

DEPARTMENT OF PHYSICS

COURSE CURRICULUM & MARKING SCHEME

B.Sc. V & VI Semester

PHYSICS

(Based on Choice Based Credit System)

SESSION : 2025-26



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. (PMC), B.Sc. (PMEI), B.Sc. (PMCs), B.Sc. (PMIt), B.Sc. (PMGI)]

V & VI Semester

2025-26



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

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

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)		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
	DSC B 1-(4)						
	DSC C 1-(4)						
II	DSC A 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
	DSC B 2-(4)						
	DSC C 2-(4)						
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)	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/Pro ject/community outreach (2)	Choose one from a pool of courses (2)	22 Credits
	DSC B 3-(4)						
	DSC C 3-(4)						
IV	DSC A 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/Pro ject/community outreach (2)	Choose one from a pool of courses (2)	22 Credits
	DSC B 4-(4)						
	DSC C 4-(4)						
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)	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/Pro ject/community outreach (2)		22 Credits
	DSC B 5-(4)						
	DSC C 5-(4)						
VI	DSC A 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/Pro ject/community outreach (2)		22 Credits
	DSC B 6-(4)						
	DSC C 6-(4)						
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 2025-26**

Semester V	No. of Credits	Semester VI	No. of Credits
DSC : BPH501 Elements of Modern Physics	3	DSC : BPH601 Solid State Physics, Solid State Devices and Electronics	3
DSC : BPHL501 Elements of Modern Physics Lab	1	DSC : BPHL601 Solid State Physics, Solid State Devices and Electronics Lab	1
DSE : BPH502 Digital Electronics	3	DSE : BPH602 Laser And Optical Fibers	3
DSE : BPHL502 Digital Electronics Lab	1	DSE : BPHL602 Laser And Optical Fibers Lab	1
DSE : BPH503 Atomic and Molecular Physics – I (3Th+1T)	4	DSE : BPH603 Electrical Circuits	3
-	-	DSE : BPHL603 Electrical Circuits Lab	1

***DSC – Discipline Specific Course**

***GEC – Generic Elective Course**

***DSE – Discipline Specific Elective**

***SEC – Skill Enhancement Course**



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 2025-2026

Semester V

(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	BPH501: Elements of Modern Physics	3	80	20	100	40
DSC	BPHL501: Elements of Modern Physics Lab	1	50	-	50	20
DSE	BPH502: Digital Electronics	3	80	20	100	40
DSE	BPHL502: Digital Electronics Lab	1	50	-	50	20
DSE	BPH503: Atomic and Molecular Physics - I	4	80	20	100	40

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	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
DSE	BPH503: Atomic and Molecular Physics - I	4	80	20	100	40

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - V
		Session: 2025-2026	
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 and 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/Sem. – 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	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; α decay; β decay - energy released, spectrum and Pauli's prediction of neutrino; γ -ray emission.	8

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Unified Physics, R. P. Goyal, Shivalal 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, PHI Learning
- 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, Cengage Learning
- 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: 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 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. Anita Shukla
Alumni (member).....	3. Dr. Siteshwari Chandraker
Prof. from other Dept. of Sc. Faculty	4. Dr. Abhishek Kumar Misra
Specialist from Industry.....	5. Dr. Kusumanjali Deshmukh.....

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26
LAB COURSE

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - V
		Session: 2025-2026	
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/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 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 different colors.		
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:

1. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, AsiaPublishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. 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)

Link for e-Books for Physics: Physics Practical:

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

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. Anita Shukla
Alumni (member).....	3. Dr. Siteshwari Chandraker
Prof. from other Dept. of Sc. Faculty	4. Dr. Abhishek Kumar Misra
Specialist from Industry.....	5. Dr. Kusumanjali Deshmukh.....

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DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26

PART A: INTRODUCTION

Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - V	Session: 2025-2026
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 :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	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. Floyd, 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-Circuits_Books.html#google_vignette
2. https://www.researchgate.net/profile/DkKaushik/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/combinational/comb_3.html
8. <https://www.electronics-tutorials.ws/combinational/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: 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 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

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LAB COURSE

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - V
		Session: 2025-2026	
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: 50	Minimum Passing Marks: 20
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 flip 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: 50 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. Anita Shukla
Alumni (member).....	3. Dr. Siteshwari Chandraker
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DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - V
		Session: 2025-2026	
1	Course Code	BPH503	
2	Course Title	ATOMIC AND MOLECULAR PHYSICS - I	
3	Course Type	Discipline Specific Elective (DSE)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: - Identify different atomic model and will be able to differentiate different atomic systems, various coupling schemes and their interactions with magnetic and electric fields. - Implement knowledge of atomic spectra in production of X-rays - Apply the techniques of microwave and infrared spectroscopy to elucidate the structure of molecules - Apply the principle of Raman spectroscopy and its applications in the different field of science & Technology. - Explain different resonance spectroscopic techniques and its applications to find solutions to problems related different spectroscopic systems, like MASERS, LASER etc	
5	Credit Value	3 Credits + 1 Tutorial	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	Atomic Spectra: Spectra of hydrogen, deuteron and alkali atoms spectral terms, Vector atom model, quantum numbers associated with vector atom model, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules, singlet, triplet fine structure in alkaline earth spectra, L-S and J-J coupling		12

II	X-Ray Spectra: X-rays , Nature and Production , Uses of X-rays, X-ray spectra, Duan-Hunt limit, Mosley's law, Application of Mosley's Law, Doublet structure of X-ray spectra, X-Ray Spectroscopy, Distinction between X-ray spectra and visible spectra	10
III	Different types of Spectra, Discrete set of electronic energies of molecules, quantization of vibrational energies, determination of inter-nuclear distance, Transition rules for vibration and electronic vibration spectra. Pure rotational and rotation vibration spectra, Quantization of States Dissociation limit for the ground and other electronic states, transition rules for pure rotation and electronic- rotation Spectra	12
IV	Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy. Application of Raman Spectroscopy, Resonance Spectroscopy, Life of Raman and his contribution in field of science.	11
V	Atom Radiation interactions: Semi-classical description of radiation. Absorption, spontaneous and stimulated emissions, Einstein's A and B coefficients, Coherent and Incoherent emissions, LASERs and MASERs, Line widths, various types of line broadening, two-level atoms in a radiation field.	15
Tutorial Topics	• Problem solving on Vector atom model. • Estimation of various transitions based on selection rules. • Problems on X-Ray spectra, Mosley's law and X-Ray spectroscopy. • Problems on Duan- Hunt's Limit • Numerical problems on vibrational, rotational and electronic spectra. • Numerical problems on applications of rotational and vibrational spectra. • Discussion on Raman's life and his contribution. • Numerical problems on laser. • Problem based on Einstein's coefficient, line broadening and line width.	15

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
- Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A. Dubson, 2009, PHI Learning
- Unified Physics Part –III, R PGoyal, Shivilal and Son's Publication

Reference Books :

- Modern Physics, R.A. Serway, C.J. Moses, and C.A. Moyer, 2005, Cengage Learning
- Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill

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

1. <https://archive.nptel.ac.in/courses/115/105/115105100/>
2. <https://archive.nptel.ac.in/courses/115/101/115101003/#>

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 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. Anita Shukla
Alumni (member).....	3. Dr. Sitieshwari Chandraker
Prof. from other Dept. of Sc. Faculty	4. Dr. Abhishek Kumar Misra
Specialist from Industry.....	5. 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 2025-2026

Semester VI

(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	BPH601 : Solid State Physics, Solid State Devices and Electronics	3	80	20	100	40
DSC	BPHL601 : Solid State Physics, Solid State Devices and Electronics Lab	1	50	-	50	20
DSE	BPH602 : Laser And Optical Fibers	3	80	20	100	40
DSE	BPHL602 : Laser And Optical Fibers Lab	1	50	-	50	20
DSE	BPH603 : Electrical Circuits	3	80	20	100	40
DSE	BPHL603 : Electrical Circuits Lab	1	50	-	50	20

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	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
DSE	BPH603 : Electrical Circuits	3	60	15	75	30
DSE	BPHL603 : Electrical Circuits Lab	1	25	-	25	10

GOVT. V.Y.T.PG AUTONOMOUS COLLEGE DURG
FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - VI
		Session: 2025-2026	
1	Course Code	BPH601	
2	Course Title	SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS	
3	Course Type	Discipline Specific Course (DSC)	
4	Course Learning Outcome (CLO)	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	
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	Amorphous and crystalline solids, Elements of symmetry, Seven crystal system, Cubic lattices, Crystal planes, Miller indices, Laue's equation for X-ray diffraction, Bragg'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 paramagnetism, 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 full 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 Barkhausen'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, Shivalal 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: **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 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. Anita Shukla
Alumni (member).....	3. Dr. Siteshwari Chandraker
Prof. from other Dept. of Sc. Faculty	4. Dr. Abhishek Kumar Misra
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DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26
LAB COURSE

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - VI
		Session: 2025-2026	
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: 50	Minimum Passing Marks: 20
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: 50 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. Anita Shukla
Alumni (member).....	3. Dr. Sitieshwari Chandraker
Prof. from other Dept. of Sc. Faculty	4. Dr. Abhishek Kumar Misra
Specialist from Industry.....	5. Dr. Kusumanjali Deshmukh.....

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FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - VI
		Session: 2025-2026	
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 :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	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, Shivalal Agrawal Publication (Old Edition).

Reference Books :

- J.M. Senior, “Optical Fiber Communication – Principles and Practice”, Prentice Hall of India, 1st 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)

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

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 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
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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. Anita Shukla
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DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26
LAB COURSE

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - VI
		Session: 2025-2026	
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: 50	Minimum Passing Marks: 20
PART B: CONTENT OF THE COURSE			
S. No.	List of 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.

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

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

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

1. [Virtual Lab on Advanced Manufacturing methods \(iitkgp.ac.in\)](http://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: 50 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.

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V.C. Nominee	Departmental members
Subject Expert	1. H.O.D/ Dr. Jagjeet Kaur Saluja
Subject Expert	2. Dr. Anita Shukla
Alumni (member).....	3. Dr. Siteshwari Chandraker
Prof. from other Dept. of Sc. Faculty	4. Dr. Abhishek Kumar Misra
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DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - VI
		Session: 2025-2026	
1	Course Code	BPH603	
2	Course Title	ELECTRICAL CIRCUITS	
3	Course Type	Discipline Specific Elective (DSE)	
4	Course Learning Outcome (CLO)	This Course will enable the students to: - Understand the basic concepts of electrical circuits. - Analyze Two Port Networks. - Apply their knowledge in analyzing Circuits by using network theorems. - Understand the basic concepts of A.C. circuits. - Know the Growth and Decay of Current in different circuits.	
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	Introduction to Electrical Circuits: Basic Terminology: Current, Voltage and Power; Ohm's law; ideal and practical voltage and current sources; Source transformation; Electrical Circuits Elements: Resistor, Inductor, Capacitor; Series and Parallel connection of Resistor, Inductor, Capacitor; Star to Delta and Delta to Star Transformations for resistive networks; Numerical Problems based on Equivalent Resistance. Kirchhoff's Voltage Law, Kirchhoff's Current Law, Voltage division rule, Current division rule, Mesh analysis and Nodal analysis, Numerical Problems based on KVL and KCL.	10
II	Two Port Network Analysis: Introduction, Z-Parameters, Y-Parameters, Hybrid Parameters (h-Parameters), ABCD Parameters, Condition of Reciprocity and Symmetry in two port parameter representation, Inter-relationship between parameters of two port networks, Expression of input and output impedances in terms of two port parameters, Numerical Problems based on these parameters.	10

III	Network Theorems (Only Independent DC sources): Principal of Duality, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem and Numerical Problems based on these theorems.	9
IV	A.C. Fundamentals: Sinusoidal Voltage and Current, Concept of cycle, Time period, Frequency, Instantaneous, Peak, Peak to Peak, Average Value, Root Mean Square (R.M.S) value, Peak factor, Form factor, Power factor, Impedance, Reactance and Admittance. AC applied to only resistance circuit, AC applied to only inductance circuit, AC applied to only capacitance circuit, AC applied to Series and parallel RC, RL and RLC circuits.	8
V	Resonance Series and Parallel Resonance, condition for Resonance, Resonant Frequency, Bandwidth and significance of Quality Factor (Q). Growth and Decay of Current in L-R Circuit, CR Circuit and LCR Circuit, Time Constant of different circuits.	8

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Circuit Theory (Analysis and Synthesis), A. Chakraborty, Dhanpat Rai & Co.
- A Textbook of Electrical Technology, B. L. Theraja, S Chand and Co.
- Unified Physics –I, B.K. Sinha, M.L. Chauhan, Ram Prasad & Sons Publication (Old Edition).

Reference Books :

- Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill(2004)
- Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press
- Network, Lines and Fields, J.D. Ryder, Prentice Hall of India.
- Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
- Electrical Circuits, M. Nahvi & J. Edminister, Schaum's Outline Series, Tata McGraw-Hill(2005)

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 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
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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 8/4/25	2. Dr. Anita Shukla
Alumni (member).....	3. Dr. Sitieshwari Chandraker
Prof. from other Dept. of Sc. Faculty	4. Dr. Abhishek Kumar Misra
Specialist from Industry.....	5. Dr. Kusumanjali Deshmukh.....

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FOUR YEAR UNDERGRADUATE PROGRAM
DEPARTMENT OF PHYSICS
COURSE CURRICULUM 2025-26
LAB COURSE

PART A: INTRODUCTION			
Program: FYUP B.Sc. with Physics		Class: B.Sc.	Semester - VI
		Session: 2025-2026	
1	Course Code	BPHL603	
2	Course Title	ELECTRICAL CIRCUITS LAB	
3	Course Type	Discipline Specific Elective (DSE)	
4	Course Learning Outcome (CLO)	After successful completion of the course, Students are able to - Understand the different types of network theorems. - Determine the different parameters of two port network.	
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	Familiarization with resistor.		
2	Verification of Ohm's law.		
3	Verification of Norton's theorem.		
4	Verification of Thevenin's theorem.		
5	Verification of Superposition theorem.		
6	Verification of Millman's theorem.		
7	Verification of Reciprocity theorem.		
8	Verification of Maximum power transfer theorem.		
9	Determination of different parameters of two port network and verification of their interrelations.		
10	To study the behaviour of a series R-L-C circuit.		

PART C - LEARNING RESOURCES

Text Books, Reference Books, Other Resources

TEXT BOOKS Recommended :

- Basic practical in electrical engineering by P. S. Dhogal.
- Circuit Theory (Analysis and Synthesis), A. Chakraborty, Dhanpat Rai & Co.

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

- <https://be-iitkgp.vlabs.ac.in/exp/familiarisation-resistor/>
- <https://be-iitkgp.vlabs.ac.in/exp/ohm-law/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/verification-norton-theorem/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/verification-thevenin-theorem/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/verification-superposition-theorem/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/verification-millman-theorem/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/rlc-circuit-analysis/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/verification-reciprocity-theorem/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/maximum-power-transfer-theorem/>
- <https://asnm-iitkgp.vlabs.ac.in/exp/two-port-network/>

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 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

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



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

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

B.Sc. with Physics

Session 2025-2026

SEC (Theory & Practical/Project)

BPHSE101: BASIC INSTRUMENTATION SKILLS

Credits: 02

Theory – 01

Practical – 01

Lectures: 45 Hours

Theory – 15 Hours

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)



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

Open Ended Experiments:

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



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REFERENCE BOOKS:

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

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

B.Sc. with Physics

Session 2025-2026

SEC (Theory & Practical/Project)

BPHSE201: ELECTRICAL CIRCUITS AND NETWORK SKILLS

Credits: 02

Theory – 01

Practical – 01

Lectures: 45 Hours

Theory – 15 Hours

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)**



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Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor. **(2 Lecture)**

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

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