List of New Course(s) Introduced

Department : ***Pure and applied physics***

Programme Name : ***B.Sc. Electronics***

Academic Year : 2018-19

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
01.	PS/ELEC/SEC-301L	Electronics Workshop Skills
02.	PS/ELEC/SEC-401L	Electrical Circuits and Network Skills
03.	PS/ELEC/C-102L	Mathematics Foundation for Electronics
04.	PS/ELEC/C-204L	Applied Physics
	PS/ELEC/C-101P	Basic Circuit Theory and Network Analysis Lab
	PS/ELEC/C-102P	Mathematics Foundation for Electronics Lab
	PS/ELEC/C-203P	Semi-Conductor Devices Lab
	PS/ELEC/C-204P	Applied Physics Lab

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

गुरु घासीदास विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
कोनी, बिलासपुर - 495009 (छ.ग.)

Guru Ghasidas Vishwavidyalaya
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)
Koni, Bilaspur – 495009 (C.G.)

Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2018-19	
School	**: *School of Physical Sciences***
Department	**: *Pure and Applied Physics***
Date and Time	**: *July 13, 2018 – 11:30 AM; July 18, 2018 – 5:00 PM***
Venue	**: *Smart Class Room***

The scheduled meetings of member of Board of Studies (BoS) of Department of Pure and Applied Physics, School of Studies of Physical Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur, were held to design and discuss the B. Sc (Physics) Second year (III and IV Semesters), scheme and syllabi.

The following members were present in the meeting:

1. Prof. P K. Bajpai
2. Dr. H. S. Tewari
3. Prof. S. B. Kondawar (External Member)
4. Dr. M. N. Tripathi
5. Dr. P. Thakur
6. Dr. R. K. Pandey
7. Dr. T. G. Reddy
8. Dr. R. P. Prajapati
9. Dr. A. K. Gupta
10. Dr. M. P. Sharma
11. Dr. P. Das
12. Dr. T. Trivedi
13. Dr. S. P. Patel
14. Prof. R. Dhar (External member)

The committee discussed and approved the scheme and syllabi. The following new Skill Enhancement courses were added in the B.Sc. (Physics) Second year (III and IV Semesters) :

Electronics Workshop Skills

Electrical Circuits and Network Skills

Mathematics Foundation for Electronics

Applied Physics

Basic Circuit Theory and Network Analysis Lab

Mathematics Foundation for Electronics Lab

Semi-Conductor Devices Lab

Applied Physics Lab

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Signature & Seal of HoD

Course Structure & Syllabus of B.Sc. Electronics Session -2019

School of Physical Sciences: B.Sc. Hon's (Electronics)

Semester	Course Opted	Course Code	Name of the course	Credit	Hour / week
I	Core-1	PS/ELEC./C-101L	**Basic Circuit Theory and Network Analysis**	4	4
	Core -1 Practical	PS/ ELEC./C-101P	**Basic Circuit Theory and Network Analysis Lab**	2	4
	Core -2	PS/ ELEC./C-102L	**Mathematics Foundation for Electronics**	4	4
	Core -2 Practical	PS/ ELEC./C-P-102P	**Mathematics Foundation for Electronics Lab**	2	4
	Generic Elective -1 (GE- IA)	PS/ELEC./GE-101	To be opted from the pool*	4	4
	Generic Elective - Practical	PS/ELEC./GE-P-101	GE-101 practical as opted	2	4
	Ability Enhancement Compulsory Course (AECC)	PS/ ELEC./AE-101/EC	English Communication / MIL (Hindi Communication)	4*	4
	ECA	Open elective (Optional)	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
			TOTAL	24	28
II	Core-3	PS/ ELEC /C-203L	**Semiconductor Devices**	4	4
	Core -3 Practical	PS/ ELEC /CP-203P	**Semiconductor Devices Lab**	2	4
	Core -4	PS/ ELEC /C-204L	**Applied Physics**	4	4
	Core -4 Practical	PS/ ELEC /CP-204P	**Applied Physics Lab**	2	4
	Generic Elective -2 (GE-IB)	PS/ ELEC /GE-202/	GE-102 (second course of the same subject as opted in GE-101	4	4
	Generic Elective - Practical	PS/ ELEC /GE-P-202/	GE-202 practical as opted	2	4
	Ability Enhancement Compulsory Course (AECC)	PS/ ELEC /AE-201/ES	Environmental Science	4*	4
	ECA	Optional elective -	ECA-Extracurricular activity/ Tour, Field visit/ Industrial training/ NSS/ Swachhta/ vocational Training/ Sports/ others	2	(2)
			Total	24	28

SUMMER Internship: 15 days		Optional elective	Swayam Swachhta / NSS / Industrial/ others	2	100
III	Core-5	PS/ ELEC /C-301L	Electronic Circuits	4	4
	Core -5 Practical	PS/ ELEC /C-301P	Electronic Circuits Lab	2	4
	Core -6	PS/ ELEC /C-302L	Digital Electronics and VHDL	4	4
	Core -6 Practical	PS/ ELEC /C-302P	Digital Electronics and VHDL Lab	2	4
	Core - 7	PS/ ELEC /C-303L	C Programming and Data Structures	4	4
	Core – 7 Practical	PS/ ELEC /C-303P	C Programming and Data Structures Lab	2	4
	Generic Elective -3 (GEII-A)		To be opted from the pool of GE	4	4
	Generic Elective - Practical			2	4
	Skill Enhancement Course (SEC - 1)		To be opted from the pool of SE courses**	4*	2 (4)
			Total	28	34
IV	Core-8	PS/ ELEC /C-401L	Operational Amplifiers and Applications	4	4
	Core -8 Practical	PS/ ELEC /C-401P	Operational Amplifiers and Applications Lab	2	4
	Core -9	PS/ ELEC /C-402L	Signals and Systems	4	4
	Core -9 Practical	PS/ ELEC /C-402P	Signals and Systems Lab	2	4
	Core - 10	PS/ ELEC /C-403L	Electronic Instrumentation	4	4
	Core -10 Practical	PS/ ELEC /C-403P	Electronic Instrumentation Lab	2	4
	Generic Elective -4 (GEII-B)		To be opted from the pool of Generic courses	4	4
	Generic Elective - Practical			4	4
	Skill Enhancement Course (SEC -2)		To be opted from the pool of SE courses	4*	2 (4)
			TOTAL	28	34
SUMMER Internship: 15 days		Optional elective	Swayam Swachhta / NSS / Industrial/ others	2	100
V	Core-11	PS/ ELEC /C-501L	Microprocessors and Microcontrollers	4	4
	Core -11 Practical	PS/ ELEC /C-501P	Microprocessors and Microcontrollers Lab	2	4
	Core -12	PS/ ELEC /C-502L	Electromagnetics	4	4
	Core -12 Practical	PS/ ELEC /C-502P	Electromagnetics Lab	2	4

	Discipline Specific Elective (DSE-1)	PS/ELEC./DSE-501L	**DSE-1**	4	4
	DSE-1 - Practical	PS/ELEC/DSE-501P	**DSE-1 Lab**	2	4
	Discipline Specific Elective - (DSE-2)	PS/ELEC/DSE-502L	**DSE-2**	4	4
	DSE-2 - Practical	PS/ELEC/DSE-502P	**DSE-2 Lab**	2	4
			TOTAL	24	32
VI	Core-13	PS/ELEC /C-601L	**Communication Electronics**	4	4
	Core -13 Practical	PS/ ELEC /C-601P	**Communication Electronics Lab**	2	4
	Core -14	PS/ ELEC /C-602L	**Photonics**	4	4
	Core -14 Practical	PS/ ELEC /C-602P	**Photonics Lab**	2	4
	Discipline Specific Elective (DSE-3)	PS/ELEC/DSE-503L	**DSE-3**	4	4
	DSE-3 - Practical	PS/ELEC/DSE-503P	**DSE-3 Lab**	2	4
	Discipline Specific Elective (DSE-4) + DSE-4 – Practical **Or** Dissertation/ Project work followed by seminar	PS/ELEC/PD		4+2=6 **Or** 5+1=6	8
			TOTAL	24	32
			TOTAL CREDITS	**152 + 4 (SI)**	

As per UGC CBCS guidelines, University / departments have liberty to offer GE and SEC courses offered by any department to students of other departments. The No. of GE course is four. One GE course is compulsory in first 4 semesters each. In present scheme it is proposed to have minimum two GE courses (from one subject) in first two semesters after which student shall change two GE for another subject in IIIrd and IVth semester, so that all the student can have exposure of one additional subject. **(Subject to approval by the competent authority).**

General electives to be offered by Electronics (for Physics/Maths /Electronics/ Comp. Sc. students)

GE/101/ELEC: **Basic Circuit Theory and Network Analysis**

GE/102/ ELEC: **Mathematics Foundation for Electronics**

GE/201/ ELEC: **Semiconductor Devices**

GE/202/ ELEC: **Applied Physics**

List of General elective for Electronics Honors: (Ist SEM)

GE/201/Maths

GE/202/Maths

GE/201/PHY

GE/202/PHY

GE/201/COMP. Sc.

GE/202/COMP. Sc.

Skill Enhancement Courses (02 to 04 papers) (Credit: 02 each)- SEC1 to SEC4

1. Design and Fabrication of Printed Circuit Boards (4)
2. Electronics Workshop Skills
3. Electrical circuit network Skills
4. Basic Instrumentation Skills
5. Renewable Energy and Energy harvesting
6. Radiation Safety

MathematicsFoundationforElectronics

(Credits:Theory-04,Practicals-02)

Objective-

- To build the strong foundation inMathematics of students needed for thefield of electronics and Telecommunication Engineering
- Solve higher order linear differential equation using appropriate techniques for modelling and analysing electrical circuits.

Unit-1

Ordinary Differential Equations: First Order Ordinary Differential Equations,Basic Concepts,Separable Ordinary Differential Equations, Exact Ordinary Differential Equations, Linear Ordinary Differential Equations. Second Order homogeneous andnon-homogeneous Differential Equations.

Series solution of differential equations and special functions: Power series method, Legendre Polynomials,Frobenius Method,Bessel'sequationsandBessel'sfunctionsof firstandsecondkind.Error functions and gamma function.

Unit-2

Matrices: IntroductiontoMatrices,System ofLinearAlgebraicEquations,GaussianEliminationMethod, EigenValuesand EigenVectors,LinearTransformation,PropertiesofEigenValuesandEigenVectors,Cayley-Hamilton Theorem,Diagonalization,PowersofaMatrix.RealandComplexMatrices,Symmetric, Skew Symmetric,Orthogonal Quadratic Form,Hermitian,Skew Hermitian, Unitary Matrices.

Unit-3

Sequencesandseries: Sequences,Limitofasequence,Convergence,DivergenceandOscillationofa sequence,Infiniteseries, Necessary conditionforConvergence,Cauchy'sIntegralTest,D'Alembert'sRatio Test, Cauchy's nth Root Test, Alternating Series,Leibnitz's Theorem, Absolute Convergence and Conditional Convergence, Power Series.

Unit-4

Complex Variables and Functions: Complex Variable, Complex Function, Continuity, Differentiability, Analyticity. Cauchy-Riemann (C- R) Equations, Harmonic and ConjugateHarmonic Functions, Exponential Function, Line Integral in Complex Plane, Cauchy's Integral Theorem,Cauchy'sIntegralFormula, DerivativeofAnalyticFunctions.Sequences,SeriesandPowerSeries,Taylor's Series, Laurent Series, Zeroes and Poles.Residue integration method, Residue integration of real Integrals.

Outcomes

- Demonstrate basic knowledge of solving differential equations, introduction to special functions like Bessel and Legendre.
- Demonstrate basic knowledge of Matrix Theory, convergence and divergence of a series and Complex Integration..

References:

1. E. Kreyszig, advanced engineering mathematics, Wiley India (2008)
2.MurraySpiegel,SeymourLipschutz,JohnSchiller,OutlineofComplexVariables, SchaumOutlineS eries, Tata McGraw Hill (2007)

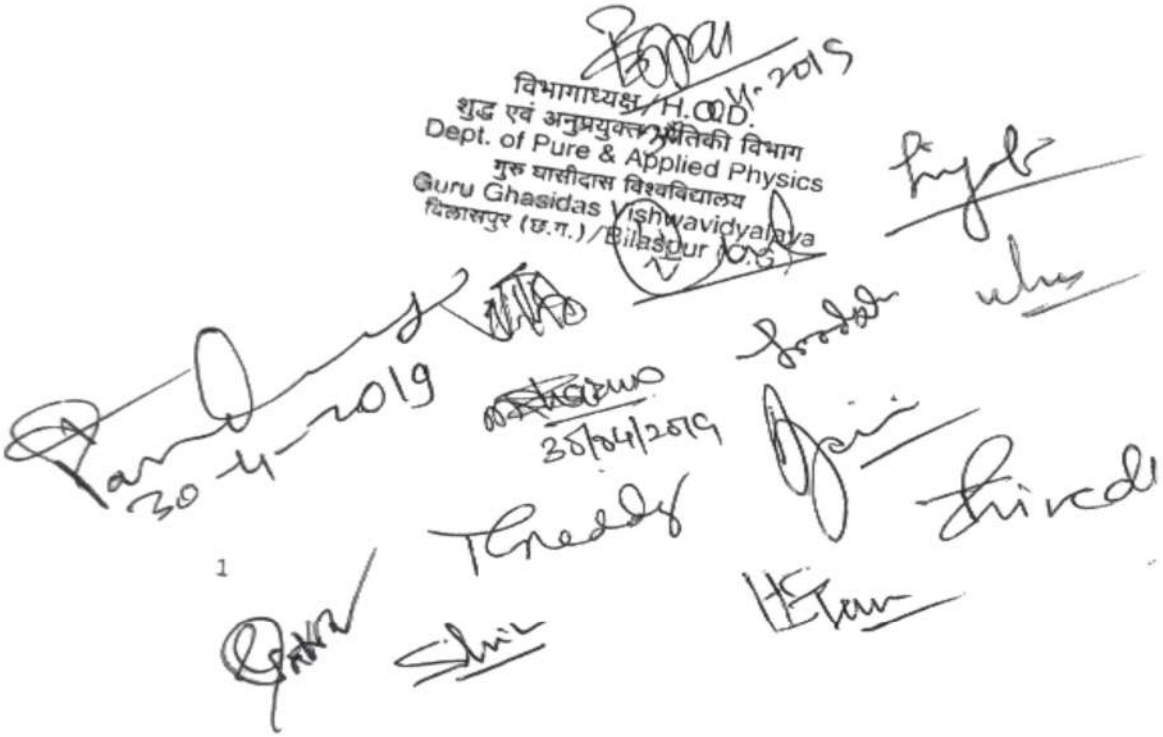
MathematicsFoundationforElectronicsLab(MATLAB/anyotherMathematicalSimulation software)
60 Lectures

Objective- To impart adequate knowledge on the need of programming languages and problem solving techniques.

1. Solution ofFirstOrderDifferential Equations
2. Solution of Second Order homogeneous Differential Equations
3. Solution of Second Order non-homogeneous Differential Equations
4. Convergence of a given series.
5. Divergence of a given series.
6. Solution of linear systemof equations using Gauss Elimination method.
7. Solution of linear systemof equations using Gauss – Seidel method.
8. Solution of linear systemof equations using L-U decomposition method.

Outcomes-

- systems this will be very useful forbitwise operations.
- Develop programs using the basic elements like control statements, Arrays and Strings
- Students will understand basics of numerical analysis.



Semiconductor Devices Lab (Hardware and Circuit Simulation Software)

60 Lectures

Objective-

- To make the students understand coherence between theory and practical.
- Develop the skills needed to set up the circuits required to test models or theory developed in the lecture course
- To study voltage current characteristics for various active components and also of solar cell.

1. Study ofthe I-V Characteristics ofDiode – Ordinary and Zener Diode.
2. Study of the I-V Characteristics of the CE configuration of BJT and obtain r_i, r_o,β.
3. Study of the I-V Characteristics of the Common Base Configuration of BJT and obtain r_i, r_o,α.
4. StudyoftheI-VCharacteristicsoftheCommonCollectorConfigurationofBJTandobtainvoltage gain, ri, r_o.
5. Study of the I-V Characteristics of the UJT.
6. Study of the I-V Characteristics of the SCR.
7. Study of the I-V Characteristics of JFET.
8. Study of the I-V Characteristics of MOSFET.
9. Study of Characteristics of Solar Cell
10. Study of Hall Effect.

Outcomes - Understanding the connection between theory and practicalas well as to make familiar with Experiments

AppliedPhysics

(Credits:Theory-04,Practicals-02)

Objective - Develop the skills needed to set up the equipment required to test models ortheory developed in the lecture course

Unit-1

QuantumPhysics: InadequaciesofClassicalphysics, Compton'seffect,Photo-electricEffect,Wave-particle duality,deBroglie waves, Basicpostulatesandformalism ofquantum mechanics:probabilisticinterpretation ofwaves,conditionsforphysicalacceptabilityofwavefunctions.Schrodingerwaveequationforafree particleand inaforce-field(1dimension),Boundaryandcontinuityconditions.Operators inQuantum Mechanics,Conservationof probability, Time-dependentform,Linearity andsuperposition, Operators,Time- independent one dimensional Schrodinger wave equation, Stationary states, Eigen-values and Eigen functions.

Unit-2

Mechanical Properties of Materials: Elastic and Plastic Deformations, Hooke's Law, ElasticModuli, Brittle andDuctileMaterials,TensileStrength,TheoreticalandCriticalShearStressof Crystals.Strengthening Mechanisms, Hardness, Creep, Fatigue, Fracture.

Unit-3

ThermalProperties: Brief Introductionto Laws of Thermodynamics,ConceptofEntropy,Conceptof Phonons, Heat Capacity, Debye's Law, Lattice Specific Heat, Electronic Specific Heat, Specific Heat Capacityfor Si and GaAs, Thermal Conductivity, Thermoelectricity,Seebeck Effect, Thomson Effect, Peltier Effect.

Unit-4

ElectricandMagneticProperties: Conductivityofmetals,Ohm'sLaw,relaxationtime,collisiontimeand meanfreepath,electronscatteringandresistivityofmetals,heatdevelopedincurrent carrying conductor, Superconductivity.

Classificationof MagneticMaterials,Origin of Magneticmoment,Originofdia, para,ferroandantiferromagnetism andtheircomparison,Ferrimagneticmaterials,SaturationMagnetisationandCurietemperature, Magnetic domains, Concepts of Giant Magnetic Resistance (GMR), Magnetic recording.

Outocmes- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.

References:

1. S. Vijaya and G. Rangarajan, Material Science, Tata McGraw Hill (2003)
2. W. E. Callister, Material Science andEngineering: An Introduction, Wiley India (2006)
3. A. Beiser, Concepts of Modern Physics, McGraw-Hill Book Company (1987)
4. A. Ghatak& S. Lokanathan, QuantumMechanics: Theory and Applications, Macmillan India (2004)
5. M.C. Jain , Quantum Mechanics

Applied Physics Lab

60 Lectures

Objective- To learn the usage of electrical and optical systems for measurement ofYoung modulus and Planck's constant

1. To determine Young's modulus of a wire by optical lever method.
2. To determine the modulus of rigidity of a wire by Maxwell's needle.
3. To determine the elastic constants of a wire by Searle's method.
4. To measure the resistivity of a Ge crystal with temperatureby four –probe method fromroomtemperature to 200 ^{0}C).
5. To determine the value of Boltzmann Constantby studying forward characteristics of diode.
6. To determine the value of Planck's constant byusing LEDs of at least4 different wavelengths.
7. To determine e/m ratio of electron by Bar Magnet or by Magnetic Focusing.

Outcomes- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.

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Electronics Circuits

Semester -III(Credits: Theory-04, Practicals-02)

Objective-

- To teach students how to analyzeelectrical filters and amplifiers using op- amps, transistors & diodes.
- To learn basic function of single stage amplifier, multistage amplifier and power Amplifier and their working principle.

Theory Lectures 60

Unit-1(14 Lectures): **Diode Circuits**: Ideal diode, dc load line analysis, Quiescent (Q) point. Clipping and clamping circuits. Rectifiers: HWR, FWR (center tapped and bridge). Circuit diagrams, working and waveforms, ripple factor & efficiency, comparison. Filters: types, circuit diagram and explanation of shunt capacitor filter withwaveforms.

Zener diode, regulator circuit diagram and explanation for load and line regulation, disadvantages of Zener diode regulator.

Unit-2 (15 Lectures): **Bipolar Junction Transistor**: Review of CE, CB Characteristics and regions of operation. Hybrid parameters, Transistor biasing, DC load line, operating point, thermal runaway, stability and stability factor, Fixed bias without and with RE, collector to base bias, voltage divider bias and emitter bias ($+V_{CC}$ and $-V_{EE}$ bias), circuit diagrams and theirworking Transistor as a switch, circuit and working,BJT amplifier (CE), dc and ac load line analysis, hybrid model of CE configuration.

Unit-3 (13 Lectures): **Feedback Amplifiers:** Concept of feedback, negative and positive feedback, advantages and disadvantages ofnegative feedback, voltage (series and shunt), current (series and shunt) feedback amplifiers, gain, input and output impedances . Barkhausen criteria for oscillations, Study of phase shift oscillator, Colpitts oscillator and Hartley oscillator.

Unit-4 (18 Lectures): **MOSFET Circuits**: Review of Depletion and Enhancement MOSFET, Biasing of MOSFETs, Small Signal Parameters, Common Source amplifier circuit analysis, CMOS circuits. **Power Amplifiers:** Classification of power amplifiers, Class A, Class B, Class C and their comparisons. Operation of a Class A single ended power amplifier Operation of Transformer coupled Class A power amplifier, overall efficiency. Circuit operation of complementary symmetry Class B push pull poweramplifier, crossover distortion, heatsinks.

Outcomes - To understand basic construction of feedback circuits and their application in Oscillators. To understand basic amplifier and oscillator circuits and their application

References:

1. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013,PHI
2. Electronic devices, David A Bell, Reston PublishingCompany

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ELECTRICAL CIRCUITS AND NETWORK SKILLS

(with Electrical Engineering)

(Credits:02)

Theory:30Lectures

Objective -The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode.

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law.Series, parallel, and series- parallel combinations.AC and DC Electricity.Familiarization with multimeter, voltmeter and ammeter.**(3 Lectures)**

Understanding Electrical Circuits: Basic electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source.Power factor.Saving energy and money.**(4 Lectures)**

Electrical Drawing and Symbols: Drawing symbols. Blueprints.Reading Schematics. Ladder diagrams. Electrical Schematics.Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop. **(4 Lectures)**

Generators and Transformers: DC Power sources. AC/DC generators.Inductance, capacitance, and impedance.Operation of transformers.**(3 Lectures)**

ElectricMotors:Single-phase,three-phase&DCmotors.Basicdesign.InterfacingDCor AC sources to control heaters & motors. Speed & power of ac motor. **(4 Lectures)**

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers.Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources**(3 Lectures)**

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection.Grounding and isolating. Phase reversal. Surge protection. Relay protection device.**(4 Lectures)**

Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection.Voltage drop and losses across cables and conductors.Instruments to measure current, voltage, power in DC and AC circuits.Insulation.Solid and stranded cable.Conduit.Cable trays.Splices: wirenuts,crimps, terminal blocks andsolder. Preparation of extension board.**(5 Lectures)**

Outcomes – 1 apply the knowledge of basic circuital law and simplify the network using reduction techniques

2 Analyze the circuit using Kirchhoff's law and Network simplification theorems

References:

1. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
2. A text book in Electrical Technology - B L Theraja - S Chand & Co.
3. A text book of Electrical Technology - A K Theraja
4. Performance and design of AC machines - M G Say ELBSEdn.