EKLAVYA UNIVERSITY, DAMOH (M.P.)

Scheme of Examination B.Sc I Year

/For batch admitted in Academic Session 2020-21/

Subject wise distribution of marks and corresponding credits

S. No.	Subject Name	Subject Code	Paper Name	Maximum Marks Allotted											Total Marks	Contact Periods Per week			Total Credits
				Theory Slot									Practical Slot						
				Final Yearly				Half Yearly				Quiz/ Assignment/ Attendence	End Sem	Lab Work/ Sessional		L	T	P	
				P1	P2	P3	P4	P1	P2	P3	P4								
1	Common	BAECC20Y101	Environmental and Disaster Management (University Core Under Ability Enhancement Course (AEC-1)	60				30				10			100	2	0	0	2
		BAECC20Y102	Communication Theory (University Core under Ability Enhancement Course (AEC-2)	60				30				10			100	4	0	0	4
		BYOGA20Y101	Yoga- 1 (University Core)	–	–	–		–	–	–		–	60	40	100	2	0	0	2
2	Physics	BPHYS20Y101	General Mathematical Physics, Mechanics and Properties of Matter Paper - I (Core Course - 3A)	30				15				5			50	3	1	0	4
		BPHYS20Y102	Thermodynamics and Statistical Physics Paper - II (Core Course - 3B)		30				15			5			50	3	1	0	4
		BPHYS20Y103	Paper - I and II Practical (Practical 3A & 3 B Core Course 3C)										30	20	50	0	0	2	2
		BPHYS20Y104	Electronics, Numerical Methods and Computer Programming Paper III (Core Course - 3D for Honors)			30				15		5			50	3	1	0	4
		BPHYS20Y105	Paper - III, Practical (Practical 3D for Honours, Core Course 3E)										30	20	50	0	0	1	1
3	Common	BASPR20Y101	Assingment Presentation for 3 Core Courses											50	50	0	3	0	3

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiencey Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

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School of Basic and Applied Sciences

UG Physics

Class				**B.Sc. Physics**
Semester/Year				**I Year**
Subject & Subject Code				**Physics - BPHYS20Y101**
Paper				**General Mathematical Physics, Mechanics and Properties of Matter Paper - I**
Max. Marks				**30 (ETE) + 20 (IA) = 50**
Credit			**Total Credits**	
L	**T**	**P**		
3	1	0	**4**	

Course Objectives:

- To introduce and make student understand the Mathematics involved in physics, Fundamentals of Mechanics and its importance and study properties of matters.
- To learn relativistic mechanics and its importance.
- To learn the contribution, research and discoveries of eminent scientists.
- To make students understand, learn, and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

Course Outcomes:

The students are expected to acquire the knowledge of the following:

- Laws of motion and their application to various dynamical situations, notion of inertial frames. Concept of conservation of energy, momentum, angular momentum and apply them to basic problems.
- Translational and rotational dynamics and their application.
- Moment of inertia about the given axis of symmetry for different uniform mass distributions.
- Collisions and idea about center of mass and laboratory frames and their correlation.
- Elasticity and various elastic moduli.
- Principles of fluid flow and the equations governing fluid dynamics such as equation of continuity, Bernoulli's Theorem etc.
- Kepler's law to describe the motion of planets and satellite in circular orbit.
- Simple harmonic motion and the properties of systems executing such motions.
- Origin of fictitious force and various relativistic effects.

Student learning outcomes:

Student will able to -

- Demonstrate a rigorous understanding of the mathematics, mechanics, oscillations and general properties of matters, involved in theories & principles of physics.
- Know the contributions, discoveries and apptitute of research scientists.
- Sharpen their and knowledge and utilize/apply their knowledge for further research and science.

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Unit	Syllabus	Periods
UNIT - I	**General Mathematical Physics** Addition, subtraction and product of two vectors; Polar and axial vectors and their examples from physics; Triple and quadruple product (without geometrical applications); Scalar and vector fields; Differentiation of a vector; Repeated integral of a function of more than one variable; Unit tangent vector and unit normal vector; Laplacian operator; Idea of line, surface and volume integrals; Physical Significance of Gradient, Divergence and Curl (with examples); Gauss', Stokes' and Green's Theorems.	15
UNIT - II	**Mechanics** Position,Velocity and Acceleration Vector, Components of velocity and acceleration in different coordinate systems, Newton's Laws of motion and its explanation with problems, Various types of forces in nature (explanation), Pseudo Forces (e.g. Centrifugal Force), Coriolis force and its applications; System of particles, Centre of mass and reduced Mass; Motion under a central force, Derivation of Kepler's laws. Gravitational law and field, Potential due to a spherical body.Gauss & Poisson's equation of Gravitation, Gravitational self energy. Rutherford Scattering, One dimensional Elastic and inelastic collisions (Centre of mass frame & Laboratory Frame).	16
UNIT - III	**Oscillations** Translational and Rotational motion, Moment of Inertia, Theorem of perpendicular axis, Theorem of parallel axis, Moment of inertia of regular bodies (rod, disc and solid cylinder) . Motion of Rigid Body: Moment of Inertia and their product, Principal moments and axes; Euler's Theorem. Concept of Simple, Periodic & Harmonic Oscillation with illustrations; Differential equation of harmonic oscillator and its solution (Examples of a simple pendulum, spring mass system); Kinetic and potential energy of Harmonic Oscillators; Oscillations of two masses connected by a spring.	15
UNIT - IV	**General Properties of Matter** Elastic moduli (Y, K, η, σ (Poisson's ratio) and their relations. The cantilever problem and Determination of Y of rectangular thin bar loaded at the centre; Torsional rigidity of a wire. Torsional oscillations: to determine η by torsional oscillations. Surface Tension, Angle of Contact, Capillary Rise Method; Energy required to raise a liquid in capillary tube; Factors affecting surface tension; Jeager's method for Determination of surface tension; Applications of Surface Tension, Concept of Viscous Forces and Viscosity; Steady and Turbulent Flow, Reynolds's number; Equation of Continuity; Bernoulli's Principle; Application of Bernoulli's equation - (i) Speed of Efflux (ii) Venturimeter (iii) Aspirator Pump (iv) Change of plane of motion of a spinning ball.	15
UNIT - V	**Relativistic Mechanics** Relativistic Mechanics: Michelson-Morley experiment and its outcome; Postulates of Special Theory of Relativity; Lorentz Transformations. Simultaneity and order of events; Lorentz contraction; Time dilation; Relativistic transformation of velocity, frequency and wave number; Relativistic addition of velocities; Variation of mass with velocity. Doppler effect. Elementary idea of Four dimensional momentum vector and Covariance of equations of Physics. **Specific Contributions / Earlier Developments by various Physicists up to 18th Century:** Contributions of - Aryabhatt, Archimedes, Nicolus Copernicus, Galileo Galilei, Huygens, Robert Hooke, Torricelli, Vernier, Pascal, Kepler, Newton, Boyle, Young, Thompson, Coulomb, Amperes, Gauss, Biot-Savarts, Cavendish, Galvani, Franklin and Bernoulli.	14

Reference Books

1 Physics for Degree students: C.L. Arora & Dr. P.S. Hemne, S. Chand

2 Unified Physics: R. P. Goyal, Shiva lal agrawal & company

3 University Physics: Sears and Zeemansky, XIthedition,Pearson education

4 Concepts of Physics: H C Verma ,BhartiBhavan Publisher

5 Problems in Physics: P.K Shrivastava Wiley Eastern ltd.

6 Berkley Physics Course Vol. 1.Mechanics:E M Purcell, Mcgraw Hill

7 Properties of Matter: D S Mathur, ShamLalCheritable Trust New Delhi

8 Mechanics: D S Mathur, S Chand And Company New Delhi

9 The Faymman Lectures in Physics Vol.1: R P Feymman, R B Lighton and M.Sands

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School of Basic and Applied Sciences

Class	**B.Sc. Physics**
Semester/Year	**I Year**
Subject & Subject Code	**Physics - BPHYS20Y102**
Paper	**Thermodynamics and Statistical Physics Paper - II**
Max. Marks	**30 (ETE) + 20 (IA) = 50**

Credit			**Total Credits**
L	**T**	**P**	**4**
3	1	0	

Course Objectives:
- To introduce and make student understand the Thermodynamics and statistical part of Physic.
- To learn the contribution, research and discoveries of eminent scientists.
- To make students understand, learn and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

Course Outcomes:
The students are expected to acquire the knowledge of the following:
- Basic concepts of thermodynamics, the first and the second law of thermodynamics,.
- Maxwell's thermodynamic relations.
- Maxwell-Boltzman distribution law, equitation of energies.
- Idea about Micro and Macro states, Ensembles, Statistical Probability and Phase Space.
- Idea of partition function and distribution function for classical and quantum statistics.

Student learning outcomes:
Student will able to -
Demonstrate a rigorous understanding of the fundamentals of thermodynamics and statistical physics, involved in theories & principles of physics.
- Sharpen his skill and knowledge and utilize/apply his knowledge in further research and science.

Unit	**Syllabus**	**Periods**
UNIT - I	**Thermodynamics-I** Reversible and irreversible process, Heat engines, Definition of efficiency, Carnot's ideal heat engine, Carnot's cycle, Effective way to increase efficiency, Carnot's engines and refrigerator, Coefficient of performance, Second law of thermodynamics, Various statements of Second law of thermodynamics, Carnot's theorem, Clapeyron's latent heat equation, Carnot's cycle and its applications, Conceptual / Numerical Problems (viz. Perpetual Machines) Steam engine, Otto engine, Petrol engine, Diesel engine.	15

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Unit	Syllabus	Periods
UNIT - II	**Thermodynamics-II** Concept of entropy, Change in entropy in adiabatic process, Change in entropy in reversible cycle.Principle of increase of entropy, Change in entropy in irreversible process. T-S diagram, Physical significance of Entropy, Entropy of a perfect gas, Kelvin's thermodynamic scale of temperature, The size of a degree, Zero of absolute scale, Identity of a perfect gas scale and absolute scale. Third law of thermodynamics, Zero point energy, Negative temperatures (not possible), Heat death of the universe.Relation between thermodynamic variables (Maxwell's relations). Applications of Maxwell's Relations to :Clausius-Clapeyron's latent heat equation, CP - CV, CP / CV, and TdS Equations. Adiabatic demagnetization, Joule-Kelvin effect and Liquefaction of gases.	16
UNIT - III	**Statistical Physics-I** Description of a system: Significance of statistical approach, Particle-states, System-states, Microstates and Macro-states of a system, Equilibrium states, Fluctuations, Classical & Statistical Probability, The equi-probability (equi a priori probability) postulate, Statistical ensemble (Micro Canonical Ensemble, Canonical Ensemble, Grand Canonical Ensemble), Number of states accessible to a system, Phase space. Concept of β parameter, Statistical interpretation of Entropy (derivation of relation S = k logeW). First law of thermodynamics, Thermodynamic Potentials (Internal Energy, Helmholtz free energy, Enthalpy, Gibbs free energy).	15
UNIT - IV	**Statistical Physics-II** Statistical Mechanics: Phase space, The probability of a distribution, The most probable distribution and its narrowing with increase in number of particles, Maxwell-Boltzmann statistics, Molecular speeds, Distribution and mean r.m.s. and most probable velocity, Constraints of accessible and inaccessible states. Quantum Statistics:Partition Function, Relation between Partition Function and Entropy, Bose-Einstein statistics, Black-body spectrum, Wien's Displacement Law, Rayleigh-Jeans Law, Planck's Quantum theory of radiation and radiation formula, Fermi-Dirac statistics, Comparison of results, Concept of Phase transitions.	16
UNIT - V	**Specific Contributions of Physicists in Various branches of Physics** S.N. Bose, M.N. Saha, Maxwell, Clausius, Boltzmann, Joule, Wien, Einstein, Planck, Bohr, Heisenberg, Fermi, Dirac, Max Born, Bardeen.	13

Text Books

1 Physics for Degree students: C.L. Arora & Dr. P.S. Hemne, S. Chand

2 Unified Physics: R. P. Goyal, Shiva lal agrawal & company

Reference Books

1 Heat and Thermodynamics: Mark W. Zeemansky, Richard H Dittman, Seventh edition, Mcgraw Hill International edition

2 Thermal Physics (Heat and Thermodynamics): A B Gupta, H P Roy, Books and allied(P) Ltd. Calcutta

3 Heat and Thermodynamics: Brijlal and N Subramanyam, S Chand and company Ltd. New Delhi

4 Berkley Physics Course Vol 3. Thermodynamics: F Reif, Mcgraw Hill

5 Thermodynamics and Statistical Physics: D.P. Khandelwal and A.K. Pandey, Himalaya Publications

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School of Basic and pplied Sciences

Class			**B.Sc. Physics**
Semester/Year			**I Year**
Subject & Subject Code			**Practical Physics - BPHYS20Y103**
Paper			**Paper - I and II Practical**
Max. Marks			**50= (30+20)** (ETE+ PA)
Credit			**Total Credits**
L	**T**	**P**	**2**
0	0	2	

PRACTICALS

1 To determine the value of 'g' at current place with the help of compound pendulum.

2 Verification of theorem of Parallel Axis with the help of inertia table.

3 To determine the Modulus of rigidity of the material of wire by using an inertia table (annular ring).

4 To determine the Modulus of rigidity of the material of wire by using an inertia table (solid sphere).

5 To determine elastic constants of the material of wire with the help of Searle's Apparatus.

6 To determine the Young's Modulus of material of given beam by bending of beam method.

7 To determine the moment of inertia of a Fly Wheel.

8 To determine the moment of inertia of a given body (annualar ring) with the help of an inertia table (auxillary body - Disc).

9 To determine the surface tension of a liquid with the help of Jaeger's Apparatus.

10 To determine the coefficient of viscosity of a liquid by Stoke's Method.

11 To determine the coefficient of viscosity of a given liquid by Poiseuille's Method.

12 To determine the ratio of Cp/Cv by Clement and Desorme's method.

13 To determine the value of mechanical equivalent of heat J by Callendar and Barnes method.

14 To determine the Modulus of rigidity of the material of wire by Maxwell's Needle method.

15 To determine the coefficient of thermal conductivity of a rubber in the form of tube.

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School of Basic and Applied Sciences

Class				**B.Sc. Physics (Honours)**
Semester/Year				**I Year**
Subject & Subject Code				**Physics Honours - BPHYS20Y104**
Paper				**Electronics, Numerical Methods and Computer Programming Paper III**
Max. Marks				**30 (ETE) + 20 (IA) = 50**
Credit			**Total Credits**	
L	**T**	**P**		
3	1	0	**4**	

Course Objectives:

1. To develop an understanding of fundamentals of electronics in order to deepen the understanding of electronic devices that are part of the technologies that surround us.
2. To learn about approximation, error in numerical analysis, interpolation and solution of non-linear equations along with their application using computer programming.

Course Outcomes:

At the end of the course students will be able to

1. Understand working & functioning of amplifiers and wave shaping circuits their applications.
2. Understand the working and applications of logic & Integrated Circuits and Multivibrators.
3. Learn how to reach to accuracy by minimizing the errors during experiments and reach to approximation using different methods of interpolation.
4. Solve non- linear and integration of first order differential equation.
5. Learn programing in C Language.

Student Learning Outcomes:

Student will able to -

1. Demonstrate a rigorous understanding of the fundamentals of Electronics, Numerical Methods and Computer Programming, involved in theories & principles of physics.
2. Sharpen his skill and knowledge and utilize/apply his knowledge in further research and science.

Unit	Syllabus	Periods
Unit - I	**Linear Small Signal and Direct Coupled Amplifier**:-R.C. Coupled C.E. Amplifier and its response in different frequency ranges, effect of cascading expression of bandwidth in low and high frequency ranges, emitter follower, tuned amplifier(small signal) single and double tuned amplifiers, Differentials amplifier, common mode rejection ratio, operational amplifier and its basic applications. Wave Shaping Circuits: Exponential circuit response, differentiation and integration by R.C. and L.R circuits, clipping or limiting circuit, clamping circuit, general feature of a time base signal, thyratron sweep circuits, circuits to improve linearity, Miller and Boot strap sweep circuits.	15

Unit	Syllabus	Periods
Unit - II	**Logic and Integrating Circuits**: Boolean algebra, binary counting, counting to a base other then two, binary counter, conversion of binary counter in a decade counter, Decoder, logic gates : NOT, OR, AND, NAND and their circuits, Micro electronic devices, basic principles of LED & solid state laser. basic concepts about fabrication and characteristics of integrated circuits. Multivibrators: Astable, monostable, and bistable multivibrators, frequency of a stable vibrator, frequency control and synchronization, triggering of bistable, Blocking oscillator.	15
Unit - III	**Errors in Numerical Analysis**: - Computer arithmetic, sources of errors, Round off errors, Errors analysis, Condition and stability, Approximation, functional and errors analysis, The method of Undetermined coefficients. Interpolation:- Interpolation, Finite differences, Gauss central difference formula, Newton's formula for interpolation, Lagrange's interpolation formula, Double interpolation, Numerical differentiation, Newton and Starling's formula, Solution of linear systems, Direct and iterative, Eigen value problems.	15
Unit - IV	**Solution of Non-Linear Equation:** Bisection method, Newton's Method, Modified Newton's method, Method of integration, Newton's method and method of integration for a system of equations, Newton's method for the case of complex roots, Integration of functions: Trapezoidal and Simpson's rules, Gaussian quadrature formula, singular integrals, Double integration.	14
Unit - V	**Integration of Ordinary Differential Equation**:- Predictor Corrector method, Runga-Kutta methods, Simultaneous and higher order equations, Numerical integration and differentiation of Data, Least squares approximation, computer simulation, Monte Carlo method, Curve fitting. Introduction to C: Data type (int, float, double, char, long, long double etc.) operators (Unary.Binary and ternarys), input /output statement (scanf(), printf()), control statements (if, for, while, do while, switch -case-default), Function (type of Function, function definition, function calling, formal arguments, actual arguments, function prototype), Program structure, string (Array, character array), string manipulation functions like strlen(), strcpy(), strcat(), strcmp(), etc.	16

Reference Books

Electronics-fundamentals and Applications : Ryder

Integrated Electronics : Millman & Halkias

Pulse digital and switching Waveforms : Millman & Taub

Network-Line and Fields : Ryder

Electronics Devices and Circuits : Bapat

Programming in Basic : B. Balguruswamy (McGraw Hill-1985)

Introductory Methods of Numerical Analysis : S.S. Sastry

A first course in Numerical Analysis : A. Ralston & P. Rabinowitz (McGraw Hill-1985)

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School of Basic and Applied Sciences

Class				**B.Sc. Physics (Honours)**
Semester/Year				**I Year**
Subject & Subject Code				**Practical Physics Honours - BPHYS20Y105**
Paper				**Paper - III, Practical**
Max. Marks				**50= (30+20)** (ETE)+(IA)
Credit			**Total Credits**	
L	**T**	**P**	**1**	
0	0	1		

PRACTICALS

1 Frequency response of R C coupled amplifier

2 Study of Logics gates NOT, OR, AND, NAND and their circuits

3 To study the basic logic gates using IC's.

4 To study and plot the V -I characteristic of UJT.

5 Study of op-amp as an adder.

6 To find out the roots of a quadratic equation using C language.

7 Lagrange interpolation with the upward/downward correction method

8 Root Search with the bisection method.

9 Root Search with the Newton method.

10 Root Search with the secant method.

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School of Basic and Applied Sciences

Class			**B.Sc. Physics**
Semester/Year			**II Year**
Subject & Subject Code			**Physics - BPHYS20Y201**
Paper			**Optics, Paper - I**
Max. Marks			**30 (ETE) + 20 (IA) = 50**
Credit			**Total Credits**
L	**T**	**P**	**4**
3	1	0	

Course Objectives:

1. Is to make student study and understand the various phenomenon of light, viz. reflection, refraction, interference, diffraction and polarization.
2. It to study and understand the working, construction and applications of Laser.
3. Is to develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Physics.
4. Is to make students understand, learn,and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

Course Outcomes:

The students are expected to acquire the knowledge of the following:

1. Fermat's Principle, aplanatic points, Chromatic aberration and different types of eyepieces.
2. Principles of wave motion and superposition, Physics of polarization, interference and diffraction.
3. Working of optical instruments like biprism, interferometer, diffraction grating etc.
4. Basic principle of Lasers and their applications.
5. Idea about Various photo devices
6. Experiments related to theory course.

Student learning outcomes:

Student will able to -

1. Demonstrate a rigorous understanding of the fundamentals of Geometrical and Wave optics involved in theories & principles of physics.
2. Understand working and applications of Lasers.
3. Sharpen his skill and knowledge and utilize/apply his knowledge in further research and science.

Unit	Syllabus	Periods
Unit - I	**Geometrical Optics:** Reflection and Refraction, Fermat's Principle, Refraction at a Spherical surface, aplanatic points and its applications, Lens formula, Combination of thin lenses and equivalent focal length , Dispersion and dispersive Power, Chromatic aberrations and achromatic combination, Different type of aberration (qualitative) and their remedy, need for multiple lenses in eyepieces, Ramsden and Huygens eyepiece.	15

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Unit	Syllabus	Periods
Unit - II	**Interference of light:** The principle of superposition, two-slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, Rayleigh refractometer and other applications. Localised fringes; thin films, interference by a film with two non-parallel reflecting surfaces, Newton's rings, Haidinger fringes (Fringes of equal inclination). Michelson interferometer, its application for precision determination of wavelength, wavelength difference and the width of spectral lines. Intensity distribution in multiple beam interference, Fabry-Perot interferometer and Etalon.	15
Unit - III	**Diffraction**: Fresnel's theory of half period zones, Diffraction at straight edge, rectilinear propagation. Diffraction at a slit, phasor diagram and integral calculus methods, diffraction at a circular aperture and a circular disc, Rayleigh criterion of resolution of images, resolving power of telescope and microscope. Outline of phase contrast microscopy. Diffraction at N parallel slits, intensity distribution, plane diffraction grating, Resolving power of a grating and comparison with resolving powers of prism and of a Fabry-Perot etalon.	15
Unit - IV	**Polarisation**: Transverse nature of light waves, Polarisation of electromagnetic waves, Plane polarised light – production and analysis, Description of Linear, circular and elliptical polarisation. Propagation of electro magnetic waves in anisotropic media, uniaxial and biaxial crystals, symmetric nature of dielectric tensor. Double refraction, Hygen's principle, Ordinary and extraordinary refractive indices, Fresnel's formula, light propagation in uniaxial crystal. Nicol prism, Production of circularly and elliptically polarised light, Babinet compensator and applications, Optical rotation, optical rotation in liquids and its measurement through Polarimeter.	15
Unit - V	**Laser and Photo sensor** A brief history of lasers, Characteristics of laser light, Einstein's prediction, Relationship between Einstein's coefficients (qualitative discussion only), Pumping scheme, Resonators, Ruby laser , He- Ne laser, Applications of lasers, Principle of holography , Photodiodes. Phototransistors and Photomultipliers.	15

Reference Books

1 Fundamentals of Optics: F.A. Jenkins and H.E. White ,1996 ,Mc Graw Hill.

2 Principles of Optics : B. K. Mathur , 1995,Gopal Printing

3 University Physics :F.W. Sears ,M.W. Zemansky and H.D. Young , 1986, Addison Wesley

4 Optics :A.K.Ghatak ,McGraw Hill

5 Principles of Optics :Max Born and Wolf ,Pregmon Press

6 Optics and Atomic Physics :D.P.Khandelwal Himalaya Publication

7 Laser :Theory and Applications, K. Tyagrajan and A.K.Ghatak

8 Optics : Brijlal and Subramaniyam , S.Chand Publications

9 Physics for Degree Students: C. L. Arora and P.S. Hemne, S.Chand Publications.