ORIGINAL

DEPARTMENT OF PHYSICS

COURSE CURRICULUM & MARKING SCHEME

B.Sc. III & IV Semester

PHYSICS

(Based on Choice Based Credit System)

SESSION : 2023-24

ESTD : 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A+, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

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Govt. V.Y.T. PG Autonomous College, Durg (Chhattisgarh)

(Erstwhile: Govt. Arts & Science College, Durg)

B. Sc. WITH PHYSICS

[B.Sc (PCM), B.SC (PMEl), B.Sc (PMCS), B.Sc (PMIT) B.Sc(PMG)]

III and IV Semester
2023-24

Govt. V.Y.T. PG Autonomous College, Durg (Chhattisgarh)

(Erstwhile: Govt. Arts & Science College, Durg)

Appendix-II

Table: A Sample UGCF for Multidisciplinary Courses of Study

Semester	DSC	DSE	GE	AEC	SEC	Internship/ Apprenticeship / Project/ community outreach (2)	VAC	Total Credits
I	DSC A 1-(4) DSC B 1-(4) DSC C 1-(4)		Choose one from a pool of courses GE-1 (4)	Choose one from a pool of AEC courses (2)	Choose one from a pool of courses (2)		Choose one from a pool of courses (2)	22 Credits
II	DSC A 2-(4) DSC B 2-(4) DSC C 2-(4)		Choose one from a pool of courses GE-2 (4)	Choose one from a pool of AEC courses (2)	Choose one from a pool of courses (2)		Choose one from a pool of courses (2)	22 Credits
Students on exit shall be awarded undergraduate certificate (in the Field of Multidisciplinary study) after securing the requisite 44 credits in semester I and II								Total = 44 Credits
III	DSC A 3-(4) DSC B 3-(4) DSC C 3-(4)	Choose one from a pool of courses DSE A/B/C (4) Or Choose one from a pool of courses GE-3(4)		Choose one from a pool of AEC courses (2)	Choose one SEC (2) OR Internship/Apprenticeship/Project/community outreach (2)		Choose one from a pool of courses (2)	22 Credits
IV	DSC A 4-(4) DSC B 4-(4) DSC C 4-(4)	Choose one from a pool of courses DSE A/B/C (4) Or Choose one from a pool of courses GE-4(4)		Choose one from a pool of AEC courses (2)	Choose one SEC (2)OR Internship/Apprenticeship/Project/community outreach (2)		Choose one from a pool of courses (2)	22 Credits
Students on exit shall be awarded undergraduate Diploma (in the Field of Multidisciplinary study) after securing the requisite 88 credits on completion of semester IV								Total = 88 Credits
V	DSC A 5-(4) DSC B 5-(4) DSC C 5-(4)	Choose one from a pool of courses DSE A/B/C (4)	Choose one from a pool of courses GE-5 (4)		Choose one SEC (2) OR Internship/Apprenticeship/Project/community outreach (2)			22 Credits
VI	DSC A 6-(4) DSC B 6-(4) DSC C 6-(4)	Choose one from a pool of courses DSE A/B/C (4)	Choose one from a pool of courses GE-6 (4)		Choose one SEC (2) OR Internship/Apprenticeship/Project/community outreach (2)			22 Credits
Students on exit shall be awarded Bachelor of (in the Field of Multidisciplinary study) after securing the requisite 132 credits on completion of semester VI								Total = 132 Credits
VII	DSC A/B/C-(4)	Choose three DSE (3x4) courses OR Choose two DSE-(2x4) and one GE(4) course OR Choose one DSE and two GE(4) courses OR All three GE 7,8 & 9(total=12)				Dissertation (6)		22 credits
VIII	DSC A/B/C-(4)	Choose three DSE(3x4)courses OR Choose two DSE-(2x4) and one GE(4) course OR Choose one DSE and two GE(4) courses OR All three GE 10, 11 &12(total=12)				Dissertation (6)		22 credits
students on exit shall be awarded Bachelor of (in the Field of Multidisciplinary study) (Honours or Honours with Academic Project/Entrepreneurship) after securing the requisite 176 credits on completion of Semester VIII								Total = 176 Credits

Note:

1. In 1st semester Hindi Language, 2nd semester EnglishLanguage and Environmental studies in 3rd and 4th Semester will be offered as AECC.
2. Students are required to take Generic Specific courses (courses from other than A/B/C Disciplines)
3. DSC-1 to DSC-7 shall be core courses of either Discipline A or B or C.
4. Completion of core courses from host institute is mandatory.
5. Students may take up SEC, GEC and DSEC of equivalent credits from any other institute/ online platforms/MOOC/ ODL from UGC recognized organizations.

Govt. V.Y.T. PG Autonomous College, Durg (Chhattisgarh)

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Approved syllabus for Semester and CBCS curriculum of B.Sc. with PHYSICS, by the members of Board of Studies for

Session 2022-23

Semester I	No. of Credits	Semester II	No. of Credits
DSC: BPH101 Mechanics	3	DSC: BPH201 Electricity and Magnetism	3
DSC: BPHL101 Mechanics Lab	1	DSC: BPHL201 Electricity And Magnetism Lab	1
*SEC : BPHSE101 Basic Instrumentation Skills	2	*SEC : BPHSE201 Electrical Circuits And Network Skills	2

*Students may opt for any one SEC in any of the semesters till Semester VI. Successful completion of at least one SEC of the Discipline is mandatory for award of Degree.

Semester III	No. of Credits	Semester IV	No. of Credits
DSC: BPH301 Thermal Physics And Statistical Mechanics	3	DSC: BPH401 Waves And Optics	3
DSC: BPHL301 Thermal Physics And Statistical Mechanics Lab	1	DSC: BPHL401 Waves And Optics Lab	1
*SEC : BPHSE101 Basic Instrumentation Skills	2	*SEC : BPHSE201 Electrical Circuits And Network Skills	2
DSE: BPH302 Elementary Mathematical Physics	4	DSE: BPH402 Nuclear Energy, nuclear detectors and Accelerators	4

Govt. V.Y.T. PG Autonomous College, Durg (Chhattisgarh)

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Semester V	No. of Credits	Semester VI	No. of Credits
DSC: BPH501 Elements Of Modern Physics	3	DSC: BPH601 Solid State Physics, Solid State Devices And Electronics	3
DSC: BPHL501 Element Of Modern Physics Lab	1	DSC: BPHL601 Digital Electronics Lab	1
*SEC : BPHSE101 Basic Instrumentation Skills	2	*SEC : BPHSE201 Electrical Circuits And Network Skills	2
DSE: BPH502 Basic Electronics	4	DSE: BPH602 Laser and Optoelectronics	4

Semester VII	No. of Credits	Semester VIII	No. of Credits
DSC: BPH701 Mathematical Physics	4	DSC : BPH801 Atomic and Molecular Physics	4
Choose any 2 From Pool Of Courses DSE1 : BPH 702 Classical Mechanics (3Th+1T)	4	Choose any 2 From Pool Of Courses DSE: BPH802 Electronic Devices (3) + BPHL802 Electronics Lab (1)	4
DSE :BPH703 Quantum Mechanics - I (3Th+1T)	4	DSE : BPH803 Quantum Physics II (3Th +1T)	4
DSE : BPH704 Digital, Analog and Instrumentation (3) + BPHL704 Digital, Analog and Instrumentation Lab (1)	4	DSE5 : BPH804: Electrodynamics (3Th +1T)	4

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Marking Scheme

4Yr UG Program B.Sc.(Multidisciplinary) with Physics

CBCS Pattern

Session 2022-23

B.Sc Semester III & IV

Course. Type	Course Code	End Semester		Internal Assessments		Total	
		Max	Min	Max	Min	Max	Min
DSC	BPH301	60	24	15	6	75	30
DSC	BPHL301	25	10	-	-	25	10
DSE (if opted)	BPH302	80	32	20	08	100	40
DSC	BPH401	60	24	15	6	75	30
DSC	BPHL401	25	10	-	-	25	10
DSE (if opted)	BPH402	80	32	20	08	100	40
SEC	BPHSE101	20	08	5	2	25	10
SEC	BPHSEL101	25	10	-	-	25	10
SEC	BPHSE201	20	08	5	2	25	10
SEC	BPHSEL201	25	10	-	-	25	10

Absolute Grading System (for conversion of marks into grade points)

Letter Grade	Grade point	Obtained Score
O (Outstanding) 10	10	> 90 and = 100
A+(Excellent) 9	9	>80 and = 90
A(Very Good) 8	8	> 70 and = 80
B+(Good) 7	7	> 60 and = 70
B(Above Average) 6	6	>50 and = 60
C(Average) 5	5	>40 and = 50
P (Pass) 4	4	= 40
F(Fail) 0	0	<40
Ab (Absent) 0	0	0

Sample Grade Sheet

Courses	Credit Ci	Marks ESE	Marks obtained	Internal	% Marks Obtained =80%ESE +Int	Grade Point Gi	CiGi	SGPA
Phy	3	75	70	20	76/80 = 96%	10	30	
Chem	3	75	50	20	60/80 =75%	8	24	
Maths	4	100	80	20	80	7	28	
Phy Lab	1	25	20	-	80	8	8	
Chem Lab	1	25	23	-	92	10	10	8.09
GEC 1 (History eg)	4	100	70	15	71	8	32	
AEC (Hindi)	2	50	30	10	34/50=68%	7	14	
VAC (yoga/sports)	2	50	30	10	68%	7	14	
SEC1	2	50	40	10	84%	9	18	
Total	**22**	**450**	**280**		**560**	**62**	**178**	

CGPA of an Academic Yr = SGPA1 +AGPA2/ 2 or (SGPA1 + SGPA2 +.....SGPAn)/n,
n is total number of semesters

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SEMESTER III

PHYSICS-DSC:

BPH301: THERMAL PHYSICS AND STATISTICAL MECHANICS

(Credits: Theory-03)

Theory:45 Hrs

After completion of the course, Students will be able to:

CO1 Associate with different laws of Thermodynamics, compare them and correlate phenomena observed in past. Explain working of Carnot's engine and derive efficiency in different situations.

CO2 Identify thermodynamic variables and appraise various relations for gaseous system.

CO3 Acquire a thorough knowledge of Black body radiation and laws associated with it.

CO4 Describe Maxwellian distribution of speeds and distinguish between mean, r.m.s. and most probable speed values, Compute molecular collisions, mean free path and collision cross sections and estimate molecular diameter and mean free path.

CO5 Interpret the statistical basis of thermodynamic probability and enlist statistical postulates of Gibb's ensemble. Derive Maxwell Boltzmann statistical laws and describe Bose Einstein and Fermi Dirac statistics through canonical partition function

Unit I

Laws of Thermodynamics:

Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P & C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero. **(12 Lectures)**

Unit II

Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, Expression for $(C_P - C_V)$, C_P/C_V, TdS equations. **(8 Lectures)**

Unit III

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomicgases. **(8 Lectures)**

Unit IV

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh- Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

(8 Lectures)

Unit V

Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity -Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics.

(9 Lectures)

Reference Books:

- Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
- A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
- Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
- Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill
- Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G.L.Salinger. 1988, Narosa
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- Thermal Physics, A. Kumar and S.P. Taneja, 2014, R. chand Publications.

V.C. Nominee	**Departmental Members**
Subject Expert	**1. H.O.D Dr. Jagjeet Kaur Saluja**..... 11.3.2023
Subject Expert.....	**2. Dr.R.S. Singh**.....
Alumni (member).....	**3. Dr. Anita Shukla**.....
Prof. from other Dept. Of Sc. Faculty	**4. Mrs. Siteshwari Chandrakar**.....
Specialist from Industry.....	**5. Dr. Abhishek Kumar Misra**.....
	6. Dr Kusumanjali Deshmukh..... 11.3.23

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SEMESTER III

PHYSICS-DSE: Credits: 4
BPH302: Elementary Mathematical Physics
Lectures- (45 Hrs Th + 15 Hrs tutorials)

BPH302: Elementary Mathematical Physics

After completion of the course, Students will be able to:

CO1 Write and solve derivatives and integrals of a given function and extract its Physical meaning

CO2 Perform algebraic operations of scalars and vectors and workout repeated integration of a given function.

CO3 Apply matrix algebra for a given problem and find solution.

CO4 Demonstrate ability to analyze and implement complex algebra in a given physical problem.

CO5 Apply probability and statistical distribution for various events and visualize its applicability for a given system.

Unit 1: Derivatives and Integrals **(9Th + 3Tut)**

Functions of two and three variables, partial derivatives, geometrical interpretation of partial derivatives of functions of two variables. Total differential of a function of two and three variables. Repeated integrals of a function of more than one variable, definition and problems of double and triple integrals.

Unit 2: Scalars and Vectors **(9Th + 3Tut)**

Scalars and vectors, dot and cross products, triple vector product, gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, line, surface and volume integrals, flux of a vector field. Gauss's divergence theorem, Green's theorem and Stokes theorm.

Unit 3: Matrices and Determinants **(9Th + 3Tut)**

Matrix algebra, equality, zero matrix, addition, multiplication , Transpose and adjoint, commutator, Inverse and its existence; Inverse of product of matrices; Rank of matrix; Invariance of rank in elementary transformations, Linear equation; homogeneous and inhomogeneous equations, consistency and solutions; Orthogonality and unitary matrices, unitary transformations.

Unit 4: Complex Numbers **(9Th + 3Tut)**

Algebra of complex numbers; equality, addition, multiplication by real number, Argand diagrams, Complex conjugate, triangle inequality, Cartesian and polar representation of a complex number, De-Moiver's theorem. Common functions of complex variables, separation into real and imaginary parts.

Unit 5: Probability And Elementary Statistics **(9Th + 3Tut)**

Sample space, events, probability in a descrete sample space, Discrete random variables, mean joint distributions. Statistical description, frequency distribution, commulative distribution and tabulation of data.

Reference Books:

- Mathematical Physics By B. S, Rajput (Pragati Prakashan)
- Mathematical Physics by H K Dass (S Chand Publication)
- Mathematical Physics P K Chatopadhyay (New Age Publication)
- Mathematical Physics By V D Gupta (Vikas Publishing House)

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PHYSICS LAB -DSC

BPHL301: THERMAL PHYSICS AND STATISTICAL MECHANICS LAB

CREDITS - 01

Lab Hours : 30

BPHL02: Lab Course

After the completion of the course, Students are expected to understand working mechanism and factors governing Thermodynamics and Statistical Physics. In connection of the same students are expected to

CO1 Design and assemble apparatus for given objectives.

CO2 Record data as required by the experimental objectives.

CO3 Analyze recorded data and formulate it to get desired results.

CO4 Interpret results and check for attainment of proposed objective.

List of Experiment:

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. Measurement of Planck's constant using black body radiation.
3. To determine Stefan's Constant.
4. To determine the coefficient of thermal conductivity of copper by Searle'sApparatus.
5. To determine thermal conductivity of rubber.
6. To determine the coefficient of thermal conductivity of a bad conductor by Lee andCharlton's disc method.
7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
8. To study the variation of thermo emf across two junctions of a thermocouple withtemperature.
9. To Study Newton's law of cooling.
10. Verification of Joule's Law

Reference Books:

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
- A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.

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	6. Dr Kusumanjali Deshmukh..... 11.3.22

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SEMESTER IV

PHYSICS-DSC:

BPH401: WAVES AND OPTICS

(Credits: Theory-03)

Lectures- 45 Hrs

BPH04: Waves, Acoustics and Optics

After completion of the course, Students will be able to:

CO1 Explain superposition theorem for waves of different waves.

CO2 Express waves in form of equation, interpret the solutions and determine values of parameters.

CO3 Differentiate Quality and features of sounds and evaluate the parameters affecting architectural acoustics of a building.

CO4 Demonstrate different type of interferences and interpret interference results using Michelson interferometer.

CO5 Describe and demonstrate diffraction and Polarization of light. Compare Fresnel half period zones with, Fraunhoffer diffractions. Compare techniques to produce polarized light.

Unit I

Superposition of Two Collinear Harmonic oscillations: Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).

Superposition of Two Perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.

(6 Lectures)

Unit II

Waves Motion- General: Transverse waves on a string. Travelling and standing waveson a string and fluid. Normal Modes of wave propogation, Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity. **(7 Lectures)**

Unit III

Sound: Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale.

- Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria.

(8 Lectures)

Unit IV

Wave Optics:

Interference: Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.

Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes. **(12 Lectures)**

Unit V

Diffraction: Fraunhofer diffraction: Single slit; N slits & Diffraction grating, Fresnel's Diffraction (only Introduction) Zone plate

Resolving Power: Rayleigh's Criterion, RP of Grating

Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization. **(12 Lectures)**

Reference Books:

- Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill
- Principles of Optics, B.K. Mathur, 1995, Gopal Printing
- Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
- University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison-Wesley

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SEMESTER IV

PHYSICS-DSE: Credits: 4
BPH402: Nuclear Energy, Nuclear Detectors and Accelerators
Lectures- (45 Hrs Th + 15 Hrs tutorials)

BPH402: Nuclear Energy, Nuclear Detectors and Accelerators

After completion of the course, Students will be able to:

CO1 Understand and explain process of fission, derive conditions for sustained, controlled and uncontrolled process.

CO2 Analyse and apply knowledge of fusion for energy needs of country.

CO3 Use interaction mechanism of radiation with matter to detect nuclear particles

CO4 Explain working and construction of various nuclear detectors.

CO5 Apply knowledge of particle acceleration and its application in accelerators.

Unit-1: Nuclear Fission **(7Th + 3Tut)**
Energy giving nuclear reactions, Nuclear Fission, Chain Reaction, Condition for sustained chain reaction, Condition for Uncontrolled chain reaction, Nuclear reactors working and their types, Nuclear reactors in India

Unit 2: Nuclear Fusion **(6Th + 3Tut)**
Nuclear Fusion, Thermonuclear reaction and its challenges; Tokomac, Nuclear Fusion Reactors; Energy production in stars; p-p chain and CNO cycle

Unit-3: **(9Th + 3Tut)**
Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, pair production, neutroninteraction with matter(elementary).

Unit-4: **(12Th+3Tut)**
Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility).

Unit-5:Particle Accelerators: **(11Th+3Tut)**
Van-de Graaff generator(Tandem accelerator), Linear accelerator, Cyclotron, Betatron, Synchrotrons, Accelerator facility available in India

Reference Books:

- Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998).
- Nuclear Physics by S. N. Ghosal (S.Chand)
- Nuclear Physics by D. C. Tayal (Himalaya Publishing House)

V.C. Nominee	**Departmental Members**
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	6. Dr Kusumanjali Deshmukh..... 11.3.23

PHYSICS LAB-DSC LAB:
BPHL401: WAVES AND OPTICS
Credit - 02
Lab Hrs : 60

After the completion of the course, Students are expected to understand working mechanism and factors governing Thermodynamics and Optics (both geometrical and wave). In connection of the same students are expected to

CO1 Design and resolve circuits for electronic applications.

CO2 Record data as required by the experimental objectives.

CO3 Analyse recorded data and formulate it to get desired results.

CO4 Interpret results and check for attainment of proposed objective.

List of experiments :

1. To determine the Frequency of AC mains with the help of Sonometer.
2. To determination of angle of prism.
3. To determine the Coefficient of Viscosity of water by Capillary Flow Method(Stoke's method).
4. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
5. To determine Dispersive Power of the Material of a given Prism using MercuryLight
6. To determine the value of Cauchy Constants of a material of a prism.
7. To determine the Resolving Power of a Prism.
8. To determine wavelength of sodium light using Fresnel Biprism.
9. To determine wavelength of sodium light using Newton's Rings.
10. To determine the wavelength of Laser light using Diffraction of Single Slit.
11. To determine wavelength of (1) Sodium & (2) spectrum of Mercury light usingplane diffraction Grating
12. To determine the Resolving Power of a Plane Diffraction Grating.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

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SKILL ENHANCEMENT COURSES (CREDIT: 02 EACH)-

BPHSE101

BASIC INSTRUMENTATION SKILLS
(Credits: 02 1Th +1Lab)
Total : 15 Lect + 30 lab

This course is to get exposure with various aspects of instruments and their usage through hands-on mode. Experiments listed below are to be done in continuation of the topics.

Course Outcomes:

After the completion of the course, Students will be able to:

CO1 Use millimeter to the accuracy required for a stated situation or within the permissible errors.

CO2 Use digital voltmeter to the accuracy required for a stated situation or within the permissible errors and compare its advantage over analog meers

CO3 Set a CRO for measurements and use all its function

CO4 Explain and specify uses of function generators and its block diagram.

CO5 Compare analog and digital meters, in general

Basic of Measurement: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Multimeter:** Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. **(2Lectures)**

Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. **AC millivoltmeter:** Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance. **(2Lectures)**

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. **(3 Lectures)**

Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working. **(3 Lectures)**

Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. **(3 Lectures)**

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. **(2 Lectures)**

The test of lab skills will be of the following test items:

1. Use of an oscilloscope.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
4. Use of Digital Multimeter/VTVM for measuring voltages
5. Circuit tracing of Laboratory electronic equipment,
6. Winding a coil / transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

Laboratory Exercises:

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltage and currents.
3. To measure Q of a coil and its dependence on frequency, using a Q- meter.
4. Measurement of voltage, frequency, time period and phase angle using CRO.
5. Measurement of time period, frequency, average period using universal counter/ frequency counter.
6. Measurement of rise, fall and delay times using a CRO.
7. Measurement of distortion of a RF signal generator using distortion factor meter.
8. Measurement of R, L and C using a LCR bridge/ universal bridge.

Open Ended Experiments:

1. Using a Dual Trace Oscilloscope
2. Converting the range of a given measuring instrument (voltmeter, ammeter)

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand and Co.

- Performance and design of AC machines - M G Say ELBS Edn.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Logic circuit design, Shimon P. Vingron, 2012, Springer.
- Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
- Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill
- Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer
- Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India

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V.C. Nominee	**Departmental Members**
Subject Expert	**1. H.O.D Dr. Jagjeet Kaur Saluja**.....11.3.2023.....
Subject Expert.....	**2. Dr.R.S. Singh**.....
Alumni (member).....	**3. Dr. Anita Shukla**.....
Prof. from other Dept. Of Sc. Faculty	**4. Mrs. Siteshwari Chandrakar**.....
Specialist from Industry.....	**5. Dr. Abhishek Kumar Misra**.....
	6. Dr Kusumanjali Deshmukh.....11.3.23

BPHSE201

ELECTRICAL CIRCUITS AND NETWORK SKILLS

(Credits: 02)

Theory: l5 Lectures + 30 Lab Periods

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

Course Outcomes:

After the completion of the course the student will acquire necessary skills :

CO1	To understand various types of DC and AC circuits.
CO2	To make electrical drawings with symbols for various systems.
CO3	To operate generators, transformers and electric motors.
CO4	To develop knowledge of solid state devices and their uses.
CO5	To do electrical wiring with assured electrical protection of devices.

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter. **(2 Lecture)**

Understanding Electrical Circuits: Main 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. **(2 Lecture)**

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. **(2 Lecture)**

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers. **(2 Lecture)**

Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC

or AC sources to control heaters & motors. Speed & power of ac motor. **(2 Lecture)**

Solid State Devices : Resistors, inductors and capacitors.. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources, Diode and rectifiers in Regulated Power supply **(2Lecture)**

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device) **(3 Lecture)**

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand & Co.
- A text book of Electrical Technology - A K Theraja
- Performance and design of AC machines - M G Say ELBS Edn.

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