

गुरु घासीदास विश्वविद्यालय  
(केंद्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 से अंतर्गत स्थापित केंद्रीय 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.)

### 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  
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बिलासपुर (छ.ग.)/Bilaspur (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

विभागाध्यक्ष/H.O.D.

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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-1A)	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-1B)	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	

*Handwritten signatures and dates:*  
Date: 10/11/19  
Prof. Dr. ...  
Prof. Dr. ...  
Prof. Dr. ...



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

*Handwritten notes:*  
10/11/2021  
Dr. Praveen Kumar  
Prof. Jyoti  
Prof. Anil



	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
	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
VI	Discipline Specific Elective (DSE-4) + DSE-4 - Practical	PS/ELEC/PD		4+2=6	8
	Or Dissertation/ Project work followed by seminar			5+1=6	
			TOTAL	24	32
			<b>TOTAL CREDITS</b>	<b>152 + 4 (SI)</b>	

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 III<sup>rd</sup> and IV<sup>th</sup> semester, so that all the student can have exposure of one additional subject. (Subject to approval by the competent authority).

*Handwritten notes and signatures:*  
18/7/20  
Koni Bilaspur  
T. S. Singh  
T. S. Singh  
T. S. Singh



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

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

GE/102/ ELEC: Mathematics Foundation for Electronics ✗

GE/201/ ELEC: Semiconductor Devices ✗

GE/202/ ELEC: Applied Physics ✓ *SK*

List of General elective for Electronics Honors: (1st 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

*SK* *SK*  
*SK* *SK*  
*SK* *SK*  
*SK* *SK*  
*SK* *SK*



## Mathematics Foundation for Electronics (Credits: Theory-04, Practicals-02)

### Objective-

- To build the strong foundation in Mathematics of students needed for the field 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 and non-homogeneous Differential Equations.

Series solution of differential equations and special functions: Power series method, Legendre Polynomials, Frobenius Method, Bessel's equations and Bessel's functions of first and second kind. Error functions and gamma function.

### Unit-2

**Matrices:** Introduction to Matrices, System of Linear Algebraic Equations, Gaussian Elimination Method, Eigen Values and Eigen Vectors, Linear Transformation, Properties of Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem, Diagonalization, Powers of a Matrix. Real and Complex Matrices, Symmetric, Skew Symmetric, Orthogonal Quadratic Form, Hermitian, Skew Hermitian, Unitary Matrices.

### Unit-3

**Sequences and series:** Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series, Necessary condition for Convergence, Cauchy's Integral Test, D'Alembert's Ratio 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 Conjugate Harmonic Functions, Exponential Function, Line Integral in Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivative of Analytic Functions. Sequences, Series and Power Series, Taylor's Series, Laurent Series, Zeros 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:

- E. Kreyszig, advanced engineering mathematics, Wiley India (2008)
- Murray Spiegel, Seymour Lipschutz, John Schiller, Outline of Complex Variables, Schaum Outline Series, Tata McGraw Hill (2007)

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20-4-2019  
20/04/2019  
H.Tan







**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 of the I-V Characteristics of Diode – Ordinary and Zener Diode.
  2. Study of the I-V Characteristics of the CE configuration of BJT and obtain  $r_i, r_o, \beta$ .
  3. Study of the I-V Characteristics of the Common Base Configuration of BJT and obtain  $r_i, r_o, \alpha$ .
  4. Study of the I-V Characteristics of the Common Collector Configuration of BJT and obtain voltage gain,  $r_i, r_o$ .
  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 practical as well as to make familiar with Experiments

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30-4-2019  
30/04/2019  
30/4/2019

Handwritten signatures and dates are present, including names like 'Shir', 'Tredy', 'Jain', 'Shinde', 'H. Tan', 'Joshi', 'Ush', and 'Raj'. A date '30-4-2019' is written multiple times.



## Applied Physics

(Credits: Theory-04, Practicals-02)

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

### Unit-1

**Quantum Physics:** Inadequacies of Classical physics, Compton's effect, Photo-electric Effect, Wave-particle duality, de Broglie waves, Basic postulates and formalism of quantum mechanics: probabilistic interpretation of waves, conditions for physical acceptability of wave functions. Schrodinger wave equation for a free particle and in a force field (1 dimension), Boundary and continuity conditions. Operators in Quantum Mechanics, Conservation of probability, Time-dependent form, Linearity and superposition, 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, Elastic Moduli, Brittle and Ductile Materials, Tensile Strength, Theoretical and Critical Shear Stress of Crystals. Strengthening Mechanisms, Hardness, Creep, Fatigue, Fracture.

### Unit-3

**Thermal Properties:** Brief Introduction to Laws of Thermodynamics, Concept of Entropy, Concept of Phonons, Heat Capacity, Debye's Law, Lattice Specific Heat, Electronic Specific Heat, Specific Heat Capacity for Si and GaAs, Thermal Conductivity, Thermoelectricity, Seebeck Effect, Thomson Effect, Peltier Effect.

### Unit-4

**Electric and Magnetic Properties:** Conductivity of metals, Ohm's Law, relaxation time, collision time and mean free path, electron scattering and resistivity of metals, heat developed in current carrying conductor, Superconductivity. Classification of Magnetic Materials, Origin of Magnetic moment, Origin of dia, para, ferro and anti-ferromagnetism and their comparison, Ferrimagnetic materials, Saturation Magnetisation and Curie temperature, Magnetic domains, Concepts of Giant Magnetic Resistance (GMR), Magnetic recording.

**Outcomes**- 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 and Engineering: An Introduction, Wiley India (2006)
3. A. Beiser, Concepts of Modern Physics, McGraw-Hill Book Company (1987)
4. A. Ghatak & S. Lokanathan, Quantum Mechanics: Theory and Applications, Macmillan India (2004)
5. M.C. Jain, Quantum Mechanics

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20/4/2019  
28/4/2019  
H.T. Jain  
Shinde  
H.T. Jain



**Applied Physics Lab**

60 Lectures

**Objective-** To learn the usage of electrical and optical systems for measurement of Young 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 temperature by four -probe method from room temperature to 200 °C).
5. To determine the value of Boltzmann Constant by studying forward characteristics of diode.
6. To determine the value of Planck's constant by using LEDs of at least 4 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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30-4-2019  
30/04/2019

Shir  
Treddy  
Jain  
H. Kumar  
Shinde  
Hyde  
Uday



## Electronics Circuits

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

#### Objective-

- To teach students how to analyze electrical 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 with waveforms.

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<sub>CC</sub> and -V<sub>EE</sub> bias), circuit diagrams and their working Transistor as a switch, circuit and working, BJT amplifier (CE), dc and ac load line analysis, hybrid mode of CE configuration.

**Unit-3 (13 Lectures): Feedback Amplifiers:** Concept of feedback, negative and positive feedback, advantages and disadvantages of negative 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 power amplifier, 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 Boylestad and Louis Nashelsky, 9th Edition, 2013, PHI
2. Electronic devices, David A Bell, Reston Publishing Company

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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 circuit 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.