DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/B.Sc./08/2022

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies and Ad-hoc Boards with recommendation of the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Regulation under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc.Electronics(Optional)	Ist and IInd semester (First Year)
2.	B.A./B.Sc.Mathematics(Optional)	Ist and IInd semester (First Year)
3.	B.Sc.Chemistry(Optional)	Ist and IInd semester (First Year)
4.	B.Sc.Physics(Optional)	Ist and IInd semester (First Year)
5.	B.Sc.Analytical Chemistry	Ist and IInd semester (First Year)
6.	B.Sc.Geology (Optional)	Ist to VIth semester (First to Third)

This is effective from the Academic Year 2022-23 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2022/ 6852-62
Date:- 10.08.2022.

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Deputy Registrar,
Academic Section

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1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.

2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
6] The Public Relation Officer, Dr.BAMU,A'bad.
7] The Record Keeper, Dr.BAMU,A'bad.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

Physics Syllabus

Choice Based Credit & Grading System

B. Sc. F. Y.
Semester I & II

Effective from
Academic Year 2022-23

B.Sc. First Year Physics Syllabus

Choice Based Credit System Syllabus

To be implemented from Academic Year 2022-23

Title of the Course: B. Sc. Physics

Preamble:

The curriculum for the B. Sc. (Physics) programme is designed to cater to the requirement of Choice Based Credit System following the University Grants Commission (UGC) guidelines. In the proposed structure, due consideration is given to Core and Elective Courses (Discipline specific - Physics), along with Ability Enhancement (Compulsory and Skill based) Courses. Furthermore, continuous assessment is an integral part of the CBCS, which will facilitate systematic and thorough learning towards better understanding of the subject. The systematic and planned curricula from first year to the third year (comprised of six semesters) shall motivate the student for pursuing higher studies in Physics and inculcate enough skills for becoming an entrepreneur.

Objectives:

- To foster scientific attitude, provide in-depth knowledge of scientific and technological concepts of Physics.
- To enrich knowledge through problem solving, minor/major projects, seminars, tutorials, review of research articles/papers, participation in scientific events, study visits, etc.
- To familiarize with recent scientific and technological developments
- To create foundation for research and development in Physics.
- To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems.
- To train students in skills related to research, education, industry, and market.
- To help students to build-up a progressive and successful career in Physics.

Structure of the Course

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum For Physics Under Faculty of Science and Technology
Course Structure and Scheme of Examination
B.Sc. Three Year Undergraduate Degree Program

	Course Code	Course Title	Total periods (Teaching periods / week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Semester I								
Optional I (DSC-1A) Core Courses	PHY-111	Mechanics and Properties of Matter (Theory Paper-I)	45(3/week)	2	50	10	40	20
	PHY-112	Heat and Thermodynamics (Theory Paper-II)	45(3/week)	2	50	10	40	20
	PHY-121	Lab course 1 (Based on PHY-111 and PHY-112)	45(3/week)	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-1)	CLE-131	Communication skills in English-I	45(5/week)	3	50	10	40	20
	AECC-1	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-I)	45(4/week)	3	50	10	40	20
			225	11.5	250	50	200	100
Total Credits for Semester I : 11.5 (Theory : 10 ; Laboratory : 1.5)								
Semester II								
Optional I (DSC-1B) Core Courses	PHY-211	Optics (Theory Paper-III)	45(3/week)	2	50	10	40	20
	PHY-212	Electricity and Magnetism (Theory Paper-IV)	45(3/week)	2	50	10	40	20
	PHY-221	Lab course 2 (based on PHY-211 and PHY-212)	45(3/week)	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-2)	CLE-231	Communication skills in English-II	45(5/week)	3	50	10	40	20
	AECC-2	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-II)	45(4/week)	3	50	10	40	20
Non-Credit Course / additional credits	COI-213	Constitution of India	45(3/week)	2 *				
Non-Credit Course /additional credits	CCC-214	Compulsory Computer Course	45(3/week)	2*				
			315	15.5	250	50	200	100
Total Credits for Semester II : 15.5 (Theory : 14 ; Laboratory : 1.5)								

	Course Code	Course Title	Total periods (Teaching periods / week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Semester III								
Optional I (DSC-1C) Core Courses	PHY-311	Core Course (Theory Paper-V)	45(3/week)	2	50	10	40	20
	PHY-312	Core Course (Theory Paper-VI)	45(3/week)	2	50	10	40	20
	PHY-321	Lab course 3 (Based on PHY-311)	45(3/week)	1.5	50	10	40	20
	PHY-322	Lab course 4 (Based on PHY-312)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-1)	SEC-313	SEC-1 Any one skill to be chosen out of two SEC-1(A), SEC-1(B)	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-3)	CLE-3	Communication skills in English-III	45(5/week)	3	50	10	40	20
	AECC-3	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-III)	45(4/week)	3	50	10	40	20
			315	15	350	70	280	140
Total Credits for Semester III : 15 (Theory : 12 ; Laboratory : 3)								
Semester IV								
Optional I (DSC-1D) Core Courses	PHY-411	Core Course (Theory Paper-VII)	45(3/week)	2	50	10	40	20
	PHY-412	Core Course (Theory Paper-VIII)	45(3/week)	2	50	10	40	20
	PHY-421	Lab course 5 (Based on PHY- 411)	45(3/week)	1.5	50	10	40	20
	PHY-422	Lab course 6 (Based on PHY- 412)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-2)	SEC-413	SEC-2 Any one skill to be chosen out of two SEC-2(C):Physics Workshop Skills-II, SEC-2 (D): Computational Physics Skills-II	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-4)	CLE-4	Communication skills in English-IV	45(5/week)	3	50	10	40	20
	AECC-4	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-IV)	45(4/week)	3	50	10	40	20
Additional credits		Environmental Studies	45(3/week)	2*				
			360	17	350	70	280	140
Total Credits for Semester IV : 17 (Theory : 12; Laboratory : 5)								

	Course Code	Course Title	Total periods (Teaching periods / week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Semester V								
Optional I (DSE-1 A) Discipline Specific Elective	PHY-511	DSE-1A(1) (Theory Paper-IX) (Select any one paper from A1/B1/C1/D1)	45(3/week)	2	50	10	40	20
	PHY-512	DSE-1A(2) (Theory Paper-X) (Select any one paper from A2/B2/C2/D2)	45(3/week)	2	50	10	40	20
	PHY-521	Lab course 7 (Based on PHY -511)	45(3/week)	1.5	50	10	40	20
	PHY-522	Lab course 8 (Based on PHY -512)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-3)	SEC-513	SEC-3 Any one skill to be chosen out of two SEC-3(E) , SEC-3 (F)	45(3/week)	2	50	10	40	20
			225	09	250	50	200	100
Total Credits for Semester V : 09 (Theory : 06 ; Laboratory : 03)								
Semester VI								
Optional I (DSE-1 B) Discipline Specific Elective	PHY-611	DSE-1B(1) (Theory Paper-XI) (Select any one paper from A1/B1/C1/D1)	45(3/week)	2	50	10	40	20
	PHY-612	DSE-1B(2) (Theory Paper-XII) (Select any one paper from A2/B2/C2/D2)	45(3/week)	2	50	10	40	20
	PHY-621	Lab course 8 (Based on PHY -611)	45(3/week)	1.5	50	10	40	20
	PHY-622	Lab course 9 (Based on PHY -612)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-4)	SEC-613	SEC-4 Any one skill to be chosen out of two SEC-4(G) , SEC-4 (H)	45(3/week)	2	50	10	40	20
			225	09	250	50	200	100
Total Credits for Semester VI : 09 (Theory : 06 ; Laboratory : 03)								
Total Credits for three years: Sem. I (11.5) + Sem. II (15.5) + Sem. III (15) + Sem. IV (17) + Sem V (09) + Sem. VI (09) = 77 Credits								

Important Notes:

i) **Nomenclature**: DSC- Discipline Specific Core course, SEC – Skill Enhancement Course, AECC- Ability Enhancement compulsory course, DSE- Discipline Specific Elective, UA-University Assessment (Semester End), CIA-Continuous Internal Assessment.

ii) **There shall be one skill enhancement course (SEC) IIIrd to VIth Semester (any one SEC course to be chosen (any one from three optional subjects) from the basket of SEC courses for the respective semester.**

iii) **Code description**: XXX code has to be decided by BoS of the respective subject while designing their respective curriculum (e.g. for Physics it will be PHY; for Electronics it will be ELE)

- The codes for first semester courses will start from XXX-111, Second-semester courses will start from XXX-211 and so on
- XXX-111 : The first digit indicate the Semester Number, the second two digits indicate paper numbers for the first-semester courses and the same analogy is for the remaining semesters
- The codes for theory courses will start from XXX-111 (for the first semester and the same analogy is for the remaining semesters)
- The codes for practical courses will start from XXX-121 (for the first semester and the same analogy is for the remaining semesters)
- The codes for Ability Enhancement compulsory courses will start from XXX-131 (for the first semester and the same analogy is for the remaining semesters)

iv) **Assessment**: 80% for University Assessment (Semester End Examination) and 20 % for Continuous Internal Assessment (CIA)

v) **Continuous Internal Assessment (CIA): Theory** (10 Marks): Internal Test 05 Marks (Two Internal Tests of 05 marks each and average of the two test will be considered) and 05 Marks for Assignment/tutorials.

vi) **Continuous Internal Assessment (CIA): Practical** (10 Marks): 07 Marks for Internal Practical Examination and 03 Marks for record book/submission of collection and field survey report and excursion report

vii) Practical examination : Annual examination

B. Sc. I Year Physics (Semester-I)
(Mechanics and Properties of Matter)
Course Code: PHY-111

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome: On successful completion of this course students will be able to:

- Understand Newton's laws and apply them in calculations of the motion of simple systems.
- Use the free body diagrams to analyze the forces on the object.
- Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be able to perform calculations using them.
- Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process. 5. Demonstrate quantitative problem solving skills in all the topics covered

Unit – I Mechanics **[13 L]**

Newton's law of Gravitation (Statement only), Gravitational Field Gravitational Potential, Gravitational Potential of mass, Gravitational potential and field due to spherical shell and solid sphere (at a point, outside, inside and on the surface). Compound Pendulum- expression of time period, Interchangeability of centre of suspension and oscillation, Kater's Pendulum, Problems.

Unit – II Elasticity **[10 L]**

Introduction, Stress and Strain, Hook's law and Coefficient of elasticity, Young's modulus, Bulk modulus, Modulus of rigidity, Twisting couple on a cylinder, Bending of Beam - Bending moment, cantilever loaded at free end- (a) When weight of beam is ineffective, (b) When weight of beam is effective, Depression of Beam supported at centre, Problems.

Unit – III Viscosity **[12 L]**

Introduction, Concept of viscous force and viscosity, Coefficient of viscosity, Steady and Turbulent flow, Reynolds number, Equation of continuity, energy of liquid in motion, Bernoulli's Theorem, practical applications: (i) Law of hydrostatic pressure (ii) Filter pump, Problems.

Unit – IV Surface Tension **[10 L]**

Introduction, Angle of contact, Factors affecting surface tension Difference of pressure across a curved surface, Determination of S.T. by Jaeger's method, Applications of surface tension, Problems.

Reference Books:

1) Elements of Properties of Matter - D. S. Mathur (S. Chand, 11 th edition, 1992)
2) Physics for Degree students-C. L. Arora and P.S.Heme (S. Chand, I st edition 2010)
3) Mechanics and Electrodynamics - Brijlal,N. Subrahmanyam, Jivan Seshan (S.Chand, 7 th edition)
4) Concepts of Physics: H. C. Verma, BharatiBhavan Publisher.
5) University Physics: Sears and Zeemansky, XIth/XIIth Edition, Pearson Education.

B.Sc. First Year Physics (Semester – I)

(Heat and Thermodynamics)

Course Code: PHY-112

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome:

- Develop an understanding on the concepts of Heat and Thermodynamics.
- Describe and apply the physical concepts of heat, transport phenomena and laws of thermodynamics.
- Perform calculations of heat conduction in various geometries.
- To develop ability among the students to identify, remember and grasp the meanings, definitions and laws of heat and thermodynamics.
- To develop attitudes such as concern for accuracy and precision, objectivity and enquiry.

Unit – I: Thermometry and Thermal conductivity **[12 L]**

Principal of thermometry, Celsius, Fahrenheit and Kelvin scale, types of thermometers (Mercury thermometer and platinum resistance thermometer), transference of heat, coefficient of thermal conductivity, rectilinear flow of heat along a metal bar, methods of radial flow of heat, (i) spherical shell method and (ii) flow of heat along the wall of a cylindrical tube, comparison of conductivities of different metals (Ingen-Housz experiment), Problems.

Unit – II: Real Gas: **[10 L]**

Introduction, change of state, behavior of gases at high pressure, reason for modification of a gas equation, Van-der Waal's Equation of state, comparison with experimental curves (Andrews Experiment), critical point and critical constants, estimation of critical constants, constants of Van-der Waal's equation, Problems.

Unit – III: Transport Phenomena: **[10 L]**

Introduction, Mean free path, sphere of influence, expression for mean free path, variation of mean free path with temperature and pressure, transport phenomena, viscosity, thermal conductivity, self diffusion (and their interrelationships, effect of temperature and pressure), Problems.

Unit - IV: Thermodynamics: **[13 L]**

Thermodynamic system, Zeroth law of thermodynamics, adiabatic process, adiabatic equation of a perfect gas, isothermal process, indicator diagram, first law of thermodynamics, work done during isothermal process and adiabatic process, reversible and irreversible process, second law of thermodynamics (Kelvin and Clausius statement), Heat engines, Carnot's ideal heat engine, Carnot's cycle (work done and efficiency).

Reference Books:

1) Heat, Thermodynamics and Statistical Physics – Brijlal, N. Subrahmanyan, P. S. Heme, (S. Chand, 2007 Edition)
2) Text Book of Heat and Thermodynamics – J. B. Rajam, C. L. Arora (S. Chand 9th Edition)
3) Heat and Thermodynamics – S. S. Singhal, J. P. Agarwala, S. Prakash (Pragati Prakashan)
4) Thermodynamics and Statistical Physics – S. L. Kakani

B.Sc. First Year Physics (Semester – I)

(Physics Practical)

Course Code: PHY-121

Credit 1.5

1. Determination of acceleration due to gravity by using Kater's Pendulum.
2. Y by bending loaded at center
3. Y by cantilever (Oscillation method)
4. Moment of inertial by using fly wheel.
5. η by Maxwell's needle
6. Determination of 'Y' and 'η' by flat spiral spring
7. Surface tension of a liquid by using Jaeger's method
8. Viscosity of a liquid by using Poiseuille's method
9. To find the co-efficient of thermal conductivity of copper using Searle's apparatus.
10. Thermal conductivity of a bad conductor by using Lee's disc method.

Note: Students should perform at least six experiments

Books:

1. B. Sc. Practical Physics – C. L. Arora (S. Chand Publications)
2. College Practical Physics – Khanna and Gulati (S. Chand Publication)
3. Practical Physics – Gupta and Kumar (Pragati Prakashan, Meerut)
4. A text book of Practical physics – Shrinivasan and Balsubramanyam.

B. Sc. F. Y. Physics (Semester –II)

(Optics)

Course Code-PHY-211

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome: On successful completion of this course the student will able to

- Acquire the basic concept of optics and its applications.
- Explain how image formation takes place in lenses
- Understand the operations of many modern optical devices
- Understand the optical phenomenon such as interference and diffraction

Unit 1 - Geometrical Optics **[12 L]**

Introduction to lenses, Location of the image, sign conversions, Thin Lens, Lens Equations, Lens Makers formula, Cardinal points of optical system (Six Points) and corresponding planes, Deviation by Lens, Coaxial Lens System (equivalent focal length and cardinal points), Problems

Unit 2 - Lens Aberrations **[08 L]**

Introduction, Types of aberrations: Monochromatic and Chromatic aberration, methods to minimize Chromatic and spherical aberration, Problems

Unit 3 - Optical Instruments **[12 L]**

Introduction, The Simple Magnifier, Field of View, stop and pupils, Objective and eyepiece, Need of multiple lens eye piece, Huygen's Eye-piece, Ramsden's Eye-piece, Comparison of Ramsden's eyepiece with Huygen's Eyepiece, Gauss Eye-piece, Problems

Unit 4 – Interference and Diffraction **[13 L]**

Interference in thin film due to reflected and transmitted light, wedge shaped thin film, Newton's rings by reflected light, determination of wavelength, Michelson's Interferometer, type of fringes, determination of wavelength and difference in wavelength, Types of Diffraction, Plane diffraction grating, Rayleigh's Criterion for resolution, Resolving power of prism and grating, Problems

Reference Books:

1. Optics - A.R. Ganesan, 4th edition, Pearson Education.
2. A Textbook of Optics - N. Subhramanyam, Brijlal, M.N. Avadhanulu, S. Chand Publication.
3. Physical Optics - A.K. Ghatak, McMillan, New Delhi
4. Fundamental of Optics - F.A. Jenkins, H.E.White, Mc Graw-Hilll International edition
5. Principles of Optics - D.S. Mathur, Gopal Press, Kanpur.

B.Sc. First Year Physics (Semester – II)
(Electricity and Magnetism)
Course Code: PHY-212

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome:

- Develop an understanding on the concepts of Electricity and magnetism.
- To understand the knowledge of various mathematical operations required for electrostatics and magnetostatics.
- Explain the fundamental concepts and operations of vector analysis.
- To increase the ability to perform calculations of various mathematical expressions and laws.
- To develop ability among the students to identify, remember and grasp the meanings, definitions and laws of electricity and magnetism.

Unit – I: Mathematic foundation (Vector Algebra) **[15 L]**

Introduction, scalar (dot) and vector (cross) product, scalar triple product and its geometrical interpretation, vector triple product, scalar and vector field, differentiation of vector with respect to scalar, partial differentiation and gradient of a scalar field, divergence and curl of a vector field and their physical significance, vector integrations (line, surface and volume integrals), Gauss divergence theorem, Stoke's theorem, Problems.

Unit – II: Electrostatics **[10 L]**

Coulomb's law, electric field, field due to point charge, electric flux, Gauss law (with proof), differential form of gauss law, electric potential, potential due to a point charge, field and potential due to a point charge, Problems.

Unit – III: Dielectrics **[08 L]**

Introduction, polar and non-polar molecules, fundamental definitions of dielectrics (dielectric constant, dielectric polarization, polarizability, polarization vector, and dielectric displacement), Relation between D, E and P, molecular field in a dielectric (Clausius – Mossotti relation), Problems.

Unit – IV: Magnetostatics **[12 L]**

Introduction, magnetic field, magnetic flux, magnetic induction, Biot and Savart law, magnetic induction at a point due to straight conductor carrying current, magnetic field at the center of circular coil carrying current, magnetic induction on the axis of solenoid, Ampere's law, differential form of Ampere's law, torque on a current loop in uniform magnetic field, moving coil ballistic galvanometer – expression for charge, Problems.

References:

1. Mathematical Methods in Physics – D. Biswas (New Central book agency, 2009 edition)
2. Electricity and Magnetism – R Murugeshan (S. Chand, 2008 edition)
3. Electrodynamics – Gupta, Kumar, Singh (Pragati Prakashan, Merrut, 18th Edition, 2005)
4. Foundation of Electromagnetic theory – Reitz, Milford, Chirstey IIIrd Edition)
5. Fundamentals of Physics – Halliday Rensik and Walkar, 8th Edition
6. Electromagnetic – B. B. Laud
7. Electricity and Magnetism – Brijlal, Subramanyan (Ratan Prakashan (Revised edition, 1997)
8. Electricity and Magnetism – Edward M. Purcell, 1986, McGraw – Hill Education
9. Electricity and Magnetism – D. C. Tayal, 1988, Himalaya Publishing house.

B. Sc. F. Y. II Semester Physics

PHY-221

Credit 1.5

List of experiment

1. Use of multimeter for measuring voltage, current and resistance.
2. Determination of dielectric constant of liquid/solid.
3. I-H curve.
4. Field along the axis of circular coil.
5. Determination of wavelength of light by Newton's rings.
6. Resolving power of telescope.
7. Specific rotation by Laurent's half shade polarimeter.
8. λ by grating (normal incidence)
9. Determination of frequency of AC mains by sonometer
10. Comparison of capacitor using De'Sauty's method
11. Measurement of constants of B. G.

Note: - At least six experiments should be performed.

Books:

1. B. Sc. Practical Physics – C. L. Arora (S. Chand Publications)
2. College Practical Physics – Khanna and Gulati (S. Chand Publication)
3. Practical Physics – Gupta and Kumar (Pragati Prakashan, Meerut)
4. A text book of Practical physics – Shrinivasan and Balsubramanyam.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Nature of Question Paper for choice based credit system (CBCS) semester pattern.

Subject: Physics

Time: 2 hours Max. Marks: 40

Instructions:

1. All questions are compulsory.
2. All questions carry equal marks.
3. Draw neat diagrams and give equations wherever necessary.
4. Figures to the right indicate full marks.
5. Use of logarithmic table and calculator is allowed.

Q. 1)	Long answer questions (Solve any one) A. Question from Unit – I 2. Question from Unit – III	10
Q. 2)	Long answer questions (Solve any one) 1. Question from Unit – II 2. Question from Unit – IV	10
Q. 3)	Short answer questions / problems a. Short answer question / problem from Unit – I b. Short answer question / problem from Unit – III OR a. Short answer question / problem from Unit – II b. Short answer question / problem from Unit – IV	10
Q. 4)	Multiple Choice Questions (MCQ)	10

Note: Ten MCQ's having four alternatives based on theory and numerical.
(Minimum two MCQ's from each chapter)

Dr.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

CIRCULAR NO.SU/B.Sc./CBC&GS /67/2023

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies, Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Practical Pattern of Question Paper under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	**B.Sc. Biotechnology (Degree)**	**IIIrd & IVth semester**
2.	**B.Sc. Automobile Technology (Degree)**	**IIIrd & IVth semester**
3.	**B.Sc. Workshop Technology (Degree)**	**IIIrd & IVth semester**
4.	**B.Sc. Refrigeration and Air Conditioning (Degree)**	**IIIrd & IVth semester**
5.	**B.Sc.Physics (Optional)**	**IIIrd & IVth semester**
6.	**B.Sc.Chemistry (Optional)**	**IIIrd & IVth semester**
7.	**B.Sc.Analytical Chemistry (Optional)**	**IIIrd & IVth semester**
8.	**B.Sc. Statistics (Optional)**	**IIIrd & IVth semester**

This is effective from the Academic Year 2023-24 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2023/ 670-77
Date:- 03.06.2023.

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Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

Physics Syllabus

As per

Choice Based Credit & Grading System

B. Sc. S. Y.
Semester III & IV

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

2015 2023
(Dr. B N Dole)

Effective from
Academic Year- 2023-24

B.Sc. Second Year Physics Syllabus
Choice Based Credit System Syllabus
To be implemented from Academic Year 2023-24

Title of the Course: B. Sc. Physics

Preamble:

The curriculum for the B. Sc. (Physics) programme is designed to cater to the requirement of Choice Based Credit System following the University Grants Commission (UGC) guidelines. In the proposed structure, due consideration is given to Core and Elective Courses (Discipline specific - Physics), along with Ability Enhancement (Compulsory and Skill based) Courses. Furthermore, continuous assessment is an integral part of the CBCS, which will facilitate systematic and thorough learning towards better understanding of the subject. The systematic and planned curricula from first year to the third year (comprised of six semesters) shall motivate the student for pursuing higher studies in Physics and inculcate enough skills for becoming an entrepreneur.

Objectives:

- To foster scientific attitude, provide in-depth knowledge of scientific and technological concepts of Physics.
- To enrich knowledge through problem solving, minor/major projects, seminars, tutorials, review of research articles/papers, participation in scientific events, study visits, etc.
- To familiarize with recent scientific and technological developments
- To create foundation for research and development in Physics.
- To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems.
- To train students in skills related to research, education, industry, and market.
- To help students to build-up a progressive and successful career in Physics.

Structure of the Course

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum for Physics Under Faculty of Science and Technology
Course Structure and Scheme of Examination
B.Sc. Three Year Undergraduate Degree Program

	Course Code	Course Title	Total periods (Teaching periods/ week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Semester III								
Optional I (DSC-1C) Core Courses	PHY-311	Core Course **(Statistical Physics and Relativity)**	45(3/week)	2	50	10	40	20
	PHY-312	Core Course **(Modern and Nuclear Physics)**	45(3/week)	2	50	10	40	20
	PHY-321	Lab course 3 (Based on PHY-311)	45(3/week)	1.5	50	10	40	20
	PHY-322	Lab course 4 (Based on PHY-312)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-1)	SEC-313	SEC-1 Any one skill to be chosen out of two SEC-1(A): **Medical Physics,** SEC-1(B): **Sensor and Instrumental Physics**	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-3)	CLE-3	Communication skills in English-III	45(5/week)	3	50	10	40	20
	AECC-3	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-III)	45(4/week)	3	50	10	40	20
			315	15	350	70	280	140
Total Credits for Semester III : 15 (Theory : 12 ; Laboratory : 3)								
Semester IV								
Optional I (DSC-1D) Core Courses	PHY-411	Core Course **(Semiconductor and Digital Electronics)**	45(3/week)	2	50	10	40	20
	PHY-412	Core Course **(Condensed Matter Physics)**	45(3/week)	2	50	10	40	20
	PHY-421	**Lab course 5** (Based on PHY- 411)	45(3/week)	1.5	50	10	40	20
	PHY-422	**Lab course 6** (Based on PHY- 412)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-2)	SEC-413	SEC-2 Any one skill to be chosen out of two SEC-2 (C): **Renewable energy** SEC-2 (D): **Physics Workshop Skill**	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-4)	CLE-4	Communication skills in English-IV	45(5/week)	3	50	10	40	20
	AECC-4	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-IV)	45(4/week)	3	50	10	40	20
Additional credits		Environmental Studies	45(3/week)	2*				
			360	17	350	70	280	140
Total Credits for Semester IV : 17 (Theory : 12; Laboratory : 5)								

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Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Important Notes:

i) **Nomenclature**: DSC- Discipline Specific Core course, SEC – Skill Enhancement Course, AECC- Ability Enhancement compulsory course, DSE- Discipline Specific Elective, UA-University Assessment (Semester End), CIA-Continuous Internal Assessment.

ii) **There shall be one skill enhancement course (SEC) IIIrd to VIth Semester (any one SEC course to be chosen (any one from three optional subjects) from the basket of SEC courses for the respective semester.**

iii) **Code description**: XXX code has to be decided by BoS of the respective subject while designing their respective curriculum (e.g., for Physics it will be PHY; for Electronics it will be ELE)

- The codes for first semester courses will start from XXX-111, Second-semester courses will start from XXX-211 and so on
- XXX-111: The first digit indicates the Semester Number; the second two digits indicate paper numbers for the first-semester courses and the same analogy is for the remaining semesters
- The codes for theory courses will start from XXX-111 (for the first semester and the same analogy is for the remaining semesters)
- The codes for practical courses will start from XXX-121 (for the first semester and the same analogy is for the remaining semesters)
- The codes for Ability Enhancement compulsory courses will start from XXX-131 (for the first semester and the same analogy is for the remaining semesters)

iv) **Assessment**: 80% for University Assessment (Semester End Examination) and 20 % for Continuous Internal Assessment (CIA)

v) **Continuous Internal Assessment (CIA): Theory** (10 Marks): Internal Test 05 Marks (Two Internal Tests of 05 marks each and average of the two tests will be considered) and 05 Marks for Assignment/tutorials.

vi) **Continuous Internal Assessment (CIA): Practical** (10 Marks): 07 Marks for Internal Practical Examination and 03 Marks for record book/submission of collection and field survey report and excursion report

vii) Practical examination: Annual examination

B. Sc. Second Year Physics
(Semester-III)
(Statistical Physics and Relativity)
Course Code: PHY-311

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome: On successful completion of this course students will be able to:

- Show an analytic ability to solve problems relevant to statistical mechanics.
- Can explain the procedures for deriving the relation between thermodynamic parameters such as pressure, temperature, entropy and heat capacity from the distribution functions.
- Can apply the methods of statistical physics in other fields of physics and related fields
- Demonstrate knowledge and broad understanding of Special Relativity

Unit I- Basic Concepts in Statistical Physics **[10 L]**

Introduction, probability, some basis rules of probability theory, permutation and combination, macrostates and microstates, phase space, principle of equal a priori probability, thermodynamic probability, probability distribution, Problems

Unit II- Classical statistics **[11 L]**

Maxwell-Boltzmann energy distribution law, evaluation of gi, α and β, M.B. distribution function for ideal gas, Molecular Speed (Vmp, $\bar{V}$, Vrms), Thermodynamic functions in terms of Partition Function, Problems

Unit III- Quantum statistics **[11 L]**

Quantum statistics I: Need of quantum statistics, Bose-Einstein distribution law, Planck's radiation law,

Quantum statistics II: Fermi-Dirac distribution law, Fermi level and Fermi energy, EFO for electrons in a metal, electron energy distribution, comparison of M-B, F-D and B-E statistics, difference between classical and quantum statistics, Problems.

Unit IV- Theory of relativity **[13 L]**

Introduction, frame of reference, Postulates of Special Relativity, Galilean transformation, Michelson Morley experiment, Einstein's special theory of relativity, Lorentz transformation equation, length contraction, time dilation, addition of velocities, variation of mass-energy equivalence, Problems.

Reference Books:

1) Heat, thermodynamics & statistical Physics- Brijlal, N. Subrahmanyam, P.S. Hemne. S. Chand Publication
2) Modern physics – R. Murgeshan, Kiruthiga Shivprasath, S. Chand Publication.
3) Statistical Mechanics by Satya Prakash, Kedar Nath Ram Nath Publisher, Delhi
4) Concepts of Modern Physics by Arthur Beiser Publisher McGraw-Hill

B. Sc. Second Year Physics
(Semester-III)
(Modern and Nuclear Physics)
Course Code: PHY-312

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome: On successful completion of this course students will be able to:

- Able to explain the factors influencing photoelectric effect, explain the experimental setup and apply it for applications
- understand the fundamentals of lasers, laser systems, their characteristics and diversified applications including industry, medicine and Defense
- use this knowledge for applications of lasers in specific fields of their interest
- Demonstrate the ability to critically evaluate the results in nuclear and particle physics
- Identify the strengths and limitations of various nuclear models

Unit – I: Photoelectric effect **[12 L]**

Introduction, Lenard's method to determine e/m for photoelectrons, Richardson and Compton experiment, Relation between photoelectric current and retarding potential, Relation between velocity of photoelectrons and frequency of light, photoelectric cells- (1) Photo- emissive cell (2) Photo- voltaic cell (3) Photoconductive cell, Applications of photoelectric cells.

Unit – II: Lasers **[11 L]**

Introduction, induced absorption, spontaneous emission, stimulated emission, population inversion, properties of laser beam, laser pumping, Types of laser-Ruby laser, He-Ne laser, carbon dioxide (CO_2) laser, Applications of laser-Biological, medical and industrial.

Unit – III: Nuclear forces and models **[12 L]**

Introduction, Binding energy, Nuclear stability, Nuclear forces, Meson theory of nuclear forces, liquid drop model, shell model, Energy released in Fission, Chain reaction, Atom bomb, Nuclear Reactors, Nuclear fusion, Source of stellar energy.

Unit - IV: Particle accelerators and detectors **[10 L]**

Linear accelerator, Cyclotron, Synchrocyclotron, Betatron, Ionization chamber, proportional counter, Geiger – Muller counter.

Reference Books:

1) Modern Physics- J. B. Rajan
2) Modern Physics- R. Murugeshan, Er. Kirutyhiga, Sivaprasath. S.Chand Publication
3) LASERS: Fundamentals and Applications, K. Thyagarajan, Ajoy Ghatak
4) Nuclear Physics- Kaplan
5) Nuclear Physics- B.N.Srivastava
6) Atomic and nuclear physics-N. Subramanyan and Brijlal.

B. Sc. Second Year Physics
(Semester-III)
Physics Practical: Lab Course-3
Course Code: PHY-321

Credit 1.5 **Marks-50 (CIA-10 and UA-40)**

List of Experiments:

1. Study of temperature dependence of total radiation
2. To draw the histogram of theoretical Gaussian curve
3. Velocity of sound using Helmholtz resonator
4. Surface tension by Fergusons method
5. e/m by Thomson's tube experiment
6. I-V characteristics of solar cell
7. Viscosity of liquid using Searle's viscometer
8. M. I. by Bifilar suspension
9. Viscosity of liquid by using oscillating disc method.

Note: Students should perform at least six experiments

Books:

1. B. Sc. Practical Physics – C. L. Arora (S. Chand Publications)
2. College Practical Physics – Khanna and Gulati (S. Chand Publication)
3. Practical Physics – Gupta and Kumar (Pragati Prakashan, Meerut)
4. A text book of Practical physics – Shrinivasan and Balsubramanyam.

B. Sc. Second Year Physics
(Semester-III)
Physics Practical: Lab Course-4
Course Code: PHY-322

Credit 1.5 **Marks-50 (CIA-10 and UA-40)**

List of Experiments:

1. To verify the inverse square law using photocell
2. 'h' by photocell
3. To compare the luminous intensities of two lights sources using photocell
4. Measurement of the focal length of a given convex lens using laser
5. Diffraction of grating using laser beam
6. Beam divergence of a diode laser
7. Determination of the diameter of a thin wire using laser
8. Determination of wavelength of He-Ne laser by transmission grating and reflection grating.
9. To draw the plateau curve for GM counter
10. To find the dead time of GM counter

Note: Students should perform at least six experiments

Books:

1. B. Sc. Practical Physics – C. L. Arora (S. Chand Publications)
2. College Practical Physics – Khanna and Gulati (S. Chand Publication)
3. Practical Physics – Gupta and Kumar (Pragati Prakashan, Meerut)
4. A text book of Practical physics – Shrinivasan and Balsubramanyam.

B. Sc. Second Year Physics
(Semester-III)
Skill Enhancement Course

NOTE:
Any one skill Enhancement Course to be chosen out of two either 'SEC-1(A): Medical Physics,' or 'SEC-1(B): Sensor and Instrumental Physics

B. Sc. Second Year Physics
(Semester-III)
Title of the course: SEC-1(A) Medical Physics
Course code: SEC-313

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Learning Objectives:

At the completion of this course, the student should be –

- To learn the construction of X-ray generator
- Explain different types of radiation, their sources/properties.
- The basic principles and working of CT, MRI and Ultrasound Imaging.
- Able to provide adequate knowledge about the medical testing equipment.
- Able to transfer knowledge and skills to students as well as younger professionals.

Unit I: X-ray Generators **[13 L]**

Discovery - Production - Properties of X-rays - X-ray spectrum : characteristics and continuous spectra - Design of hot cathode X-ray tube - Basic requirements of medical diagnostic, therapeutic and industrial radiographic tubes - Rotating anode tubes - Hooded anode tubes - Rating of tubes - standard exposure charts, Limitations on loading Safety devices in X-ray tubes - Insulation and cooling of X-ray tubes – Design requirements for X-ray equipment, Faults detection in X-ray equipment such as pitting of anode, filament evaporation etc., - Types of X-ray units (Fixed radiography, CT, Interventional radiology, C-Arm, Mammography, Bone Mineral Densitometer, dental X-ray units etc.,). Filtration in the X-ray machines

Unit II: Radioactivity. **[11 L]**

Radioactivity - General properties of alpha, beta and gamma rays - Laws of radioactivity - Half life and Average Life - Laws of successive transformations - Natural radioactive series - Radioactive equilibrium - Alpha ray spectra - Beta ray spectra - Gamma emission - Electron capture - Internal conversion - nuclear isomerism - Artificial radioactivity.

Unit III: Computed Tomography, MRI and Ultrasound Imaging. **[11 L]**

Computed Tomography (CT): Principle, CT imaging system, image reconstruction and processing, acquisition and image quality.

Magnetic Resonance Imaging (MRI): NMR Principle, techniques involved MR image acquisition and reconstruction, safety and applications of MRI in radiotherapy for treatment planning.

Ultrasound imaging (US): construction and working of a transducer, B-mode signal processing, modern imaging methods, image artifacts- US imaging in radiotherapy for treatment planning.

Unit IV: Medical testing equipment. **[10 L]**

Construction, working of the medical testing equipment: Thermometer, Optical thermometer, Infrared thermometer, Reflex hammer, radiography, Weighing machine, Glucometer, ECG machine, Stethoscope, X-Ray machine, CT scan, PET machine, MRI, Infusion pump, medical laser, Ultrasound machine.

Reference Books:

1. F. M. Khan, The Physics of Radiation therapy, 3rd Edition, Lippincott Williams &Wikins, Philadelphia, 2003
2. Radiation Physics in Radiology, Oliver R., Blackwell Science Ltd; 1st Edition (1966).
3. Radiation Physics for Medical Physicists, E. B. Podgarsak, Springer Verlag, 1st Edition (1996).
4. The essential physics of medical imaging, Bushberg, S.T., Seibert, J.A, Leidholt, E.M. & Boone, J.M., Baltimore: Williams & Wilkins 1st Edition (1990).

B. Sc. Second Year Physics
(Semester-III)
Title of the course: SEC-1(B) Sensor and Instrumental Physics
Course code: SEC-313

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Learning Objectives:

At the completion of this course, the student should be –

- Describe primary blocks of an Instrumentation System and Qualities of Measurement.
- Classify physical measurement backgrounds.
- Select transducers as per application demand.
- Identity terminals of industry grade transducers.
- Describe operation of basic transducers employed for industrial process parameter monitoring applications

Unit I: Basic Measurement devices **[11L]**

Ammeter: DC Ammeter, Multi range Ammeter, Voltmeter, Multi Range Voltmeter. Multimeter: Multimeter operating instructions. Digital Voltmeter: Introduction, Resolution and Sensitivity of Digital meter, General specification of DVM. Oscilloscope: Introduction, Basic principle, Block diagram of Oscilloscope, Simple CRO. Function Generator: Introduction, Basic principle, Block diagram of Function Generator.

Unit II: Transducers and Sensors **[11L]**

Resistance Transducers, Variable inductance type transducers, Capacitive Limit Switches, Proximity Detectors, Hall Effect Sensor, Photoelectric sensors: Through beam sensor, Retro-reflective sensor, Limited-reflective sensor, Mark sensor, Distance-settable Sensor, Applications of Photoelectric sensor. Ultrasonic Sensors. Photoelectric pick-up & Proximity sensor (non-contact type). Rotary and translational encoders

Special purpose sensors:

Gas sensors, accelerometer, gyro sensor, humidity sensor, reed switch, thickness sensor, tilt sensors

Unit III: Temperature and Pressure measurement. **[11L]**

Temperature: Definition and units, Different temperature scales & their conversions; Classification of temperature measuring transducers: Gas Filled thermometer, Bimetallic thermometer, Thermistors, RTD – (PT-100) , Thermocouple – Seeback& Peltier effect, Types J, K, R , S, T(Based on material, temperature ranges), Non-Contact measurement methods, Pyrometer.

Pressure measurement - Pressure: Definition, Types - Absolute, Gauge, Atmospheric, Vacuum (Definition, Units), Classification of Pressure measuring devices; Non elastic pressure transducer: U tube, well type manometer; Elastic pressure transducer: Bourdon Tube, Bellows, Diaphragm; Strain Gauge: Working principle, construction, piezo resistance co-efficient; Types of strain gauge: bonded, unbounded, semiconductor

Unit IV: Flow and Level Measurement **[12L]**

Flow measurement - Flow: Definition, Types of Flow – Laminar, turbulent, Reynolds number Classification of flow measuring transducers: Variable head flow meter- Venturi meter, orifice plate meter, Variable area flow meter – Rota meter, Electromagnetic Flow meter, Ultrasonic flow meter-Doppler Type, Solid flow measurement.

Level Measurement - Classification of level measurement methods: Float type – linear & rotary potentiometer (Contact type), Capacitive type (Contact type), Ultrasonic type (non-contact type) Radiation type (non-contact type), RADAR type (non-contact type).

Reference Books:

1. Electronics Instrumentation – H. S. Kalsi; Second Edition, 2004,Tata McGraw Hill Publishing Co. Ltd; N. Delhi
2. Instrumentation and Control - D. Patranabis; Publishing PHI Learning Private Limited, New Delhi
3. Industrial Electronics – Terry Bartlet; Cengage Learning India Edition, Second Indian Reprint, 2006, New Delhi.

B. Sc. Second Year Physics
(Semester-IV)
(Semiconductor and digital Electronics)
Course code PHY-411 * Theory Paper-VII

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome: On successful completion of this course students will be able to:

- Basic semiconductor devices
- Various transistor basing techniques and detailed study of Single stage amplifier
- How amplifier can be converted into oscillator
- Importance of Op-amp and its various circuits
- Number systems, Logic gates and Boolean Algebra

Unit – I: Semiconductor devices: **[10 L]**

Semiconductor diode, Construction, Working and Characteristics of semiconductor diode, Construction, Working and Characteristics of Bipolar Junction Transistor, Transistors IV characteristics (CE, CB and CC configuration). Construction, Working and IV Characteristics of FET.

Unit – II: Transistor biasing and Amplifiers: **[12 L]**

Faithful amplification, Essentials of Transistor biasing. Selection of operating point, bias stability, transistor biasing circuits [only circuit diagram, advantages and disadvantages for fixed bias (base bias), collector feedback bias, emitter feedback bias (self-bias)]. Voltage divider bias (circuit diagram, Circuit analysis, stability factor), Single stage transistor amplifier, How transistor amplifies–Graphical demonstration of transistor amplifier.

Unit – III: Oscillators and Op-Amp: **[12L]**

Introduction, Oscillatory tank circuit, Positive feedback Amplifier -Oscillator. Essentials of Transistor Oscillator, Explanation of Barkhausen Criterion, Hartley Oscillator (LC), Phase Shift Oscillator (RC).

Differential Amplifier, CMRR, Parameters of OP–amp, Schematic Symbol and Block Diagram of OP-Amp, Applications of Op-Amp- inverting & non-inverting amplifier. Op-Amp as an adder and subtractor.

Unit - IV: Digital Electronics: **[11L]**

Number systems: (Binary, Decimal, Hexadecimal), Decimal to Binary conversion, Binary to Decimal conversion, Binary to Hexadecimal conversion, Hexadecimal to Binary conversion.Binary-Coded Decimal Code (BCD Code), Logic Gates: OR, AND, NOT, NAND, NOR, XOR (logic symbol, Truth table, Boolean expression), Combination of Basic Logic Gates, NAND as universal building block

Boolean algebra: Boolean theorems (Single variable and multivariable theorems), De-Morgan's first and second theorem

Reference Books:

1. Basic principle of electronics- V. K. Mehta.
2. Basic Electronics & Linear circuits- N.N. Bhargawa
3. An introduction to Electronics edition-II or III - A.P. Malvino
4. Radio engineering- M.L. Gupta.
5. An introduction of Electronics - K.J.M. Rao

B. Sc. Second Year Physics
(Semester-IV)
(Condensed Matter Physics)
Course code PHY-412 * Theory Paper-VIII

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Course Outcome: On successful completion of this course students will be able to:

- Expose students to the basic concepts in condensed matter physics
- Recognize common crystal structures.
- Explain the physics of different types of bonds and Bonding in solids
- Describe electrical conduction in crystals.
- Thermal properties of solids
- The details study of Hall effect.

Unit I. Crystal Physics **[12L]**

Introduction, lattice point and space lattice, the basis and the crystal structure, Unit cell, (primitive, non-primitive Wigner-Sietz primitive cell), symmetry operations, point groups and space groups, Bravais lattices-Bravais lattice in two dimensions (Plane lattice), and Bravais lattice in three dimensions (Space lattice), representation of plane-Miller indices, different crystal structures-1. Simple cubic structure, 2. Face centered cubic structure, 3. Body centered cubic structure, 4. Hexagonal closed packed structure, 5. Other cubic structure-Diamond structure, Zinc Blande structure, NaCl structure.

Unit II. Bonding in solids **[11L]**

Introduction, concept of inters atomic forces, cohesive energy and types of bonding, primary bonding- (ionic bonding, covalent bonding and metallic bonding), secondary bonding- (Vander Waals bonding and hydrogen bonding).

Unit III. Thermal properties of solids **[11L]**

Introduction, Classical theory of lattice heat capacity (Concept and comparison with experimental values), Einstein's theory of lattice heat capacity, Debye's model of lattice heat capacity, density of modes, limitations of Debye's model.

Unit IV. Free electron in crystals **[11L]**

Introduction, the outstanding properties of metals, Drude-Lorentz's theory, electrical conductivity, thermal conductivity, Wiedemann Franz relation, significance of Fermi energy level, Hall effect, Hall voltage and Hall coefficient, experimental determination of Hall coefficient, Importance of Hall effect.

Reference Books:

1. Physics for degree student- C. L. Arora & Dr. P. S. Hemne- S. Chand publication
2. Solid state Physics-Structure and properties of materials, - M A Wahab - Narosa Publishing House
3. Principles of the Solid State-H. V. Keer- New Age International Publishers.
4. Applied Solid State- Physics-Rajnikant-Wiley India Pvt. Ltd.
5. Solid State Physics- S. O. Pillai (VIIth Edition)- New Age International Publishers.

6. Solid State Physics and Electronics – R. K. Puri & V.K. Babbar- S. Chand publication
7. Solid State Physics- A. J. Dekker- The Macmillan Press Ltd.
8. Fundamentals of Solid-State Physics-C.M. Kale, K. M. Jadhav, N. N. Waghule-Rushi Publication.
9. Introduction to Solid State Physics, VIIth Edition - C. Kittel.
10. Fundamentals of Solid-State Physics-Saxena, Gupta, Saxena- Pragati prakashan, Meerat.

B. Sc. Second Year Physics
(Semester-IV)
Physics Practical: Lab Course-5
Course Code: PHY-421

Credit 1.5 **Marks-50 (CIA-10 and UA-40)**

List of Experiments:

1. I-V Characteristics of transistor in CB configuration
2. I-V Characteristics of transistor in CE configuration
3. I-V Characteristics of Zener diode
4. I-V Characteristics of FET
5. Study of OR, NOT, AND gates
6. Study of Op-amp as adder
7. Study of Op-amp as subtractor
8. Study of RC Oscillator (Phase shift Oscillator)
9. Study of LC Oscillator (Hartley Oscillator)

Note: Students should perform at least six experiments

B. Sc. Second Year Physics
(Semester-IV)
Physics Practical: Lab Course-6
Course Code: PHY-422

Credit 1.5 **Marks-50 (CIA-10 and UA-40)**

List of Experiments:

1. Energy band gap of semiconductor using thermistor
2. Thermal conductivity by Forb's method
3. Rydberg constant using Excel
4. I-H curve using Excel
5. Calibration of bridge wire using Carry-Foster's bridge.
6. Determination of absolute capacity of condenser using B.G.
7. To determine the Hall coefficient of a semiconductor sample.
8. Study V-I characteristics of a solar cell.
9. To analyze the XRD data of the two given sample and find out the lattice constant

Note: Students should perform at least six experiments

B. Sc. Second Year Physics
(Semester-IV)
Skill Enhancement Course

NOTE:
Any one skill Enhancement Course to be chosen out of two either 'SEC-2(C) Renewable energy' or 'SEC-2(D) Physics Workshop Skill'

B. Sc. Second Year Physics
(Semester-IV)
Title of the course: SEC-2(C) Renewable energy
Course code: SEC-413

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Learning Objectives: At the completion of this course, the student should be –

- Know the need of renewable energy resources, historical and latest developments
- Discuss wind energy conversion systems and explain sources of geothermal energy
- Describe different biogas plants and working of different gasifiers
- Explain the working principle of different fuel cells and ocean thermal energy conversion systems
- Compare Solar, Wind and bio energy systems, their prospects, advantages and limitations

Unit I- Introduction to Energy sources **[13 L]**

Energy sources and their availability, non-conventional sources, advantages of renewable energy sources, prospects of renewable energy sources.

Sun as a source of energy: Solar energy collectors – flat plate collectors and concentrating collectors, solar energy, storage systems – mechanical, electrical, chemical and electro-magnetic, solar pond, applications of solar energy – solar water heating, solar distillation, solar cooking.

Unit II- Wind and Geothermal Energy **[12 L]**

Wind Energy: Introduction, Principle of wind energy conversion, Advantages and disadvantages of wind mills, Applications of wind energy

Geothermal energy: Introduction - Estimates of Geothermal Power - Nature of geothermal fields - Geothermal resources - Hydrothermal (convective) Resources Geo pressured resources

Unit III- Bio-Energy **[10 L]**

Energy from biomass - Sources of biomass - Different species - Conversion of biomass into fuels - Energy through fermentation - Pyrolysis, gasification and combustion Biogas plants - Properties and characteristics of biogas.

Unit IV- Ocean -Energy **[10 L]**

Introduction, Principle of ocean thermal energy conversion (OTEC), Tidal power generation, Tidal energy technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and disadvantages.

Reference Books:

1. Non-Conventional Energy Resources by B.H. Khan, Tata McGraw Hill Pub.,2009
2. Solar Energy, Fundamentals and Applications, Garg, Prakash, Tata McGraw Hill
3. Solar energy - M P Agarwal - S Chand and Co. Ltd
4. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd
5. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi

B. Sc. Second Year Physics
(Semester-IV)
Title of the course: SEC-2(D) Physics Workshop Skill
Course code: SEC- 413

Periods 45 **Credit 02** **Marks 50 (CA=10, ESE 40)**

Learning Objectives:

At the completion of this course, the student should be –

- The students to familiar and experience with various mechanical and electrical tools through hands-on mode

Unit I: Introduction: **[12 L]**

Measuring units. conversion to SI and CGS. Familiarization with meter scale, Vernier caliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

Unit II: Mechanical Skill: **[13 L]**

Concept of workshop practice. Overview of manufacturing methods: casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block. Use of bench vice and tools for fitting. Make funnel using metal sheet.

Unit III: Electrical and Electronic Skill: **[10 L]**

Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope.Making regulated power supply. Timer circuit, electronic switch using transistor and relay.

Unit IV: Introduction to prime movers: **[10 L]**

Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.

Reference Books:

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edn.
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes [ISBN: 0750660732]
5. New Engineering Technology, Lawrence Smyth / Liamennessy, TheEducational Company of Ireland [ISBN: 0861674480]

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Question Paper Pattern

Nature of Question Paper (Theory) for choice-based credit system (CBCS) semester pattern.

Subject: Physics

Time: 2 hours | Max. Marks: 40

Instructions:

1. All questions are compulsory.
2. All questions carry equal marks.
3. Draw neat diagrams and give equations wherever necessary.
4. Figures to the right indicate full marks.
5. Use of logarithmic table and calculator is allowed.

Q. 1) Long answer questions (Solve any one) 10

A. Question from Unit – I

B. Question from Unit – III

Q. 2) Long answer questions (Solve any one) 10

A. Question from Unit – II

B. Question from Unit – IV

Q. 3) Short answer questions / problems (5 Marks for each) 10

A. Short answer question / problem from Unit – I

B. Short answer question / problem from Unit – III

OR

A. Short answer question / problem from Unit – II

B. Short answer question / problem from Unit – IV

Q. 4) Multiple Choice Questions (MCQ) 10

Note: Ten MCQ's having four alternatives based on theory and numerical.
(Minimum two MCQ's from each chapter)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Scheme of Practical examination and marks (Practical) for choice-based credit system (CBCS) semester pattern.

B. Sc. Second Year Semester-III (**PHY-321, 322**) and Semester- IV (**PHY-421, 422**)

Subject: Physics

i) **Continuous Internal Assessment (CIA): Practical** (10 Marks): 07 Marks for Internal Practical Examination and 03 Marks for record book /submission of collection and field survey report and excursion report

ii) Practical examination: Annual examination

*Continuous Internal Assessment (CIA) For 40 Marks distribution

Course title	Internal Practical Examination	Record book	Total
PHY-321	07 Marks	03 Marks	10 Marks
PHY-322	07 Marks	03 Marks	10 Marks
PHY-421	07 Marks	03 Marks	10 Marks
PHY-422	07 Marks	03 Marks	10 Marks
Total	**28 Marks**	**12 Marks**	**40 Marks**

PRACTICAL EXAMINATION (UA)

1. Experimental performance 321 + 421 – 70 marks + Viva voce 10 marks = 80 Marks
2. Experimental performance 322 + 422 – 70 marks + Viva voce 10 marks = 80 Marks

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Dr. S.T. Alone.

Dr. G.M. Dharne

20/5/2023

(Dr. B.N Dole)
Chairman, BOS

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/SU/Sci./B.Sc. & M.Sc. Syll./5/2015

It is hereby notified for information to all the concerned that, on the recommendation of the Faculty of Science the Academic Council at its meeting held on 30-05-2015 has accepted the **revised semester-wise syllabi as mentioned against their names in the Faculty of Science as under** :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Computer Science Degree Course	III & IV
[2]	B.Sc. Information Technology Degree Course	III & IV
[3]	B.C.A. Science Degree Course	III & IV
[4]	B.Sc. Animation Degree Course	III & IV
[5]	B.Sc. Bioinformatics Degree Course	III & IV
[6]	B.Sc. Computer Science [Optional]	III & IV
[7]	B.Sc. Information Technology [Optional]	III & IV
[8]	B.Sc. Computer Applications [Optional]	III & IV
[9]	B.Sc. Computer Maintenance [Optional]	III & IV
[10]	B.Sc. Environmental Science [Optional]	V & VI
[11]	B.Sc. Bio-Chemistry [Optional]	V & VI
[12]	B.Sc. Forensic Science Degree Course	V & VI
[13]	B.Sc. Industrial Chemistry [Optional]	V & VI
[14]	B.Sc. Electronics [Optional]	V & VI
[15]	B.Sc. Zoology [Optional]	V & VI
[16]	B.Sc. Microbiology [Optional]	V & VI
[17]	B.Sc. Instrumentation Practice [Optional]	V & VI
[18]	B.Sc. Statistics [Optional]	V & VI
[19]	B.A. Statistics [Optional]	V & VI
[20]	B.A. / B.Sc. Mathematics [Optional]	V & VI
[21]	B.Sc. Home Science Degree Course	V & VI
[22]	B.Sc. Textile Interior Decoration Degree Course	V & VI
[23]	B.Sc. Fishery Science [Optional]	V & VI
[24]	B.Sc. Dairy Science & Technology [Optional]	V & VI
[25]	B.Sc. Botany [Optional]	V & VI
[26]	B.Sc. Physics [Optional]	V & VI
[27]	M.Sc. Computer Science	III & IV
[28]	M.Sc. I.T.	III & IV

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

All concerned are requested to note the contents of the circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/3761-4160
Date:- 16-06-2015.

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Director,
Board of College and University Development.

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Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [M.Sc. Unit],
5] The Programmer [Computer Unit-1] Examinations,
6] The Programmer [Computer Unit-2] Examinations,
7] The Record Keeper.

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S*/-160615/-

Dr. Babasaheb Ambedkar Marathwada University,

Aurangabad

PHYSICS SYLLABUS

B. Sc. III Year

Semester V & VI

Effective from academic year 2015-16

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B. Sc. IIIrd year Physics Syllabus

(Semester-V and VI)

Revised syllabus from June 2015

Semester	Course Code	Paper	Title of Paper	Periods	Marks
V	301	XV	Classical & Quantum Mechanics	45	50
V	302	XVI	Electrodynamics	45	50
V	303	XVII	Practical	45	50
V	304	XVIII	Practical	45	50
VI	305	XIX	Atomic, Molecular Physics & Laser	45	50
VI	306	XX	Non-conventional energy sources and Optical fiber	45	50
VI	307	XXI	Practical	45	50
VI	308	XXII	Practical	45	50

Scheme of practical examination and marks

Practical examination will be conducted annually

Practical : paper XVII+XVIII based on theory paper XV & XVI (50+50= 100 Marks)

Practical : paper XXI + XXII based on theory paper XIX & XX (50+50= 100 Marks)

Experiment : Paper XVII+XVIII – Experiment 75 marks + Viva-Voce 15 Marks + Record

Book/Journals 10 Marks + = 100 Marks

Experiment : Paper XXI + XXII - Experiment 70 marks + Viva-Voce 10 Marks + Record

Book/Journals 10 Marks + Submission of project report 10 Marks = 100 Marks

B.Sc. IIIrd year Physics (Semester-V)

Classical and Quantum Mechanics

Course code PHY-301

Paper-XV

Period-45 **Marks-50**

Chapter 1. Classical Mechanics **[11]**

Mechanics of Particle, Mechanics of system of particles Constraints, Classification of Constraints, Virtual Work, D'Alembert's principle, Lagrange's equation, Simple application of Lagrangian formulation –Simple Pendulum, Particle in space, Linear Harmonic Oscillator, Atwood's Machine .

Chapter 2. Origin of Quantum theory **[12]**

Introduction, Failure of Classical mechanics, Black body Radiation (Distribution of Energy), Plank's Quantum theory-Plank's Quantum postulates, linear momentum of photon in terms of wave vector, Plank's radiation law-Wein's law and Rayleigh's law, Einstein's equation: Quantum theory of photoelectric effect, Quantum effect.

Chapter 3. Wave Particle duality **[12]**

Introduction, de-Broglie's hypothesis for matter waves, de-Broglie's wavelength in terms of energy and temperature, de-Broglie phase velocity and particle velocity (relation between them), Group velocity, Relation between group velocity and phase velocity, Davisson-Germer Experiment, Heisenberg uncertainty principle, Applications of Heisenberg uncertainty principle (1) Nonexistence of electrons in nucleus (2) Binding energy of an electron in an atom.

Chapter 3. The Schrodinger Equation and its applications **[10]**

Wave Function (Ψ) of a moving particle, Time dependent Schrodinger's wave equation, Expectation value, Operators, Time independent Schrodinger equation (steady state form), particle in one dimensional box, Quantization of energy and momentum.

Reference Books

1) Classical Mechanics- H- Goldstein
2) Classical Mechanics – N.C. Rana and P.S. Joag
3) Classical Mechanics – Gupta, Kumar and Sharma
4) Introduction of Classical Mechanics – R.G. Takwale& P.S. Puranik.
5) Physics for degree student – C.L. Arora, P.S. Hemne (Ist edition S. Chand Publication).
6) Quantum Chemistry- Donald Allan Macquarie (Viva-Books Pvt. Ltd.).
7) Mathematics for Chemistry- Donald Allan Macquarie (Viva Books Pvt. Ltd.).
8) Concepts of Modern Physics - Arthur Beiser, ShobhitMahajan, S. RaiChoudhary (VIth Edition- Mc- Graw Hill).
9) Perspective of Modern Physics – Arthur Beiser.

B.Sc. IIIrd year Physics (Semester-V)

Electrodynamics

Course code PHY-302

Paper-XVI

Period-45 **Marks-50**

Chapter 1. Electrostatics **[12]**

Introduction : Electric field lines , electric flux and Gauss law, the divergence of E, Curl of E, Application of Gauss law: i) Electric field due to a uniform charged sphere ii) Electric field due to charged cylinder, Gaussian pillbox, Poisson's equation, Laplace's equation, Uniqueness theorem (First and Second)

Chapter 2. Time varying field [10]

Faraday's Law of Electromagnetic induction, Lenz's law, Self-Induction, Mutual Induction, equation of continuity, Maxwell's displacement current, Maxwell's equation (Derivation, Differential form)

Chapter 3. Electromagnetic waves III [15]

Origin of electromagnetic waves, characteristics of electromagnetic wave, electromagnetic wave equations in a conducting medium, transverse nature of electromagnetic wave, plane polarized electromagnetic wave, The Poynting Vector, Poynting theorem, Polarization of Electromagnetic waves

Chapter 4. Interaction of Electromagnetic waves with matter [08]

Boundary condition for the electromagnetic field vector –**B,E,D and H** at the interface between the two media, reflection and refraction at the boundary of two

non conducting media.

Reference Books:

1. Introduction to Electrodynamics-David J. Griffiths, Third Edition.
2. Mechanics and Electrodynamics - Brijlal N. Subrahmanyam, JivanSeshan
3. Classical Electrodynamics – S.P. Pure
4. Electrodynamics- B.B. Laud
5. Electrodynamics-Gupta, Kumar and Singh, Pragati Prakashan, Meerut
6. Electromagnetic waves and fields –R.N.Singh

B.Sc. IIIrd year Physics (Semester-V)

Practical

Course code PHY-303

Paper-XXI

Period-45 Marks-50

List of experiments

1. Measurement of the focal length of a given convex lens using laser
2. Spectral response of photoconductor (LDR)
3. Diffraction of grating using laser beam
4. e by Millikan's oil drop method
5. Study of thermocouple (Fe-Cu) and to find inversion temperature
6. Refractive Index R.I. of Optical fiber
7. constant of B.G. by standard condenser method
8. study of absorption spectra of iodine and determination of its wavelength using grating

Note :- At least Six experiments should be performed.

B.Sc. IIIrd year Physics (Semester-V)

Practical

Course code PHY-304

Paper-XXII

Marks-50

List of experiments

1. Beam divergence of a diode laser

2. Determination of the diameter of a thin wire using laser
3. To study the interference of light using optical fibers
4. Determination of wavelength of He-Ne laser by transmission grating and reflection grating
5. Y by Koenig's method
6. Edser's A pattern
7. e/m by Thomson methods by Excel
8. Surface tension by Ripple's method

Note :- At least Six experiments should be performed.

B.Sc. IIIrd year Physics (Semester-VI)

Atomic, Molecular Physics and LASER

Course code PHY-305

Paper-XIX

Period-45 **Marks-50**

Chapter 1. The Atom model [10]

Introduction, Thomson atom model, the Rutherford nuclear atom model, drawbacks of Rutherford atomic model, the Bohr's atom model, Bohr's theory of origin of spectral lines, diagrammatic representation of the series spectrum of the H-atom in the light of Bohr's theory.

Chapter 2. Vector Atom Model [15]

Introduction-vector atom model, Quantum numbers associated with the vector atom model, L-S coupling, j-j coupling, The Pauli's exclusion principle, Selection rules, Intensity Rules, Interval Rule, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect and its experimental study.

Chapter 3. Molecular spectra [15]

Introduction, origin of pure rotational spectrum of a molecule, origin of vibration-rotation spectrum of a molecule, Rayleigh's law of scattering, Raman effect-Discovery, experimental study, Applications of Raman effect-molecular structure, Nature of liquids, Crystal Physics, Nuclear Physics, Chemical effects.

Chapter 4. LASER [10]

Introduction, induced absorption, spontaneous emission, stimulated emission, population inversion, properties of laser beam, laser pumping, Types of laser-Ruby laser, He-Ne laser, carbon dioxide (CO_2) laser, Applications of laser-Biological, medical and industrial.

Reference Books

1. Atomic Physics – J.B. Rajam, S. Chand & Company Ltd.
2. Physics for degree students – C.L. Arora, Dr. P.S. Hemne, S. Chand Publication
3. Modern Physics – R. Murugeshan, Er. KiruthigaSivaprasath, S. Chand Publication
4. Introduction of Atomic Spectra-white.
5. Fundamentals of Molecular Spectroscopy- C.N. Banwell and E.M. McCash (McGraw Hill International Edition)

B.Sc. IIIrd year Physics (Semester-VI)

Non-conventional energy sources and Optical fiber

Course code PHY-306

Paper-XX

Period-45 Marks-50

Chapter1. Non-conventional energy sources (12)

Introduction, Biomass, wind energy, tidal energy/Ocean energy, geothermal energy, biogas hydro energy, wind energy, solar energy

Biogas plant-fixed dome type

Wind energy: Introduction to wind energy, terms and definition: wind, wind farm, wind turbine, vertical axis wind turbine (VAWT), horizontal axis wind turbine (HAWT), propeller (wheel), wind mill,types of wind turbines generator units, monoblade HAWT, twin blade HAWT, merits and limitation of wind energy.

Chapter 2. Solar Photovoltaic Systems: (10)

Introduction to photovoltaic systems, Solar Cell fundamentals: i) Semiconductor, ii) P-N junction, iii) Generation of electron-hole pair by photon absorption, iv) I_V characteristics of solar cell

Electrical storage: Lead acid battery, basic battery theory

Chapter 3. Introduction of optical fiber (10)

Introduction, importance of optical fiber, classification of optical fiber-stepped index fiber, stepped index monomode fiber, Disadvantages of monomode fiber, plastic fiber, latest developed types of optical fibers-HPSUV; HPSIR; Halide; Tapered.

Chapter4. Fiber cables and fabrication (13)

Fiber fabrication: Classification of fiber fabrication techniques; external chemical vapour deposition (external CVD), axial vapour deposition (AVD), internal chemical vapour deposition (internal CVD)

Fiber Cables: Construction, Strength members, cable tensile loading, minimum bend radius losses incurred during installation of cables or during subscriber service testing of cable, selection criteria, optical cable fiber laying in telephone.

References:

1) Optoelectronics; R. A. Barapate (Tech-Max Publication, Pune)

2) Principles of Solar Cells, LEDs and Diodes: The role of the PN junction; ADRIAN KITAI (2011 John Wiley & Sons, Ltd)

3) Light Sources: Technologies and Applications; Spiros Kitsinelis (CRC Press Taylo & Francis Group, FL 33487-2742) - 2011

4) Energy technology (non-conventional, renewable, and conventional) - S. Rao, Dr. B.B. Parulekar, Khanna Publishers.

5) Non-conventional energy resources- B.H. Khan, G.D. Rai, R.P. Khare, IInd edition, McGraw Hill Education (India) Private Limited, New Delhi.

6) Non-conventional Energy Sources- G.D. Rai, Khanna Publisher

7) Solar energy and Rural development- S.H. Pawar, C.D. Lokhande& R.N. Patil

8) Solar energy, Fundamentals and applications- Garg, Prakash Tata McGraw Hill

9) Fiber Optics and Optoelectronics – R.P. Khare, Oxford University Press.

B.Sc. IIIrd year Physics (Semester-VI)

Practical

Course code PHY-307

Paper-XVII

Marks-50

List of experiments

1. Thermal conductivity by Forb's method
2. Rydberg constant
3. B-H curve using magnetometer
4. Determination of Debye's temperature (e.g. Tin)
5. Determination of dielectric constant of liquid/solid
6. Resistance measurement of semiconductor by Vaders Pau's method
7. I-H Curve by Excel
8. Rydberg constant Excel

Note:- At least Six experiments should be performed.

Practical

Course code PHY-308

Paper-XVIII

Marks-50

List of experiments

1. Temperature coefficient of resistance of semiconductor
2. Measurement of thickness of thin film by gravimeter/optical/electrical method
3. Temperature of sodium flame
4. Hartmann's dispersion formula
5. Maxwell's bridge (measurement of inductance using impedance at different frequency)
6. λ by grating (normal incidence)
7. Transistorized Regulated power supply using Zener diode.
8. Bridge Rectifier

Note:- At least Six experiments should be performed.

Compulsory Activities

Organize a visit / study tour to Thermoelectric / Hydroelectric Power station, Wind mill, Solar farm and submit project report along with a photograph during the final practical examination.

OR

Organize study tour to industry / Research centre and submit a report at the time of final practical examination.

QUESTION PAPER PATTERN

B.Sc.F.Y.(I & II Semester)

PHYSICS

Time : 2.30 Hours **Max.Marks :50**

Note:-1.All questions carry equal marks

2.Use of logarithmic table and electronic pocket calculator is allowed.

Q.1.Chapt. I (Long question) 10 Marks

OR

Chapt.II (Long question)

Q.2.Chapt.III (Long question) 10 Marks

OR

Chapt.IV (Long question)

Q.3. a)Chapt. I (Short question) 10 Marks

b)Chapt.II(Short question)

OR

a)Chapt.III (Short question)

b)Chapt.IV (Short question)

Q.4.Attempt any two 10 Marks

a)Chapter I Problem

b)Chapter II Problem

c)Chapter III problem

d)Chapter IV oproblem

Q.5. MCQ 10 Marks

Ten MCQ's having four alternatives based on theory and numerical (Minimum two MCQ's from each chapter)