DEPARTMENT OF PHYSICS

COURSE CURRICULUM & MARKING SCHEME

B.Sc. III, IV, V & VI Semester
PHYSICS
(Based on Choice Based Credit System)

SESSION : 2024-25

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

Website - www.govtsciencecollegedurg.ac.in,

Email – autonomousdurg2013@gmail.com

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. (PMGl)]

III, IV, V & VI Semester

2024-25

Appendix-II (Amended)

UGCF for Multidisciplinary Courses of Study

Sem.	DSC	DSE	GE	AEC	SEC/ Internship/ Apprenticeship / Project/ Dissertation / 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 exiting shall be awarded Undergraduate Certificate (in the Field of study/Discipline) after securing the minimum 40 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 exiling shall be awarded Undergraduate Diploma (in the Field of study/Discipline) after securing the minimum 80 credits on completion of semester IV							**Total = 88 Credits**
V	DSC A 5-(4) DSC B 5-(4) DSC C 5-(4)	Choose two from a pool of courses DSE A/B/C (4+4) OR Choose two from a pool of courses GE-5 (4) & GE-6 (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 two from a pool of courses DSE A/B/C (4+4) Choose one from a pool of courses GE-7 (4)& GE-8 (4)			Internship/Apprenticeship/Project/community outreach **(2)**		**22 Credits**
Students exiting shall be awarded Bachelor of (in the Field of Multidisciplinary study) in relevant Discipline after securing the minimum 120 credits on completion of semester VI							**Total = 132 Credits**
VII	DSCA/B/C-(4)	Choose Four DSE (4x4) courses **OR** Choose three DSE-(3x4) and one GE-(1x4) course **OR** Choose one DSE (1 x 4) and Three GE (3 x 4) courses **OR** All Four GE 9, 10, 11 & 12 (4x4) (total=16)					**20 credits**
VIII	DSC A/B/C-(4)	Choose Four DSE(4x4) courses **OR** Choose three DSE-(3x4) and one GE-(1x4) course **OR** Choose one DSE -(1x4) and Three GE(4) (3x4) courses **OR** All Four GE 13, 14, 15 & 16 (4x4) (total=16)					**20 credits**
Students shall be awarded Bachelor of (in the Field of Multidisciplinary study) (Honours)in relevant Discipline after securing the minimum 160 credits on completion of Semester VIII OR							**Total = 172 Credits**
VII	DSCA/B/C-(4)	Choose Four DSE(4x4) courses **OR** Choose three DSE-(3x4) and one GE-(1x4) course**OR** Choose one DSE (1 x 4) and Three GE (3 x 4) courses **OR** All Four GE 9, 10, 11 & 12(4x4) (total=16)					**20 credits**
VIII	DSC A/B/C-(4)	Choose one DSE (1 x 4) courses **OR** Choose one GE(1 x 4) course **OR**			**Research Project / Dissertation (12)**		**20 credits**
Students shall be awarded Bachelor of (in the Field of Multidisciplinary study) (Honours with Research) in relevant Discipline after securing the minimum 160 credits on completion of Semester VIII							**Total = 172 Credits**

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

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

Approved syllabus for Semester and CBCS curriculum of B.Sc. with PHYSICS, by the members of Board of Studies for Session 2024-25

Semester III	Semester IV	Semester V	Semester VI	No. of Credits
DSC: BPH301 Thermal Physics And Statistical Mechanics	DSC: BPH401 Waves And Optics	DSC : BPH501 Elements of Modern Physics	DSC : BPH601 Solid State Physics, Solid State Devices and Electronics	3
DSC: BPHL301 Thermal Physics And Statistical Mechanics Lab	DSC: BPHL401 Waves And Optics Lab	DSC : BPHL501 Elements of Modern Physics Lab	DSC : BPHL601 Solid State Physics, Solid State Devices and Electronics Lab	1
DSE: BPH302 Elementary Mathematical Physics	DSE: BPH402 Nuclear Energy, Nuclear Detectors and Accelerators	DSE : BPH502 Digital Electronics	DSE : BPH602 Laser And Optical Fibers	3
DSE: BPHL302 Elementary Mathematical Physics Lab/Tutorial	DSE: BPHL402 Nuclear Energy, Nuclear Detectors and Accelerators Lab/Tutorial	DSE : BPHL502 Digital Electronics Lab	DSE : BPHL602 Laser And Optical Fibers Lab	1
SEC : BPHSE101 Basic Instrumentation Skills	SEC : BPHSE201 Electrical Circuits And Network Skills	SEC : BPHSE101 Basic Instrumentation Skills	SEC : BPHSE201 Electrical Circuits and Network Skills	1
SEC : BPHSEL101 Basic Instrumentation Skills Lab/Project	SEC : BPHSEL201 Electrical Circuits And Network Skills Lab/Project	SEC : BPHSEL101 Basic Instrumentation Skills Lab/Project	SEC : BPHSEL201 Electrical Circuits and Network Skills Lab/Project	1

*DSC – Discipline Specific Course
*GEC – Generic Elective Course
*DSE – Discipline Specific Elective
*SEC – Skill Enhancement Course

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

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

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

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

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

Syllabus and Marking Scheme for B.Sc. with Physics

Session 2024-2025

Semester III

(For Regular Students)

Course Type	Title of the Paper	No. of Credits	Marks Allotted in Theory & Practical			
			SEM. END	INTERNAL ASS.	TOTAL MARKS	
			Max	Max	Max	Min
DSC	**BPH301 :** Thermal Physics And Statistical Mechanics	3	80	20	100	40
DSC	**BPHL301 :** Thermal Physics And Statistical Mechanics Lab	1	50	-	50	20
DSE	**BPH302 :** Elementary Mathematical Physics	3	80	20	100	40
DSE	**BPHL302 :** Elementary Mathematical Physics Lab/Tutorial	1	50	-	50	20
SEC	**BPHSE101 :** Basic Instrumentation Skills	1	25	-	25 + 25 = 50	20
SEC	**BPHSEL101 :** Basic Instrumentation Skills Lab/Project	1	25	-		

For ATKT/EX Students

Course Type	Title of the Paper	No. of Credits	Marks Allotted in Theory & Practical			
			SEM. END	INTERNAL ASS.	TOTAL MARKS	
			Max	Max	Max	Min
DSC	**BPH301 :** Thermal Physics And Statistical Mechanics	3	60	15	75	30
DSC	**BPHL301 :** Thermal Physics And Statistical Mechanics Lab	1	25	-	25	10
DSE	**BPH302 :** Elementary Mathematical Physics	3	60	15	75	30
DSE	**BPHL302 :** Elementary Mathematical Physics Lab/Tutorial	1	25	-	25	10
SEC	**BPHSE101 :** Basic Instrumentation Skills	1	20	05	25	10
SEC	**BPHSEL101 :** Basic Instrumentation Skills Lab/Project	1	25	-	25	10

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

<table>
<tr><th colspan="5">PART A: INTRODUCTION</th></tr>
<tr><td colspan="2">Program: FYUP
B.Sc. with Physics</td><td colspan="2">Class: B.Sc. (Maths) Semester - III</td><td>Session: 2024-2025</td></tr>
<tr><td>1</td><td>Course Code</td><td colspan="3">BPH301</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="3">THERMAL PHYSICS AND STATISTICAL MECHANICS</td></tr>
<tr><td>3</td><td>Course Type</td><td colspan="3">Discipline Specific Course (DSC)</td></tr>
<tr><td>4</td><td>Course Learning Outcome (CLO)</td><td colspan="3">This Course will enable the students to:
• 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.
• Identify thermodynamic variables and appraise various relations for gaseous system.
• Acquire a thorough knowledge of Black body radiation and laws associated with it.
• 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.
• 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.</td></tr>
<tr><td>5</td><td>Credit Value</td><td>3 Credits</td><td colspan="2">1 Credit =15 Hours/Sem. – Learning and Observation</td></tr>
<tr><td>6</td><td>Total Marks</td><td colspan="2">Maximum Marks :100</td><td>Minimum Passing Marks:40</td></tr>
<tr><th colspan="5">PART B: CONTENT OF THE COURSE</th></tr>
<tr><td colspan="5">Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)</td></tr>
<tr><td colspan="2">Unit</td><td colspan="2">Topics (COURSE CONTENTS)</td><td>No. of Periods</td></tr>
<tr><td colspan="2">I</td><td colspan="2">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: 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.</td><td>12</td></tr>
</table>

II	**Thermodynamic Potentials:** Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius- Clapeyron Equation, General Relation Between C_P & C_V, Expression for $(C_P - C_V)$, C_P/C_V, TdS equations.	**8**
III	**Kinetic Theory of Gases:** Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path, Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equi-partition of energy and its applications to specific heat of gases; mono-atomic and diatomicgases.	**8**
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**
V	**Statistical Mechanics:** Concept of Phase space, Macrostate and Microstate, Statistical Entropy and Thermodynamic probability, Partition Function, Maxwell-Boltzmann Statistics - distribution of velocity - Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics.	**9**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Unified Physics, R. P. Goyal, Shivlal Agrawal and Company Publication.
- Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.

Reference Books

- 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.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. Basics of thermodynamics ***https://www.youtube.com/watch?v=9GMBpZZtjXM&list=PLD8E646BAB3366BC8***
2. Thermodynamics ***https://www.youtube.com/watch?v=E9cOAMhFUz0***
3. Second law of thermodynamics ***https://www.youtube.com/watch?v=F_flGosPY8o***
4. ***NPTEL Online Lectures:*** ***https://archive.nptel.ac.in/courses/115/105/115105129/***
5. ***https://archive.nptel.ac.in/courses/115/106/115106090/***
6. ***https://bsc.hcverma.in/course/penopcyc***
7. Vedic Science and Thermodynamics : ***https://www.puranavedas.com/vedic-physics/***
8. ***https://www.amazon.in/Vedic-Physics-Raja-Ram-Mohan/dp/0968412009?asin=1988207045&revisionId=&format=4&depth=2***

PART D: ASSESSMENT AND EVALUATION		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **100 Marks** **Continuous Comprehensive Evaluation (CCE):** **20 Marks** **Semester End Exam (SEE):** **80 Marks**		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)		Internal Test of 20 Marks each and Assignment of 20 Marks
Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit** Question - A & B: (Compulsory) Very short answer type (02 each) 04 x 5 = 20 Marks Question - C: Short answer type question 05 x 5 = 25 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 80 Marks**	

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

LAB COURSE

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)** **Semester - III**		**Session: 2024-2025**
1	**Course Code**	**BPHL301**		
2	**Course Title**	**THERMAL PHYSICS AND STATISTICAL MECHANICS LAB**		
3	**Course Type**	**Discipline Specific Course (DSC)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Design and assemble apparatus for given objectives. • Record data as required by the experimental objectives. • Analyze recorded data and formulate it to get desired results. • Interpret results and check for attainment of proposed objective.		
5	**Credit Value**	**1 Credit**	**1 credit =30 Hours/Sem – Learning and Observation**	
6	**Total Marks**	**Maximum Marks: 50**		**Minimum Passing Marks: 20**

PART B: CONTENT OF THE COURSE	
S. No.	**List of Experiments**
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 and Charlton'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 with temperature.
9	To Study Newton's law of cooling.
10	Verification of Joule's Law.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, AsiaPublishing 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.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

Link for e-Books for Physics Practical and Virtual labs

1. Thermal Physics and Statistical Mechanics: Laboratory Collection https://egyankosh.ac.in/handle/123456789/67450
2. Virtual Lab :https://vlab.amrita.edu/index.php?sub=1&brch=194
3. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1
4. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=801&cnt=4
5. https://srmap.edu.in/seas/physics-virtual-lab/
6. https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab
7. https://www.pbslearningmedia.org/resource/lsps07-sci-phys-thermalenergy/thermal-energy-transfer/#.WdJiOJIrLIU

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:
Maximum Marks: 50 Marks
(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance:** Students need to perform 1 Experiment and present observation and calculations in the given duration of 2 hours and will be assessed on it.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

<table>
<tr><th colspan="5">PART A: INTRODUCTION</th></tr>
<tr><td colspan="2">Program: FYUP
B.Sc. with Physics</td><td colspan="2">Class: B.Sc. (Maths) Semester - III</td><td>Session: 2024-2025</td></tr>
<tr><td>1</td><td>Course Code</td><td colspan="3">BPH302</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="3">ELEMENTARY MATHEMATICAL PHYSICS</td></tr>
<tr><td>3</td><td>Course Type</td><td colspan="3">Discipline Specific Elective (DSE)</td></tr>
<tr><td>4</td><td>Course Learning Outcome (CLO)</td><td colspan="3">This Course will enable the students to:
• Write and solve derivatives and integrals of a given function and extract its Physical meaning
• Perform algebraic operations of scalars and vectors and workout repeated integration of a given function.
• Apply matrix algebra for a given problem and find solution.
• Demonstrate ability to analyze and implement complex algebra in a given physical problem.
• Apply probability and statistical distribution for various events and visualize its applicability for a given system.</td></tr>
<tr><td>5</td><td>Credit Value</td><td>4 Credits</td><td colspan="2">1 credit =15 Hours – Learning and Observation</td></tr>
<tr><td>6</td><td>Total Marks</td><td colspan="2">Maximum Marks :100</td><td>Minimum Passing Marks:40</td></tr>
<tr><th colspan="5">PART B: CONTENT OF THE COURSE</th></tr>
<tr><td colspan="5">Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)</td></tr>
<tr><th>Unit</th><th colspan="3">Topics (COURSE CONTENTS)</th><th>No. of Periods</th></tr>
<tr><td>I</td><td colspan="3">Derivatives and Integrals: 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.</td><td>9</td></tr>
<tr><td>II</td><td colspan="3">Scalars and Vectors : 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 theorem.</td><td>9</td></tr>
</table>

III	**Matrices and Determinants:** 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.	**9**
IV	**Complex Numbers**: 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.	**9**
V	**Probability And Elementary Statistics**: Sample space, events, probability in a discrete sample space, Discrete random variables, mean joint distributions. Statistical description, frequency distribution, commulative distribution and tabulation of data.	**9**
Tutorial Topics		**30**
Topics	**Problem Solving on** **Scalars and Vectors** **Matrices and Determinants:** **Complex Numbers** **Common functions of complex variables** **Probability And Elementary Statistics**:	

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Mathematical Physics By B. S, Rajput (Pragati Prakashan)
- Mathematical Physics by H K Dass (S Chand Publication)

Reference Books

- Mathematical Physics P K Chatopadhyay (New Age Publication)
- Mathematical Physics By V D Gupta (Vikas Publishing House)

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **100 Marks**

Continuous Comprehensive Evaluation (CCE): **20 Marks**

Semester End Exam (SEE): **80 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 20 Marks each and Assignment of 20 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit**	
	Question - A & B: (Compulsory) Very short answer type (02 each)	04 x 5 = 20 Marks
	Question - C: Short answer type question	05 x 5 = 25 Marks
	Question -D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 80 Marks**

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members 1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Subject Expert	3. Dr. Anita Shukla .....
Alumni (member).....	4. Dr. Siteshwari Chandraker .....
Prof. from other Dept. of Sc. Faculty	5. Dr. Abhishek Kumar Misra .....
Specialist from Industry.....	6. Dr. Kusumanjali Deshmukh.....

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

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

B.Sc. with Physics

Session 2024-2025

Semester III

SEC (Theory & Practical/Project)

BPHSE101: BASIC INSTRUMENTATION SKILLS

Credits: 02 **Lectures: 45 Hours**
Theory – 01 **Theory – 15 Hours**
Practical – 01 **Practical – 30 Hours**

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 (CO):

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 voltmeter.**
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 Multimeters.**

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. **(2 Lectures)**

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. **(2 Lectures)**

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)**

PRACTICAL/PROJECT

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 alow resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltageand 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

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

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

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

Syllabus and Marking Scheme for B.Sc. with Physics

Session 2024-2025

Semester IV

(For Regular Students)

Course Type	Title of the Paper	No. of Credits	Marks Allotted in Theory & Practical			
			SEM. END	INTERNAL ASS.	TOTAL MARKS	
			Max	Max	Max	Min
DSC	**BPH401 :** Waves And Optics	3	80	20	100	40
DSC	**BPHL401 :** Waves And Optics Lab	1	50	-	50	20
DSE	**BPH402 :** Nuclear Energy, Nuclear Detectors and Accelerators	3	80	20	100	40
DSE	**BPHL402 :** Nuclear Energy, Nuclear Detectors and Accelerators Lab/Tutorial	1	50	-	50	20
SEC	**BPHSE201 :** Electrical Circuits And Network Skills	1	25	-	25 + 25 =50	20
SEC	**BPHSEL201 :** Electrical Circuits And Network Skills Lab/Project	1	25	-		

For ATKT/EX Students

Course Type	Title of the Paper	No. of Credits	Marks Allotted in Theory & Practical			
			SEM. END	INTERNAL ASS.	TOTAL MARKS	
			Max	Max	Max	Min
DSC	**BPH401 :** Waves And Optics	3	60	15	75	30
DSC	**BPHL401 :** Waves And Optics Lab	1	25	-	25	10
DSE	**BPH402 :** Nuclear Energy, Nuclear Detectors and Accelerators	3	60	15	75	30
DSE	**BPHL402 :** Nuclear Energy, Nuclear Detectors and Accelerators Lab/Tutorial	1	25	-	25	10
SEC	**BPHSE201 :** Electrical Circuits And Network Skills	1	20	05	25	10
SEC	**BPHSEL201 :** Electrical Circuits And Network Skills Lab/Project	1	25	-	25	10

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)** **Semester - IV**		**Session: 2024-2025**
1	**Course Code**	**BPH401**		
2	**Course Title**	**WAVES AND OPTICS**		
3	**Course Type**	**Discipline Specific Course (DSC)**		
4	**Course Learning Outcome (CLO)**	**After successful completion of the course, students will be able to:** • Explain superposition theorem for waves of different waves. • Express waves in form of equation, interpret the solutions and determine values of parameters. • Differentiate Quality and features of sounds and evaluate the parameters affecting architectural acoustics of a building. • Demonstrate different type of interferences and interpret interference results using Michelson interferometer. • Describe and demonstrate diffraction and Polarization of light. Compare Fresnel half period zones with, Fraunhoffer diffractions. Compare techniques to produce polarized light.		
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :100**		**Minimum Passing Marks:40**

PART B: CONTENT OF THE COURSE		
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)		
Unit	**Topics (COURSE CONTENTS)**	**No. of Periods**
I	**Superposition of Two Collinear Harmonic oscillations:** Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having differentfrequencies (Beats). **Superposition of Two Perpendicular Harmonic Oscillations:** Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.	**6**
II	**Waves Motion- General: Waves in media:** Speed of transverse waves on uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves. Waves over liquid surface: gravity waves and ripples. Group velocity and phase velocity and relationship between them. Production and detection of ultrasonic and infrasonic waves and applications.	**7**

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**
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, Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes.	**12**
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 andanalysis. Circular and elliptical polarization.	**12**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Unified Physics, R. P. Goyal, Shivlal Agrawal and Company Publication.
- Fundamentals of Optics, F A Jenkins and H E White, 1976, McGraw-Hill.

Reference Books

- Principles of Optics, B.K. Mathur, 1995, Gopal Printing
- Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. ChandPublication
- University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison-Wesley

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

Link for e-resources:

1. Wave an introduction https://youtu.be/SuQE7eUEriU
2. Interference https://youtu.be/hvpYKPyT-vc
3. Diffraction https://youtu.be/3RZZQvEVrEA
4. Polarization https://youtu.be/nELYaf_N528
5. Waves and Oscillations- https://archive.nptel.ac.in/courses/115/106/115106119/
6. Optics- https://archive.nptel.ac.in/courses/115/107/115107131/

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **100 Marks**

Continuous Comprehensive Evaluation (CCE): **20 Marks**

Semester End Exam (SEE): **80 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 20 Marks each and Assignment of 20 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit** Question - A & B: (Compulsory) Very short answer type (02 each) 04 x 5 = 20 Marks Question - C: Short answer type question 05 x 5 = 25 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 80 Marks**

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

LAB COURSE

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - IV**	**Session: 2024-2025**
1	**Course Code**	**BPHL401**		
2	**Course Title**	**WAVES AND OPTICS LAB**		
3	**Course Type**	**Discipline Specific Course (DSC)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Design and resolve circuits for electronic applications. • Record data as required by the experimental objectives. • Analyse recorded data and formulate it to get desired results. • Interpret results and check for attainment of proposed objective.		
5	**Credit Value**	**1 Credit**	**1 credit =30 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks: 50**		**Minimum Passing Marks: 20**

PART B: CONTENT OF THE COURSE	
S. No.	**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 Mercury Light.
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 using plane diffraction Grating.
12	To determine the Resolving Power of a Plane Diffraction Grating.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, AsiaPublishing 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.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. Link for e-Books for Physics: Physics Practical: https://egyankosh.ac.in/handle/123456789/82374; https://www.lightandmatter.com/lab_223.pdf;
2. Virtual Lab : https://vlab.amrita.edu/index.php?sub=1&brch=281
3. https://www.compadre.org/books/?ID=70&FID=63273
4. https://www.edutech.com/category/higher-education/engineering-labs/virtual-labs-1
5. https://phet.colorado.edu/en/simulations/wave-interference
6. https://egyankosh.ac.in/handle/123456789/82374

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance:** Students need to perform and present observation of 1 Experiment in a duration of 2 Hrs and will be assessed on it.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - IV**	**Session: 2024-2025**
1	**Course Code**	**BPH402**		
2	**Course Title**	**NUCLEAR ENERGY, NUCLEAR DETECTORS AND ACCELERATORS**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Understand and explain process of fission, derive conditions for sustained, controlled and uncontrolled process. • Analyse and apply knowledge of fusion for energy needs of country. • Use interaction mechanism of radiation with matter to detect nuclear particles • Explain working and construction of various nuclear detectors. • Apply knowledge of particle acceleration and its application in accelerators.		
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :100**		**Minimum Passing Marks:40**

PART B: CONTENT OF THE COURSE		
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)		
Unit	**Topics (COURSE CONTENTS)**	**No. of Periods**
I	**Nuclear Fission:** 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.	**7**
II	**Nuclear Fusion :** Nuclear Fusion, Thermonuclear reaction and its challenges; Tokomac, Nuclear Fusion Reactors; Energy production in stars; p-p chain and CNO cycle.	**6**
III	**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, neutron interaction with matter(elementary).	**9**

IV	**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).	**12**
V	**Particle Accelerators:** Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Betatron, Synchrotrons, Accelerator facility available in India.	**11**
Tutorial Topics		**30**
Modules	• **Calculation of Energy released during fission** • **Presentation on Nuclear Chain Reaction by students** • **Atom Bombs and its working and discussion on its usage** • **Calculation of Energy Released during fusion reaction** • **Presentation on Energy released inside Sun** • **Presentation on nuclear reactors of India** • **Group Discussion on Good and Not so Good of Nuclear Energy** • **Demonstration of GM Counter/ Tokomac/ Gieger counters, using virtual labs** • **Photomultiplier Tubes and their working** • **Accelerators in India: survey report**	

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Nuclear Physics by S. N. Ghosal (S.Chand)

Reference Books

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

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. NPTEL :: Physics - NOC:Nuclear and Particle Physics
2. NPTEL :: Physics - Nuclear Physics: Fundamentals and Applications
3. Fundamentals of Nuclear Power Generation - Course (nptel.ac.in)
4. eGyanKosh: Unit-13 Nuclear Physics
5. eGyanKosh: Block-4 Nuclear Physics
6. NPTEL :: Physics - Nuclear Science & Engineering
7. Official Websites of Raja Ramanna Centre for Advanced Technology (RRCAT),Variable Energy Cyclotron Centre (VECC),BARC–TIFR Pelletron Facility,Inter-University Accelerator Centre (IUAC)

PART D: ASSESSMENT AND EVALUATION		
Suggested Continuous Evaluation Methods: **Maximum Marks:** **100 Marks** **Continuous Comprehensive Evaluation (CCE):** **20 Marks** **Semester End Exam (SEE):** **80 Marks**		
Internal Assessment: Continuous Comprehensive Evaluation (CCE)		Internal Test of 20 Marks each and Assignment of 20 Marks
Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit** Question - A & B: (Compulsory) Very short answer type (02 each) 04 x 5 = 20 Marks Question - C: Short answer type question 05 x 5 = 25 Marks Question -D: Long answer type question 07 x 5 = 35 Marks **Total = 80 Marks**	

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

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

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

B.Sc. with Physics

Session 2024-2025

Semester IV

SEC (Theory & Practical/Project)

BPHSE201: ELECTRICAL CIRCUITS AND NETWORK SKILLS

Credits: 02 **Lectures: 45 Hours**

Theory – 01 **Theory – 15 Hours**

Practical – 01 **Practical – 30 Hours**

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 (CO):

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

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 DCor 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 ACsources, Diode and rectifiers in Regulated Power supply. **(2 Lecture)**

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)

PRACTICAL/PROJECT

1. Study of series and parallel combination of resistance.
2. To measure current and voltage drop across the DC circuit element.
3. Tracking the connection of elements and identify polarity.
4. Study of DC generator with output voltage measurement.
5. Study of transformer with voltage measurement.
6. Study of regulated power supply.
7. Study of fuses and circuit breaker.
8. Soldering electronic components on PCB board.

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.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

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

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

Syllabus and Marking Scheme for B.Sc. with Physics

Session 2024-2025

Semester V

Course Type	Title of the Paper	No. of Credits	Marks Allotted in Theory & Practical			
			SEM. END	INTERNAL ASS.	TOTAL MARKS	
			Max	Max	Max	Min
DSC	**BPH501 :** Elements of Modern Physics	3	60	15	75	30
DSC	**BPHL501 :** Elements of Modern Physics Lab	1	25	-	25	10
DSE	**BPH502 :** Digital Electronics	3	60	15	75	30
DSE	**BPHL502 :** Digital Electronics Lab	1	25	-	25	10
SEC	**BPHSE101 :** Basic Instrumentation Skills	1	25	-	25	10
SEC	**BPHSEL101 :** Basic Instrumentation Skills Lab/Project	1	25	-	25	10

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - V**	**Session: 2024-2025**
1	**Course Code**	**BPH501**		
2	**Course Title**	**ELEMENTS OF MODERN PHYSICS**		
3	**Course Type**	**Discipline Specific Course (DSC)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Comprehend the failure of classical physics and need for quantum physics. • Grasp the basic foundation of various experiments establishing the quantum physics by doing the experiments in laboratory and interpreting them. • Formulate the basic theoretical problems in one, two and three dimensional physics an solve them. • Apply the basic skills developed in quantum physics to various problems in Nuclear Physics, Atomic Physics and Laser Physics		
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :75**		**Minimum Passing Marks:30**

PART B: CONTENT OF THE COURSE		
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)		
Unit	**Topics (COURSE CONTENTS)**	**No. of Periods**
I	Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson- Germer experiment. Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra.	**9**
II	Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle. Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wave function, probabilities and normalization; Probability and probability current densities in one dimension.	**12**

III	One dimensional infinitely rigid box- energy eigenvalues and eigen functions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier.	**9**
IV	Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.	**7**
V	Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; adecay; b decay - energy released, spectrum and Pauli's prediction of neutrino; g-rayemission.	**8**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

- Unified Physics, R. P. Goyal, Shivlal Agrawal and Company Publication.
- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill

Reference Books:

- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHILearning
- Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore,2003, McGraw Hill
- Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
- Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, CengageLearning
- Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. All e-books of physics https://www.e-booksdirectory.com/listing.php?category=2
2. Free physics textbook in PDF : https://www.motionmountain.net/?gclid=CjwKCAjwmq3kBRB_EiwAjkNDp5v8Yy6xK1s0Kma0VR0AWGlichRwFfCC0-vpZK1jrPoEOAnBq8fcqRoCILsQAvD_BwE
3. Cambridge University Books for Physics https://www.cambridgeindia.org/
4. Books for solving physics problems https://bookboon.com/en/physics-ebooks
5. NPTEL Online courses: https://onlinecourses.nptel.ac.in/noc21_ph05/preview
6. Quantum Mechanics https://archive.nptel.ac.in/courses/115/101/115101107/
7. Quantum Mechanics https://nptel.ac.in/courses/115106066

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**75 Marks**
Continuous Comprehensive Evaluation (CCE):	**15 Marks**
Semester End Exam (SEE):	**60 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 15 Marks and Assignment of 15 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit**	
	Question - A & B: (Compulsory) Very short answer type (01 each)	02 x 5 = 10 Marks
	Question - C: Short answer type question	03 x 5 = 15 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 60 Marks**

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

LAB COURSE

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - V**	**Session: 2024-2025**
1	**Course Code**	**BPHL501**		
2	**Course Title**	**ELEMENTS OF MODERN PHYSICS LAB**		
3	**Course Type**	**Discipline Specific Course (DSC)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Design and assemble materials for given objective • Record data as required by the experimental objectives. • Analyze recorded data and formulate it to get desired results. • Interpret results and check for attainment of proposed objective.		
5	**Credit Value**	**1 Credit**	**1 credit =30 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :25**		**Minimum Passing Marks:10**

PART B: CONTENT OF THE COURSE	
S. No.	**List of Experiments**
1.	To determine value of Boltzmann constant using V-I characteristic of PN diode.
2.	To determine value of Planck's constant using LEDs of at least 4 differentcolors.
3.	To determine ionization potential of mercury.
4.	To determine work function of material of filament of directly heated vacuum diode.
5.	To determine Radioactive decay constant with the help of statistical board.
6.	To determine the absorption lines in the rotational spectrum of Iodine vapour.
7.	To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photo sensor and compare with incoherent source – Na light.
8.	Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light.
9.	To determine the value of e/m by Thomson Method.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, AsiaPublishing 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.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. Link for e-Books for Physics: Physics Practical:
2. Virtual Lab : https://vlab.amrita.edu/?sub=1&brch=195
3. https://mpv-au.vlabs.ac.in/
4. https://mpv-au.vlabs.ac.in/modern-physics/Hall_Effect_Experiment/
5. https://www.falstad.com/qmatomrad/
6. https://www.falstad.com/mathphysics.html : Quantum mechanics

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **25 Marks**

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance:** Students are required to perform one experiment, take observation and make calculations in the allotted duration of 2 hours. Viva voce will be based on the experiment performed.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - V**	**Session: 2024-2025**
1	**Course Code**	**BPH502**		
2	**Course Title**	**DIGITAL ELECTRONICS**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Understand fundamentals of Number Systems, Boolean algebra and minimization techniques. • Design combinational digital circuits. • Design sequential digital circuits. • Understand working and applications of analog to digital and digital to analog converters. • Understand the different types of memories.		
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :75**	**Minimum Passing Marks:30**	

PART B: CONTENT OF THE COURSE

Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)

Unit	**Topics (COURSE CONTENTS)**	**No. of Periods**
I	**Number System and Codes**: Decimal, Binary, Octal and Hexadecimal number systems base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication.	**7**
II	**Logic Gates and Boolean algebra**: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra. **Combinational Logic Analysis and Design**: Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP).	**9**
III	**Arithmetic Circuits**: Binary Addition, Half and Full Adder, Half and Full Subtractor. **Data processing circuits**: Multiplexers, De-multiplexers, Decoders, Encoders.	**9**

IV	**Sequential Circuits**: SR, D, T and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop. **Shift registers**: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel- in-Parallel-out Shift Registers (only up to 4 bits).	**12**
V	**Semiconductors Memories:** Types of memory, RAM, ROM, Virtual Memory, Cache memory. **Digital to Analog Converters:** 4 bit binary weighted and R-2R Ladder converters. **Analog to Digital Converters:** successive approximation converters, Counter Type Converter, Flash Type Converter, Dual Slope Type Converter.	**8**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Electronics and Micro-Computer, R K Gaur, Dhanpat Rai Publication.

Reference Books:

- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed.,2011,Tata McGraw
- Digital Circuits and systems, Venugopal, 2011, Tata McGrawHill.
- Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
- Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia(1994)
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill(1994)

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. https://www.freebookcentre.net/Electronics/Digital-CircuitsBooks.html#google_vignette
2. https://www.researchgate.net/profile/Dk Kaushik/publication/264005171_Digital_Electronics/links/53fca84a0cf2364ccc04b6dd/Digital-Electronics.pdf
3. https://www.freebookcentre.net/electronics-ebooks-download/Digital-Electronics-Notes.html
4. https://www.academia.edu/40001993/Digital_Electronics
5. https://www.technicalbookspdf.com/electronic-engineering/digital-electronics/
6. https://www.tutorialspoint.com/digital_circuits/digital_circuits_multiplexers.htm
7. https://www.electronics-tutorials.ws/combination/comb_3.html
8. https://www.electronics-tutorials.ws/combination/analogue-to-digital-converter.html
9. https://www.geeksforgeeks.org/counter-type-analog-to-digital-converter-adc/
10. https://nios.ac.in/media/documents/SrSecLibrary/LCh-008.pdf

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **75 Marks**

Continuous Comprehensive Evaluation (CCE): **15 Marks**

Semester End Exam (SEE): **60 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 15 Marks and Assignment of 15 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit**	
	Question - A & B: (Compulsory) Very short answer type (01 each)	02 x 5 = 10 Marks
	Question - C: Short answer type question	03 x 5 = 15 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 60 Marks**

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

LAB COURSE

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - V**	**Session: 2024-2025**
1	**Course Code**	**BPHL502**		
2	**Course Title**	**DIGITAL ELECTRONICS LAB**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Demonstrate all logic gates with truth table. • Understand the various combinational and sequential circuits. • Analyze the operation and working of flip-flops by their truth table.		
5	**Credit Value**	**1 Credit**	**1 credit =30 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :25**		**Minimum Passing Marks:10**

PART B: CONTENT OF THE COURSE	
S. No.	**List of Experiments**
1	Verification of Truth table of logic gates.
2	Verification of De Morgan's theorem.
3	Study of half adders and full adders using IC's.
4	Study of half subtractor and full subtractor using IC's.
5	Study of multiplexer.
6	Study of De-multiplexer.
7	Study of Decoder.
8	Study of RS, D and T flip-flops.
9	Study of JK master slave flips flop.
10	Design a digital to Analog convertor (DAC) of given specifications.
11	Design a Analog to Digital Convertor (ADC) of given specification.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Electronics and Micro-Computer, R K Gaur, Dhanpat Rai Publication.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. https://nationallibraryopac.nvli.in/cgi-bin/koha/opac-detail.pl?biblionumber=15445&query_desc=Provider%3ANew%20Age%20International%2
2. https://books.google.com/books/about/Digital_Electronics.html?id=b7WwzQEACAAJ
3. https://ssit.edu.in/dept/assignment/declabmanual.pdf

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **25 Marks**

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance:** Students are required to perform one experiment, take observation and make calculations in the allotted duration of 2 hours. Viva voce will be based on the experiment performed.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

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

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

B.Sc. with Physics

Session 2024-2025

Semester V

SEC (Theory & Practical/Project)

BPHSE101: BASIC INSTRUMENTATION SKILLS

Credits: 02 **Lectures: 45 Hours**
Theory – 01 **Theory – 15 Hours**
Practical – 01 **Practical – 30 Hours**

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 (CO):

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 voltmeter.**
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 Multimeters.**

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. **(2 Lectures)**

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. **(2 Lectures)**

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)**

PRACTICAL/PROJECT

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 alow resistance and high resistance.
2. To observe the limitations of a multimeter for measuring high frequency voltageand 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

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

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

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

Syllabus and Marking Scheme for B.Sc. with Physics

Session 2024-2025

Semester VI

Course Type	Title of the Paper	No. of Credits	Marks Allotted in Theory & Practical			
			SEM. END	INTERNAL ASS.	TOTAL MARKS	
			Max	Max	Max	Min
DSC	**BPH601 :** Solid State Physics, Solid State Devices and Electronics	3	60	15	75	30
DSC	**BPHL601 :** Solid State Physics, Solid State Devices and Electronics Lab	1	25	-	25	10
DSE	**BPH602 :** Laser And Optical Fibers	3	60	15	75	30
DSE	**BPHL602 :** Laser And Optical Fibers Lab	1	25	-	25	10
SEC	**BPHSE201 :** Electrical Circuits and Network Skills	1	25	-	25	10
SEC	**BPHSEL201 :** Electrical Circuits and Network Skills Lab/Project	1	25	-	25	10

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

<table>
<tr><td colspan="4">PART A: INTRODUCTION</td></tr>
<tr><td colspan="2">Program: FYUP
B.Sc. with Physics</td><td>Class: B.Sc. (Maths) Semester - VI</td><td>Session: 2024-2025</td></tr>
<tr><td>1</td><td>Course Code</td><td colspan="2">BPH601</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="2">SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS</td></tr>
<tr><td>3</td><td>Course Type</td><td colspan="2">Discipline Specific Course (DSC)</td></tr>
<tr><td>4</td><td>Course Learning Outcome (CLO)</td><td colspan="2">This Course will enable the students to:
• Characterize and classify Seven Systems, apply Laue’s equation/ Bragg’s Law of X-ray diffraction to identify crystal planes, Associate bonding in solids with specific heat of solids laws related to it.
• Derive expression for density of states for solids, discuss kronig – penny model and distinguish Metal, Insulator and semiconductors. Classify Dia, Para and ferromagnetism. Investigate Langevin’s theory of dia and para-magnetism and description of Curieweiss’s law, B-H.curve and Hysteresis loss.
• Describe and classify Semiconductors, explain working of n-type and p-types, diodes and transistor junction potentials. Apply its knowledge to solve given problems based on its working.
• Apply knowledge of V-I characteristics of PN junction diode, Zener Diode, Capacitor and Inductor to understand working of half wave and Full wave rectifiers and regulation of voltage. Calculate voltage and current gain for transistor configurations.
• Construct a number system and formulate conversion mechanism mathematical operations for it. Explore Logical operations by basic gates and express combination of gates using Boolean Algebra. Appreciate Digital Circuits and its use in ICs</td></tr>
<tr><td>5</td><td>Credit Value</td><td>3 Credits</td><td>1 credit =15 Hours – Learning and Observation</td></tr>
<tr><td>6</td><td>Total Marks</td><td colspan="2">Maximum Marks :75 Minimum Passing Marks:30</td></tr>
</table>

PART B: CONTENT OF THE COURSE		
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)		
Unit	**Topics (COURSE CONTENTS)**	**No. of Periods**
I	Amorphous and crystalline solids, Elements of symmetry, Seven crystal system, Cubic lattices, Crystal planes, Miller indices, Laue's equation for X-ray diffraction, Brage's Law, Bonding in solids, classification. Cohesive energy of solid, Madelung constant, Specific heat of solids, classical theory (Dulong-Petit's law), Einstein and Debye theories, Vibrational modes of one dimensional monoatomic lattice, Brillouin Zone.	**10**
II	Free electron model of a metal, Solution of one dimensional Schrodinger equation in a constant potential, Density of states, Fermi Energy, Energy bands in a solid (Kronig-Penny model without mathematical details), Difference 'between Metals, Insulator and Semiconductors, Hall effect, Dia, Para and Ferromagnetism, Langevin's theory of dia and para-magnetism, Curie- Weiss's Law, Qualitative description of Ferromagnetism (Magnetic domains), B-H curve and Hysteresis loss.	**10**
III	Intrinsic and_ extrinsic semiconductors, Concept of Fermi level, Generation and recombination of electron hole pairs in semiconductors, Mobility of electrons and holes, drift and diffusion currents, p-n junction diode, depletion width and potential barrier, junction capacitance, I-V characteristics, 'Tunnel diode, Zener diode, Light emitting diode, solar cell, Bipolar Transistors, pnp and npn transistors, characteristics of transistors, different configurations, FET Characteristics.	**9**
IV	Half and fall wave rectifier, rectifier efficiency ripple Factor, Bridge rectifier, Filters, Inductor filter, L and π section filters, Application of Transistors: Bipolar Transistor as amplifier, h-parameter, h- parameter equivalent circuit, Transistor as oscillator, principle of an oscillator and Bark Hausen's condition, requirements of an oscillator, Wein-Bridge oscillator and Hartley oscillator.	**9**
V	Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Digital to Analog Converter, Analog to Digital Converter (Fundamental Circuit).	**7**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Unified Physics, R. P. Goyal, Shivlal Agrawal and Company Publication.
- Introduction to solid state physics, C. Kittel.
- Electronic Circuits: Millman and Halkias.

Reference Books :

- Solid State Physics: A.J. Dekkar.
- Electronic Circuits: Mottershead.
- Electricity and Magnetism: K.K. Tiwari.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. https://nptel.ac.in/courses/122106025
2. https://archive.nptel.ac.in/courses/108/101/108101091/
3. http://www.digimat.in/nptel/courses/video/117103063/L31.html
4. https://archive.nptel.ac.in/courses/117/103/117103063/

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**75 Marks**
Continuous Comprehensive Evaluation (CCE):	**15 Marks**
Semester End Exam (SEE):	**60 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 15 Marks and Assignment of 15 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit**	
	Question - A & B: (Compulsory) Very short answer type (01 each)	02 x 5 = 10 Marks
	Question - C: Short answer type question	03 x 5 = 15 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 60 Marks**

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

LAB COURSE

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)** **Semester - VI**		**Session: 2024-2025**
1	**Course Code**	**BPHL601**		
2	**Course Title**	**SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS LAB**		
3	**Course Type**	**Discipline Specific Course (DSC)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Design and resolve circuits for electronic applications. • Record data as required by the experimental objectives. • Analyse recorded data and formulate it to get desired results. • Interpret results and check for attainment of proposed objective.		
5	**Credit Value**	**1 Credit**	**1 credit =30 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :25**		**Minimum Passing Marks:10**

PART B: CONTENT OF THE COURSE	
S. No.	**List of Experiments**
1	To determine Band Gap of a given Semiconductors.
2	To study characteristic Curve in CB Mode for NPN/PNP
3	To study characteristic Curve in CE Mode for NPN/PNP
4	To study Regulated Power Supply Using Transistor
5	To Study Zener Diode Characteristics.
6	To Study Characteristics of LED
7	To Study Characteristics of R-S Flip-Flop
8	Characteristic Curve of Tunnel-Diode.
9	To Study A2D and D2A
10	Study of Half Adder and Full Adder.
11	To Study Basic Logic Gates
12	To Verify De-Morgan’s Theorem.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

- Semiconductor Devices: SM. Sze.
- Electronic devices: T.L. Floyd
- Device and Circuits: J. Millman and C. Halkias.
- Electronic Fundamental and Applications: D. Chatopadhyay and P.C. Rakshit,

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. Link for e-Books for Physics: Physics Practical:
   https://www.iiserkol.ac.in/~ph324/experiment_list.html
2. Virtual Lab : https://vlab.amrita.edu/?sub=1&brch=282
3. https://vlab.amrita.edu/index.php?sub=1&brch=282&sim=370&cnt=3
4. https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html
5. http://vlabs.iitkgp.ac.in/ssd/index.html#
6. http://vlabs.iitkgp.ac.in/psac/newlabs2020/ssds/#
7. https://ae-iitr.vlabs.ac.in/List%20of%20experiments.html
8. https://da-iitb.vlabs.ac.in/List%20of%20experiments.html

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **25 Marks**

(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)

Semester End Exam (SEE)	**Laboratory performance:** Students are required to perform one experiment, take observation and make calculations in the allotted duration of 2 hours. Viva voce will be based on the experiment performed.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - VI**	**Session: 2024-2025**
1	**Course Code**	**BPH602**		
2	**Course Title**	**LASER AND OPTICAL FIBERS**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Course Learning Outcome (CLO)**	**This Course will enable the students to:** • Gain knowledge of optical phenomena, different light sources and their uses, laser and optical fiber involved. • Develop an understand and analysis of the applications of Laser And Optical Fibers.		
5	**Credit Value**	**3 Credits**	**1 credit =15 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :75**	**Minimum Passing Marks:30**	

PART B: CONTENT OF THE COURSE		
Total no. of Teaching/ Learning Periods = 45 Periods (45 Hours)		
Unit	**Topics (COURSE CONTENTS)**	**No. of Periods**
I	**Laser system:** Basic properties of Lasers, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion	**7**
II	**Laser Systems and their types :** Ruby Laser: A three level system, pumping power, spiking. Neodymium Lasers: Nd-YAG Laser, Nd-Glass Laser. Semiconductor Lasers: Central features, Intrinsic, doped and injection Laser, application. Gas Laser: Nitrogen (Vibronic) Lasers, Carbon dioxide laser excimer laser.	**10**
III	**Lasers and Optical Fibre:** optical fibers, Principles of light propagation through a fiber, numerical aperture, pulse dispersion in step index fibers, modal analysis for a step index fiber, pulse dispersion, multimode fibers, first and second generation fiber optic communication, single mode fiber, Gaussian approximation, Fiber losses, vector modes optical fiber communications laser ranging,	**10**

IV	**Types of Optical and Propagation Principle:** Different types of fibers and their properties, fiber Characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splices –Fiber termination – Optical sources – Optical detectors.	**9**
V	**Application of Lasers:** A brief description of Laser applications in industry, medicine, astronomy and biology. Application of laser in Isotope separation, Application in communication, Holography and Basics of non-linear optics and Generation of Harmonic.	**9**

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

- B. B. Laud -Laser and nonlinear optics.
- Gerd Keiser, "Optical Fiber Communications", Tata McGraw Hill.
- Unified Physics –III , Navbodh Prakashan (Old Edition).
- Unified Physics –III , R.P.Goyal, Shivlal Agrawal Publication (Old Edition).

Reference Books:

- J.M. Senior, "Optical Fiber Communication – Principles and Practice", Prentice Hall of India, 1 st edition, 1985.
- J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2nd Edition, 2001.
- Ghatak & Tyagrajan – Laser and its application.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

- https://onlinecourses.nptel.ac.in/noc21_ee114/preview
- https://onlinecourses.nptel.ac.in/noc20_cy17/preview
- https://archive.nptel.ac.in/courses/115/102/115102124/
- https://www.me.iitb.ac.in/~gandhi/me645/05L11_laserprinciples.pdf
- https://egyankosh.ac.in/bitstream/123456789/19080/1/Unit-13.pdf

PART D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **75 Marks**

Continuous Comprehensive Evaluation (CCE): **15 Marks**

Semester End Exam (SEE): **60 Marks**

Internal Assessment: Continuous Comprehensive Evaluation (CCE)	Internal Test of 15 Marks and Assignment of 15 Marks

Semester End Exam (SEE)	**Pattern -FOUR Questions (A, B, C, D) from each Unit**	
	Question - A & B: (Compulsory) Very short answer type (01 each)	02 x 5 = 10 Marks
	Question - C: Short answer type question	03 x 5 = 15 Marks
	Question - D: Long answer type question	07 x 5 = 35 Marks
	Total	**= 60 Marks**

Name & Signature of Members of Board of Studies

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

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG

FOUR YEAR UNDERGRADUATE PROGRAM

DEPARTMENT OF PHYSICS

COURSE CURRICULUM 2024-25

LAB COURSE

PART A: INTRODUCTION				
Program: FYUP B.Sc. with Physics		**Class: B.Sc. (Maths)**	**Semester - VI**	**Session: 2024-2025**
1	**Course Code**	**BPHL602**		
2	**Course Title**	**LASER AND OPTICAL FIBERS LAB**		
3	**Course Type**	**Discipline Specific Elective (DSE)**		
4	**Course Learning Outcome (CLO)**	After successful completion of the course, Students are expected to appreciate mechanism and principle of Laser and optics related to it and its use in optical fiber communication. The students are expected to • Assemble required parts/devices and arrange them to perform experiments related to application of lasers. • Record/ observe data as required by the experimental objectives and Analyze recorded data and formulate it to get desired results. • Interpret results and check for attainment of proposed objectives related to principle of LASERS and Optical fibers and its applications. • Apply the learnt concept and skills in solving similar/ related problems.		
5	**Credit Value**	**1 Credit**	**1 credit =30 Hours – Learning and Observation**	
6	**Total Marks**	**Maximum Marks :25**		**Minimum Passing Marks:10**

PART B: CONTENT OF THE COURSE	
S. No.	**List of Experiments (At least 10 of the following or related Experiments)**
1	To determine the wavelength of Laser light using Diffraction of Single Slit.
2	To measure the intensity using photosensor and laser in diffraction patterns of single and double slits.
3	To study the diffraction patterns of single and double slits using laser and measure its intensity variation using Photosensor & compare with incoherent source – Na.
4	Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.

5	To find the width of the wire or width of the slit using diffraction pattern obtained by a He- Ne or solid state laser.
6	To find the polarization angle of laser light using polarizer and analyzer.
7	Thermal expansion of quartz using laser.
8	Study the characteristics of solid state laser.
9	To measure the numerical aperture of an optical fibre.
10	To study the variation of the bending loss in a multimode fibre.
11	To determine the mode field diameter (MFD) of fundamental mode in a single-mode fibre by measurements of its far field Gaussian pattern.
Keywords:	Optical fiber, losses, hologram, multimode fiber, aperture

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended:

1. Fundamental of optics, F. A. Jenkins & H. E. White, 1981, Tata McGraw hill.
2. LASERS: Fundamentals & applications, K.Thyagrajan & A.K.Ghatak, 2010, Tata McGraw Hill.
3. Fibre optics through experiments, M.R.Shenoy, S.K.Khijwania, et.al. 2009, Viva Books.
4. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.
5. Unified Practical Physics B.Sc II : R P Goyal, Shivlal Agrawal &Sons Publications.

Online Resources: (e- Resources/ e- Books/ e- Learning Portals)

1. Virtual Lab on Advanced Manufacturing methods (iitkgp.ac.in)
2. Laser Optics Virtual Lab : Physical Sciences : Amrita Vishwa Vidyapeetham Virtual Lab
3. Laser beam divergence and spot size (Theory) : Laser Optics Virtual Lab : Physical Sciences : Amrita Vishwa Vidyapeetham Virtual Lab
4. Michelson's Interferometer- Wavelength of laser beam (Theory) : Laser Optics Virtual Lab : Physical Sciences : Amrita Vishwa Vidyapeetham Virtual Lab
5. Numerical Aperture of Optical Fiber (Theory) : Laser Optics Virtual Lab : Physical Sciences : Amrita Vishwa Vidyapeetham Virtual Lab
6. Propagation Loss (Theory) : Engineering Electro-magnetics Laboratory(s) : Biotechnology and Biomedical Engineering : Amrita Vishwa Vidyapeetham Virtual Lab

PART D: ASSESSMENT AND EVALUATION	
Suggested Continuous Evaluation Methods: **Maximum Marks: 25 Marks** **(Will include Internal assessment, Lab records and End Semester Viva/Voce and performance)**	
Semester End Exam (SEE)	**Laboratory performance:** Students are required to perform one experiment, take observation and make calculations in the allotted duration of 2 hours. Viva voce will be based on the experiment performed.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....

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

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

B.Sc. with Physics

Session 2024-2025

Semester VI

SEC (Theory & Practical/Project)

BPHSE201: ELECTRICAL CIRCUITS AND NETWORK SKILLS

Credits: 02 **Lectures: 45 Hours**

Theory – 01 **Theory – 15 Hours**

Practical – 01 **Practical – 30 Hours**

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 (CO):

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

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 DCor 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 ACsources, Diode and rectifiers in Regulated Power supply **(2 Lecture)**

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)

PRACTICAL/PROJECT

1. Study of series and parallel combination of resistance.
2. To measure current and voltage drop across the DC circuit element.
3. Tracking the connection of elements and identify polarity.
4. Study of DC generator with output voltage measurement.
5. Study of transformer with voltage measurement.
6. Study of regulated power supply.
7. Study of fuses and circuit breaker.
8. Soldering electronic components on PCB board.

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.

Name & Signature of Members of Board of Studies

V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja .....
Subject Expert	2. Dr. R. S. Singh .....
Alumni (member).....	3. Dr. Anita Shukla .....
Prof. from other Dept. of Sc. Faculty	4. Dr. Siteshwari Chandraker .....
Specialist from Industry.....	5. Dr. Abhishek Kumar Misra .....
	6. Dr. Kusumanjali Deshmukh.....