) region models and their IV-characteristics.	

Learning Resources:

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. A Text Book of Applied Electronics: R. S. Sedha (2004), S. Chand and Company Ltd. Ramnagar, New Delhi.
4. Electronic Fundamentals and Applications (Integrated and Discrete system), John D. Ryder (1989) Prentice Hall of India, Pvt. Ltd. New Delhi – 110001
5. Electric Principles, Third Edition, A.P. Malvino, Tata McGraw-Hill Publications
6. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI P. Ltd, New Delhi
7. Principal of Electronics, V.K. Mehta and Rohit Mehta, S. Chand and Company Ltd.
8. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI P. Ltd, New Delhi.
9. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition
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Faculty of Science and Technology

Department of Physics and Electronics

Course Type: Lab Course
Course Title: Lab Course –II (Based on DSC-II)
Course Code: 101ELE1104
Credits: 01 **Max. Marks: 50** **Hours: 30**

Learning Objective:

LO 1. To train the students with the necessary skills to perform experiments on Ohm's law, Kirchhoff's Law, Transistor, etc.

Course outcomes:

After completion of the course, the student will be able to

CO 1. Verify fundamental network theorems such as Norton's, Kirchhoff's, and Superposition Theorems through practical circuits.

CO 2. Analyze the V-I characteristics of semiconductor devices like PN junction diodes, tunnel diodes, transistors, and JFETs.

CO 3. Demonstrate the input-output and transfer characteristics of NPN transistors in common emitter configuration.

CO 4. Study the behavior of RC and LR circuits during charging/discharging and current growth/decay processes.

Practical No.	Unit
1	Verification of Norton's theorem
2	Verification of Kirchhoff's Law.
3	Verification of Superposition Theorem.
4	Characteristics of Tunnel diode.
5	I/O and transfer characteristics of CE mode of NPN Transistor.
6	V-I Characteristics of P-N diode.
7	Study the V-I Characteristics of JFET.
8	Study the RC Circuit for Charging and Discharging of Capacitor through Resistor.
9	Study of Growth and decay of current in L-R Circuit.

Learning Resources:

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. A Text Book of Applied Electronics: R. S. Sedha (2004), S. Chand and Company Ltd. Ramnagar, New Delhi.
4. Electronic Fundamentals and Applications (Integrated and Discrete system), John D. Ryder (1989) Prentice Hall of India, Pvt. Ltd. New Delhi – 110001
5. Electric Principles, Third Edition, A.P. Malvino, Tata McGraw-Hill Publications
6. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI P. Ltd, New Delhi
7. Principal of Electronics, V.K. Mehta and Rohit Mehta, S. Chand and Company Ltd.
8. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI P. Ltd, New Delhi.
9. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition
10. Electric Principles, Third Edition, A.P. Malvino, Tata McGraw-Hill Publications

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Faculty of Science and Technology

Department of Physics and Electronics

Course Type: VSC-I

Course Title: Domestic Electrical Appliances and their Maintenance

Course Code: 101ELE1501

Credits: 02 **Max. Marks: 50** **Lectures: 30 Hrs.**

Learning Objectives:

LO 1. To create awareness about types and make of domestic appliances.

LO 2. To acquire knowledge about principles of operation, working and application of various domestic appliances

LO 3. To acquire skills in assembly, repair, installation, text and maintenance of domestic appliances.

Course Outcomes:

After completion of the course, the student will be able to-

CO 1. Identify and explain the basic working principles and components of common domestic electric appliances.

CO 2. Demonstrate skills in testing, fault detection, and basic maintenance of household electrical devices.

CO 3. Apply knowledge to ensure effective servicing of appliances and explore opportunities for self-employment.

CO 4. Develop technical proficiency in handling, assembling, and repairing domestic electrical equipment.

Unit No.	Title of Unit & Contents	Hrs.
I	**Basic Electronics**	**07**
	1. Electrical Conductors and Insulators, Voltage, Current, Resistance, Ohm's Law, 2. Capacitance, Inductance, Series and Parallel Combinations of Resistors, Galvanometer, Ammeter, Voltmeter, Multimeter, 3. Transformers, Electrical Energy, Power, Watt, Kilowatt Hour (kWh), Horse Power, Consumption of Electrical Power	
	Unit Outcomes: UO1. To understand the working principles of different household domestic appliances UO2. Acquire working knowledge on multimeters, galvanometers, ammeters, voltmeters, ac/dc generators, transformers.	

II	**Domestic Electric Appliances**	**08**
	1. Construction, 2. Working and Types: Electric Iron, Water Heaters, Electric Kittle, Coffee Maker, 3. Working and Types: Electric Mixer, Egg Beaters, Electric Fan, Hair Drier.	
	Unit Outcomes: UO1. Develop detailed knowledge about few Domestic Electric Appliances UO2. To realize basic working principal of home appliances	
III	**Safety Precautions and Maintenance**	**06**
	1. Introduction, 2. Tools for Maintenance: Electric Tester, Screw Driver, Nut Driver, Benches, Wrenches, 3. Tools for Maintenance: Hammers, Pliers, Cutters, Safety Precautions While Handling Tools and Repairing Appliances, Etc. 4. Importance of Earthing.	
	Unit Outcomes: UO1. Identify and demonstrate the use of various tools and safety precautions required for maintenance and repair of electrical appliances. UO2. Explain the significance of earthing and apply basic maintenance practices to ensure safety and functionality of electrical systems.	
IV	**Practical**	**08**
	1. Testing and repair of Electric Kittle. 2. Testing and repair of Electric Fan. 3. Testing and repair of Egg Beater. 4. Testing and repair of Coffee Maker. 5. Testing and repair of Electric Mixer. 6. Testing and repairs of Hair Drier. 7. Testing and repairs of Water Heater. 8. Dismantling and reassembling of Ordinary type and Automatic/Thermostat control type Electric Iron.	

Learning Resources:

1. Troubleshooting and Repair of Appliances-Eric Kleinert, 3rd Edition, 2012, Mc-Graw Hill Publishers
2. Study of Electrical Appliances & Devices-K.B. Bhatia (ISBN: 978-93-87394-22-3)

3. Fundamentals of Maintenance of Electrical Equipments- K.B. Bhatia (ISBN: 978-93-87394-31-5)
4. Electrical Machines and Appliances theory-Tamilnadu Textbook corporation, College Road, Chennai - 600 006.
5. A Text book on Electrical Technology, B.L. Theraja, S. Chand& Co.
6. A Text book on Electrical Technology, A.K. Theraja., S. Chand& Co.
7. Performance and design of AC machines, M.G. Say, ELBS Edn.
8. Consumer Electronics, S.P. Bali, Pearson.
9. Domestic Appliances Servicing, K.P. Anwer, Scholar Institute Publications.
10. Handbook of Repair & Maintenance of domestic electronics appliances; BPB Publications.

Semester - II

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Course Type: DSC-III
Course Title: Power Supplies and Active Filters
Course Code: 101ELE1201
Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To develop understanding about the power supplies using AC mains,

LO 2. To inculcate the idea about the transformer and its working,

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

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

LO 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 course, the student will be able to-

CO 1. Construct the necessary power supplies of different ratings,

CO 2. Construct and use transformers,

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

CO 4. Design regulated power supplies

Unit No.	Title of Unit & Contents	Hrs.
I	**Transformers**	**12**
	1. Introduction, 2 Working Principle of a Transformer, 3. Transformer Construction, Elementary Theory of An Ideal Transformer, 4. Emf Equation of a Transformer, Voltage Transformation Ratio 5. Emf Equation of a Transformer, Voltage Transformation Ratio. 6. Condition for Maximum Efficiency, Auto Transformer 7. Numerical Problems.	
	Unit Outcomes: UO1. Learn how to analyses circuits involving linear and ideal transformers., UO2. Be familiar with ideal transformer	

Unit No.	Title of Unit & Contents	Hrs.
II	**Unregulated Power Supplies**	**12**
	1. Introduction, 2. Unregulated Power Supply, 3. Steady & Pulsating DC Voltages, and Rectifiers, 4. Half Wave Rectifier, Full Wave Rectifier, Full Wave Bridge Rectifier, 5. Filters: Series Inductor Filter, Shunt Capacitor Filter, LC Filter, C-L-C (π) Filter 6 Numerical Problems.	
	Unit Outcomes: UO1. Construct the necessary power supplies of different ratings., UO2. Ability to design and analyzes simple rectifiers and understand the operation of rectifier circuit.	
III	**Regulated Power Supplies**	**12**
	1. Introduction, Voltage Regulation, 2. Zener Diode Shunt Regulator, Transistor Series Voltage Regulator, 3. Control Transistor Series Regulator, 4. Transistor Shunt Voltage Regulator, 5. Monolithic or IC Voltage Regulator, Fix Voltage Regulator Using IC 74XX And 79XX, Adjustable Voltage Regulator Using IC LM 317, 6. Numerical Problems.	
	Unit Outcomes: UO1. Able to observe and draw the static characteristics of a Zener diode., UO2. Student shall be able to construct and test Zener diode as voltage regulator.	
IV	**Wave filters**	**09**
	1. Introduction 2. Applications, 3. Different Types of Wave Filters, Low Pass RC Filter, Low Pass R- L Filter, High Pass R-C Filter, 4. High Pass R-L Filter, R-C Band Pass Filter, R-C Band Stop Filter. 5. Numerical Problems.	
	Unit Outcomes: UO1. Explain usefulness of wave filter and their uses in electronic circuitry. UO2. Emphasize the importance of filter circuits.	

Learning Resources:

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
4. A text book of electrical technology Vol-I: B.L. Theraja, A.K. Theraja, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010)
5. Basic Electronics: Solid State - B.L. Theraja, S. Chand and Company Ltd. Ramnagar, New Delhi (2009
6. A text book of electrical technology, by B.L. Theraja Vol. I, Nirja Construction and Development Company
7. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition
8. A Text book applied electronics – R.S. Sedha, S. Chand and Company Ltd. (2004).
9. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI P. Ltd, New Delhi
10. Principal of Electronics, V.K.Mehta and Rohit Mehta, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010).

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Course Type: Lab Course
Course Title: Lab Course – III (Based on DSC-III)
Course Code: 101ELE1203
Credits: 01 **Max. Marks: 50** **Hours: 30**

Learning Objectives:

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

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

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

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

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

Course outcomes:

After completion of course, the student will be able to-

CO 1. Full process of rectification, Difference between AC and DC,

CO 2. Is the rectification being sufficient for the conversion of AC and DC?

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

CO 4. How transistor is used for amplification of weak signals.

Practical No.	Unit
1	Study of step-up transformer
2	Study of step-down transformer
3	Study of half wave rectifier with and without filter.
4	Study of full wave rectifier with and without filter
5	Study of Zener shunt regulator
6	Study of Transistor series regulator
7	Study of passive low pass RC filter
8	Study of passive high pass RC filter
9	Study of Voltage regulation using IC74XX and IC79XX

Learning Resources:

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
4. A text book of electrical technology Vol-I: B.L. Theraja, A.K. Theraja, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010)
5. Basic Electronics: Solid State - B.L. Theraja, S. Chand and Company Ltd. Ramnagar, New Delhi (2009
6. A text book of electrical technology, by B.L. Theraja Vol. I, Nirja Construction and Development Company
7. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition
8. A Text book applied electronics – R.S. Sedha, S. Chand and Company Ltd. (2004).
9. Electronic Devices and Circuits: An Introduction- Allen Mottershead-PHI P. Ltd, New Delhi
10. Principal of Electronics, V.K.Mehta and Rohit Mehta, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010).

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Course Type: DSC-IV
Course Title: Amplifiers and Number Systems
Course Code: 101ELE1202
Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. To develop the concepts about operating point,

LO 2. To develop the knowledge about types of biasing and its usefulness,

LO 3. To introduce small signal behavior of transistors,

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

LO 5. To familiarize the concepts of feedback amplifiers,

LO 6. To familiarize with different number systems and their applications.

Course Outcomes:

After completion of the course, the student will be able to-

CO 1. Analyze transistor amplifier circuits using AC-DC load lines and evaluate key performance parameters.

CO 2. Demonstrate understanding of transistor biasing techniques and small signal amplifier analysis.

CO 3. Compare different transistor configurations (CE, CB, CC) and negative feedback topologies based on their characteristics.

CO 4. Apply number system conversions and perform binary arithmetic relevant to digital electronics.

Unit No.	Title of Unit & Contents	Hrs.
I	**Transistor Biasing**	**12**
	1. Introduction, 2. DC Load Line, 3. Q Point and Maximum Undistorted Output, 4. AC Load Line, Need for Biasing a Transistor, 5. Factors Affecting Bias Variations, Stability Factor, 6. Beta Sensitivity, Stability Factor for CB & CE Circuits, 7. Different Methods for Transistor Biasing: Base Bias with Emitter Feedback,	

	8. Voltage Divider Bias, 9.Numerical Problems.	
	Unit Outcomes: UO1. Draw AC-DC load line and evaluate different parameters of amplifier, UO2. Explore use of biasing circuits in various applications,	
II	**Small Signal Amplifiers**	**12**
	1. Introduction, 2. Hybrid Parameters, 3. AC Equivalent Circuit Using h-Parameters, 4. Transconductance Model, Analysis of CE Amplifier, 5. CB Amplifier, 6. CC Amplifier Using h Parameters, 7. Numerical Problems.	
	Unit Outcomes: UO1. Solve the problems on small signal amplifiers, UO2. Draw the h parameter equivalent circuits for the transistor configurations CE, CB, CC.	
III	**Feedback Amplifiers**	**12**
	1. Introduction, 2. Principle of Feedback Amplifiers, 3. Advantages of Negative Feedback: Gain Stability, 4. Decreased Distortion, 5. Increased Bandwidth, 6. Forms of Negative Feedback: Current – Series Feedback Amplifier, 7. Voltage Series Negative Feedback Amplifier, 8. Numerical Problems	
	Unit Outcomes: UO1. Compare CC, CE and CB with respect to Ri, Ro, Ai, and Av. UO2. Compare the four negative feedback topologies,	
IV	**Number Systems**	**09**
	1. Introduction 2. Digital Representation of Analog Quantities, 3. Types of Number Systems: Binary Number System, 4. Octal Number System, Hexadecimal Number System,	

	5. Signed Binary Number Representation, 6. 1's Complement Representation, 7. 2's Complement Representation, 8. Binary Arithmetic: Binary Addition and Binary Subtraction, 9. Conversion of Numbers from One System to Another, 10. Numerical Problems.	
	Unit Outcomes: UO1. Understand and represent analog quantities digitally using various number systems including binary, octal, and hexadecimal. UO2. Perform binary arithmetic operations and convert numbers between different number systems using complement methods.	

Learning Resources:

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)
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)
7. Digital Electronics Principle Device And Application, Anil Kumar, Wiley
8. Digital Logic and Computer Design Book by Morris Mano
9. Principal of Electronics, V.K. Mehta and Rohit Mehta, S. Chand and Company Ltd.
10. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Course Type: Lab Course
Course Title: Lab Course –IV (Based on DSC-IV)
Course Code: 101ELE1104
Credits: 01 **Max. Marks: 50** **Hours: 30**

Learning Objectives:

LO 1. To inculcate the idea of concepts about operating point.

LO 2. To develop the knowledge about types of biasing and its usefulness.

LO 3. To introduce small signal behavior of transistors.

LO 4. To familiarize the concepts of feedback amplifiers.

LO 5. To familiarize with different number systems and their applications.

Course outcomes:

After completion of the course, the student will be able to-

CO 1. Analyze the frequency response of single-stage CE and CC amplifiers and evaluate their voltage gain and input/output characteristics.

CO 2. Study and determine the biasing techniques, load-line analysis, and stability of transistor amplifiers.

CO 3. Examine the characteristics and working of power amplifiers and transistor configurations.

CO 4. Demonstrate binary arithmetic operations and number system conversions using digital circuits like BCD adder, subtractor, and binary-to-decimal converters.

Practical No.	Unit
1	Single stage CE amplifier (Frequency Response)
2	Single stage CC amplifier (Emitter follower)
3	Study of Transistor amplifier (Load, Line Analysis)
4	Study of transistor biasing and stability
5	Study of power amplifier.
6	Study of binary addition (BCD Adder)
7	Study of binary subtraction (BCD Subtractor)
8	Study of Binary to Decimal convertor
9	V-I characteristics CE NPN transistor

Learning Resources:

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)
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)
7. Digital Electronics Principle Device And Application, Anil Kumar, Wiley
8. Digital Logic and Computer Design Book by Morris Mano
9. Principal of Electronics, V.K. Mehta and Rohit Mehta, S. Chand and Company Ltd.
10. Basic Electronics, Bernard Grob, Tata Mc-Graw Hill Publications (2007) Tenth Edition.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science & Technology

Department of Physics and Electronics

Course Type: VSC-II
Course Title: Mobile Repairing
Course Code: 101ELE2501
Credits: 02 **Max. Marks: 50** **Lectures: 30 Hrs.**

Learning Objectives:

LO 1. To provide basic knowledge of Mobile Phones hardware.

LO 2. To provide hands on training on various identifying issues, troubleshoot issues and techniques.

Course Outcomes:

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

CO 1. Find the problem and solution of various Mobile Phone Devices.

CO 2. Start a mobile repair shop of their own.

CO 3. Perform any issue-related tasks such as identifying issues, troubleshoot issues, repairing mobile phones, etc.

CO 4. Get entry level (technician) jobs at relevant places, Mobile repair centers, mobile

CO 5. shops, mobile service centers

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Mobile**	**12**
	1 Information about Mobile 2 Invention of Mobile 3 Information about I-Phone 4 Invention of I Phone 5 Difference between Keypad mobile And Smartphone mobile	
	Unit Outcomes: UO1. Understand the evolution and technological development of mobile phones, including key inventions like the mobile and iPhone. UO2. Differentiate between various types of mobile devices such as keypad phones and smartphones based on their features and functionalities.	
II	**Information About IMEI number and tools for Mobile Repairing**	**10**
	1 Uses of IMEI number 2 Digit of IMEI number 3 Code of IMEI number	

	4 Information About all full forms 5. Tools for repair: Hot air gun, Shoulder gun, PCB Stand, multi-meter, Kathli, Battery Booster, Screwdriver set, Tweezers, Battery Meter, Brush, Thinner, Paste, Jumper wire, Computer.	
	Unit Outcomes: UO1. Identify the IMEI number UO2. Perform any issue-related tasks such as identifying issues, troubleshoot issues, repairing mobile phones, etc.	
III	**Practical**	**10**
	1. Study of Mobile Phone Dictionary: Full Forms of Terms Used in Mobile Phone. 2. Study of Mobile Phone Repairing Tools and Equipment. 3. Identification of Card Level Parts. 4. Identification of PCB. 5. Identification of Small Parts in a Mobile Phone. 6. Study About IC (Integrated Circuit) and Counting Techniques of Leg Type and Ball-Type IC. 7. Software Problems and Solutions in mobile repairing. 8. Multimedia and Downloading in Mobiles.	

Learning Resources:

1. Mobile Repairing Book in Hindi by Nitin Kothari
2. Mastering Mobile Learning by Chad Udell, Gary Woodill
3. Perfect Mobile Repairing Handbook: Smartphones Repairing Handbook Kindle Edition
4. Advance Mobile Repairing: Multicolour Circuits, Service Diagrams & Rep, Sanjib Pandit.
5. Mobile phone repair training course skills and research by MEI XIU JIANg.
6. Mobile Phones and Tablets Repairs: A Complete Guide for Beginners and Professionals, Chukky Oprandu

Open Elective Courses Offered by the Department

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Course Type: GE-I

Course Title: Fundamentals of Electronics and Domestic Wiring

Course Code: 101ELE1401/101ELE2401

Credits: 03 **Max. Marks: 75** **Lectures: 45 Hrs.**

Learning Objectives:

LO 1. Provide students with learning experiences that develops broad knowledge and understanding of key concepts of electrical and electronics,

LO 2. Provide students with skills that enable them to get employment in various organizations, industries, and turn as entrepreneurs,

Course Outcomes:

After completion of the course the student will be able to-

CO 1. Demonstrate knowledge of basic electronic components and their behavior in AC and DC circuits.

CO 2. Apply electrical theorems and techniques to analyze and solve electric circuits.

CO 3. Understand domestic wiring systems, including safety precautions and the use of electrician tools and protective devices.

CO 4. Construct and test electrical circuits using schematics, multimeters, and signal generators.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Electronics**	**13**
	1. Introduction to Electronics: Evolution of Electronics, 2. Definition and expression for of Charge, Current, Voltage, Potential Difference, Power, Energy. Coulombs Law, Ohm's Law 3. Electronic Components: Definition and list of passive and active components, 4. Resistors: Definition, application, and mention of types of resistors, color-coding of resistors, series and parallel combinations, 5. Capacitors: Definition, application and mention of types capacitors, series and parallel combinations, factors affecting capacitance, color-coding of capacitors, 6. Inductors: Definition, application, and mention of types of inductors, series and parallel combinations. Self and mutual inductance, factors affecting inductance. 7. Numerical problems	
	Unit Outcomes: UO 1. Gain the knowledge of basic electronics and electronic components Construct experimental ac circuits using schematics and perform tests and measurements with a multimeter and signal generator. UO 2. Analyze various components behaviour in AC and DC circuits	
II	**Network Theorems and Power Supplies**	**12**
	1. Kirchhoff's laws**:** KCL and KVL, voltage divider rule and current divider	

Unit No.	Title of Unit & Contents	Hrs.
	rule, open and short circuits, 2 Network Theorems (DC analysis only)**:** Thevenin's theorem, Norton's theorem and maximum power transfer theorem, Superposition Theorem (Qualitative Approach with statements and steps involved in solving) as applied to simple T-network, 3. DC power supplies**:** Block diagram and working, Application 4. Cells and Batteries: Primary and Secondary cells, Mention of types of batteries, series and parallel combination of batteries, 5. Lead Acid Battery**:** Construction, Internal resistance, Efficiency and capacity of a battery, condition of a fully charged and discharged lead acid battery.	
	Unit Outcomes: UO1. Apply Kirchhoff's laws and network theorems to analyze and solve basic DC electrical circuits. UO2. Understand the construction, working, and applications of DC power supplies, cells, and batteries, including the characteristics of lead-acid batteries.	
III	**AC Fundamentals**	**10**
	1. Definition and waveform of ac signal. Definition of Amplitude, Frequency, Time period, RMS value, average value, 2. Phase and phase angle difference of sinusoidal signal, 3. Sinusoidal signal applied to resistor, capacitor and Inductor, waveforms and phasor diagram for each, 4. Expression for capacitive and inductive reactance. Circuit diagram and working of series and parallel resonance circuits, 5. Expression for resonance frequency, 6. Transformers: Definition, construction, working principle and application, step-up and step-down transformers.	
	Unit Outcomes: UO1. Analyze the characteristics of AC signals and understand their behavior in resistive, inductive, and capacitive circuits using waveforms and phasor diagrams. UO2. Explain the concepts of resonance in AC circuits and understand the construction, working, and applications of transformers.	
IV	**Domestic Wiring**	**10**
	1. Introduction, 2. Types of Domestic Wiring, Cleat Wiring, Wooden/PVC Casing and Capping Wiring, Toughened Rubber Sheath (TRS or CTS) or Batten Wiring, Conduit Wiring, 3. Specifications of Wires, Size of Conductor, Distribution Board, Types of Cables, 4. Lighting Control Circuits, Earthing System,	

Unit No.	Title of Unit & Contents	Hrs.
	5. Fuses and HRC Fuses, Calculation of Fuse Rating, 6. Switches: Definition and application of switch, Brief note on SPST, SPDT, DPST and DPDT, electromagnetic relay, MCB, ELCB, RCCB, Toggle switch, push button, joystick, selector, limit, proximity switches.	
	Unit Outcomes: UO1. Use appropriate electrician tools, wires, protective devices and wiring accessories. UO2. Rig up wiring diagrams using conduit system of wiring.	

Learning Resources:

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 Electrical Engineering, C L Wadhwa, 4th Edition, New Age International Publisher, 2007.
3. Introductory circuit analysis, Robert Boylstead, 5th edition, PHI, 2010.
4. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, PHI, 2013)
5. ABC of Electrical Engineering, B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014).
6. Basic Electrical and Electronics Engineering, S. K. Bhattacharya Pearson Education India, 2012
7. Electronic Devices and Circuits, I. J. Nagrath, PHI Learning Pvt. Ltd., 2007.
8. Basic Electrical Engineering, V. Mittle and Arvind Mittle, McGraw Hill Companies, 2005
9. Basic Electronics, Mitchel E. Schultz, 10th Edition, TMH, 2010
10. Principle of electronics , V.K. Mehta, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010).

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Course Type: GE Lab Course-I

Course Title: Lab Course –I (Based on GE-I)

Course Code: 101ELE1402/101ELE2402

Credits: 01 **Max. Marks: 50** **Lectures: 30 Hrs.**

Learning Objective:

LO 1. The course equips the learners about basic circuit knowledge to analyze electric circuits using network theorems.

Course outcomes

After completion of the course, the student will be able to-

CO 1. Demonstrate basic domestic and electric board wiring techniques and identify key electrical components.

CO 2. Verify fundamental electrical theorems such as Kirchhoff's laws and the maximum power transfer theorem through experiments.

CO 3. Use electronic instruments like CRO to analyze AC signals and assemble basic electronic circuits on breadboards.

CO 4. Examine characteristics of electronic components such as LEDs, diodes, and inductors, and apply knowledge to practical energy-related projects.

Practical No.	Content
1	Demonstration of Domestic wiring in Labs.
2	Demonstration of Electric Board wiring in Labs.
3	Identification of electric components in electronics.
4	Verification of Kirchhoff's laws.
5	Verification of maximum power transfer theorem for DC Circuits.
6	Assembling electronic components on Breadboard
7	Determination of amplitude, frequency and time period of AC signal using CRO.
8	Study of LED Characteristics
9	Study of Diodes.
10	Study of inductors.
11	Project report on Power Generation in India.

Learning Resources:

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 Electrical Engineering, C L Wadhwa, 4th Edition, New Age International Publisher, 2007.

3. Introductory circuit analysis, Robert Boylstead, 5th edition, PHI, 2010.
4. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, PHI, 2013)
5. ABC of Electrical Engineering, B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014).
6. Basic Electrical and Electronics Engineering, S. K. Bhattacharya Pearson Education India, 2012
7. Electronic Devices and Circuits, I. J. Nagrath, PHI Learning Pvt. Ltd., 2007.
8. Basic Electrical Engineering, V. Mittle and Arvind Mittle, McGraw Hill Companies, 2005
9. Basic Electronics, Mitchel E. Schultz, 10th Edition, TMH, 2010
10. Principle of electronics , V.K. Mehta, S. Chand and Company Ltd. Ramnagar, New Delhi. (Reprint 2010).

Skill Enhancement Courses Offered by the Department

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science & Technology

Department of Physics and Electronics

Course Type: GE/OE

Course Title: Introduction to Arduino

Course Code: 101ELE1601

Credits: 02 **Max. Marks: 50** **Lectures: 30 Hrs.**

Learning Objectives:

LO 1. This course brings students over the beginner's threshold to a basic understanding of the use, terminology, and potential of the Arduino.

Course Outcomes:

After completion of course the student will be able to-

CO 1. Understand the fundamentals of Arduino, its programming environment, and the importance of learning a coding language.

CO 2. Identify and use electronic sensors and components to build basic circuits and interactive projects.

CO 3. Write Arduino programs and implement them in the design of smart system applications.

CO 4. Plan, design, and execute innovative Arduino-based projects independently from concept to completion.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Arduino**	08
	1. Overview of Arduino Learning objectives of Arduino, Prerequisites for learning Basic level Arduino, Prerequisites for learning Intermediate level Arduino, Who can use Arduino? **2. Introduction to Arduino** About Arduino device (Arduino Uno), Features of Arduino, Components of Arduino board, Description of Microcontrollers, Few examples where a Microcontroller is used, Installation of Arduino IDE on Ubuntu Linux OS, Run the Arduino executable file, The Arduino IDE window. **3. Arduino components and IDE** Set up a physical connection between Arduino and a computer, Connect the Arduino board to the computer using the USB cable, Various components available in Arduino hardware, ATMEGA 328 microcontroller chip, About Arduino Boot Loader, Digital Pins, Analog Pins, Blinking LEDs that are helpful for troubleshooting, Ground Pins, External power adapter, Arduino programming language. Bulk resistance, DC or static resistance of diode, dynamic or AC	

	resistance of diode.	
	Unit Outcomes: UO1. Understand the value and importance of learning a coding language. UO2. Work to complete a customizable full Arduino project autonomously, from the beginning to the end.	
II	**Wireless connectivity to Arduino**	**07**
	1. About ESP8266-01 Wi-Fi module, various pins of ESP8266-01 Wi-Fi module 2. Circuit connection of ESP8266 – 01 module with Arduino, Live setup of the connection 3. Setup the read-write permission to the USB port, Download and install ESP8266 Wi-Fi module in Arduino IDE 4. Establish a connection between Wi-Fi module and a laptop or a mobile phone, Source code for the above experiment, Compile and upload the program, Demonstration of the output.	
	Unit Outcomes: UO1. Understand the function of electronic sensors and components. UO2. Plan and design innovative and fun tools for education.	
III	**Practical**	**30**
	1. Write and compile an Arduino program to blink an LED. 2. Write and compile an Arduino program for blinking a Tricolor LED using Push button. 3. Write and compile an Arduino program to interfacing Arduino with LCD. 4. Write and compile an Arduino program to Connect a seven-segment display to Arduino. 5. Write and compile an Arduino program to display counter using Arduino. 6. Write and compile an Arduino program for Servo Motor Control. 7. Write and compile an Arduino program for Stepper Motor Control. 8. Write and compile an Arduino program for DC Motor Control. 9. Write and compile an Arduino program for analog input and analog output on Arduino Uno board using PWM. Different outputs on LED. 10. Write and compile an Arduino program for digital input and digital output on Arduino Uno board and using LED and Buzzer. 11. Write and compile an Arduino program for blue tooth and Wi-Fi.	

Learning Resources:

10. Arduino-Based Embedded Systems: By Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury.
11. ARM System Developer's Guide – Designing and Optimizing System Software .by: Andrew N Sloss, Dominic Symes, Chris Wright; 2004, Elseiver.
12. Arduino Made Simple by Ashwin Pajankar.
13. Assembly Language Programming: ARM Cortex – M3: Mahout, Vincent.
14. Arduino Book for Beginners, MIKE CHEUCH.

15. Arduino Project Engineers, Neerparaj Raj, BPB Publications.
16. Arduino programming: Intermediate guide to learn Arduino programming step by step, Ryan Turner.
17. ARM System – On – Chip Architecture, Furber, Steve.
18. Embedded C, Pont, Michael.
19. Programming Arduino, Simon Monk, Mc Graw Hill (Second edition.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

Basket I: Generic/Open Elective (GE/OE)

(GEs offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing GE/OE	Code	Course Title	Credits	Hrs.
1	Commerce	101AAF1401	Mutual Fund Management	04	60
2	Commerce	101MAE1401	Fundamentals of Statistics	04	60
3	English	101ENG1402	English for Science and Technology	04	60
4	Geography	101GEO1401	General Geography	04	60
5	Commerce	101BAI1401	Personal Financial Management	04	60
6	Marathi	101MAR1401	स्पर्धा परीक्षा आणि मराठी भाषा	04	60
7	Political Science	101POL1401	Human Rights	04	60
8	Biotechnology	101BIO1401	Nutrition, Health and Hygiene	04	60
9	Music	101MUS1401	Indian Vocal Classical & Light Music	04	60
10	NCC Studies	101NCC1401	Introduction to NCC	04	60
11	Sports	101SPO1401	Counseling and Psychotherapy	04	60

Note: Student can choose any one GE from the basket.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year

Basket II: Skill Enhancement Courses (SEC)

(SEC offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing SEC	Code	Course Title	Credits	Hrs.
1	Chemistry	101CHE1601	Pesticides and Green Chemistry	02	30-45
2	Information Technology	101COM1601	Basics of Python Programming	02	30-45
3	Physics	101PHY1601	Physics Workshop Skills	02	30-45
4	Biotechnology	101BIO1601	Food Processing Technology	02	30-45
5	Botany	101BOT1601	Mushroom Cultivation Technology	02	30-45
6	English	101ENG1601	Proof Reading and Editing	02	30
7	Information Technology	101COA1601	PC Assemble and Installation	02	30-45
8	Marathi	101MAR1601	कथा/पटकथालेखन	02	30
9	Zoology	101ZOO1601	Bee Keeping	02	30-45

Note: Student can choose any one SEC from the basket.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

UG First Year Sem I

Basket III: Ability Enhancement Courses (AEC)

(AEC offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing AEC	Code	Course Title	Credits	Hrs.
1	Marathi	101MAR1701	भाषिक कौशल्य भाग – १	02	30
2	Hindi	101HIN1701	हिंदी भाषा शिक्षण भाग – १	02	30
3	Sanskrit	101SAN1701	व्यावहारीक व्याकरण व नितिसुभाषिते	02	30
4	Pali	101PAL1701	उपयोजित व्याकरण	02	30

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

UG First Year

Extra Credit Activities

Sr. No.	Course Title	Course Code	Credits	Hours T/P
1	MOOCs		Min. of 02 credits	Min. of 30 Hrs.
2	Certificate Courses		Min. of 02 credits	Min. of 30 Hrs.
3	IIT, Bombay Spoken Tutorial Courses		Min. of 02 credits	Min. of 30 Hrs.

Guidelines:

Extra -academic activities

1. All extra credits claimed under this heading will require sufficient academic input/ contribution from the students concerned.
2. Maximum 04 extra credits in each academic year will be allotted.
3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
2. One credit for measurable research work undertaken and field trips amounting to 30 hours of recorded work.
3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.

4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 hours
5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/activities conducted or attended within the college.
4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.
6. Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

Faculty of Science and Technology

Department of Physics and Electronics

Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				CAT Practical		Best Scored CAT & Mid Term	SEE	Total
1	2	3				4		5	6	5 + 6
		Att.	CAT I	Mid Term	CAT II	Att.	CAT			
DSC/DSE/ GE/OE/Minor	100	10	10	20	10	-	-	40	60	100
DSC	75	05	10	15	10	-	-	30	45	75
Lab Course/AIPC/ OJT/FP	50	-	-	-	-	05	20	-	25	50
VSC/SEC/ AEC/VEC/CC	50	05	05	10	05	-	-	20	30	50

Note:

1. All Internal Exams are compulsory
2. Out of 02 CATs best score will be considered
3. Mid Term Exam will be conducted by the Exam Section
4. Mid Term Exam is of Objective nature (MCQ)
5. Semester End Exam is of descriptive in nature (Long & Short Answer)
6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance 10 Marks.