Shiksha Mandal's

Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. I (SEM-I) w.e.f. 2023-24

PHYSICS DSC I: MECHANICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Course Description:

PHYSICS DSC 1: MECHANICS is designed for students of undergraduate course. This course will be of 60 hours theory and 60 hours practical. 4 credits are allotted to the theory course whereas 2 credits are allotted for practical.

Course Objective:

Basics of Astronomy course will facilitate undergraduate students:

- To know vectors and scalars and their fundamentals.
- To study Newtonian motions.
- To study conservation of momentum and energy.
- To study rotational motion
- To study gravitational Force.
- To study Simple harmonic motions.
- To study free, damped and forces Oscillations.
- To study elasticity and its applications.
- To calculate elastic modulus.
- To calculate g, spring constant and frequency

Course Learning Outcome:

Upon completion of course student will be able to:

- CO1: Identify vectors and scalars.
- CO2: Relate Newtonian motions with day-to-day physics.
- CO3: Understand conservation of momentum and energy in daily life.
- CO4: Define and employ rotational motion.
- CO5: Recognize Simple harmonic motions.
- CO6: Memorize elasticity and its applications.
- CO7: Perform accurate measurement using vernier calliper and screw gauge.
- CO8: Use various methods to calculate elastic modulus.
- CO9: Compute g, spring constant and frequency
- CO10: Solve problems related with viscosity and surface tension.

Course Contents (Theory)

Unit I

Laws of Motion: Vector algebra. Scalar and vector products, Velocity and Acceleration, Inertia, Contact Forces, Friction, Newton's laws of motion, impulse, Coriolis forces, its consequences and applications, Motion in a plane, Dynamics of a system of particles, Centre of Mass and its applications. **(10 Lectures)**

Unit II

Momentum and Energy: Conservation of momentum, Work and energy, Conservation of energy. Elastic and inelastic collision, Angular velocity and angular momentum. Torque. Conservation of angular momentum, single stage and multistage rockets. **(10 Lectures)**

Unit III

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). **(10 Lectures)**

Unit IV

Oscillations: Introduction to linear and angular S.H.M., Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Composition of two perpendicular linear SHMs for 1:1 and 1:2 (without mathematical derivation), Lissajous's figure, Formation of Lissajous's figure using CRO, applications of Lissajous's figure, Free Damped and Forced oscillation. **(10 Lectures)**

Unit V

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion – Torsional Pendulum-Determination of Rigidity modulus and moment of inertia - q, η and σ by Searles method. Bending of beam, Bending moment, Internal and external bending moment, Cantilever, Maxwell's needle. **(10 Lectures)**

Unit VI

Fluids: Introduction, Streamline and turbulent flow, Equation of continuity, Bernoulli's theorem and its applications, Poiseuille's Law, Reynold's number, Terminal, Velocity, Stoke's law, Variation of viscosity with temperature, Introduction of Surface Tension, Angle of contact and wetting, Surface energy, Surface tension by Quincke's and Capillary rise methods, Modern applications of Viscosity and Surface Tension: Hydrophobic surfaces, Fluid Merging Viscosity Measurement. **(10 Lectures)**

Reference Books:

- University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison-Wesley
- Mechanics Berkeley Physics course, v.1: Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
- Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
- Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- Concepts of Physics: H.C. Verma, Bharati Bhavan Publishers.
- Mechanics: D.S. Mathur, S. Chand and Company.
- Physics for Degree Students, C.L. Arora, P.S. Hemne, S Chand Publication.
- Problems in Physics: P.K. Srivastava, Wiley Eastern Ltd.
- Mechanics, by-B. M. Roy, Das Ganu Publications.
- Applied Fluid Mechanics: Mott Robert, Pearson Benjamin Cummir, VIth Edition. Pearson Education /Prentice Hall International, New Delhi.
- Waves and Oscillations, by Stephenson.
- A Text Book of Oscillations, waves and Acoustics, by Dr. M. Ghosh, Dr. D. Bhattacharya.
- Oscillation, waves and sound, by Sharma and Saxena.

PHYSICS DSC 1 LAB: MECHANICS
60 Lectures

1. Measurements of length (or diameter) using vernier calliper, screw gauge and travelling microscope.
2. To determine the Modulus of rigidity (η) of a Wire by Maxwell's needle.
3. To calculate moment of inertia of ring using torsional pendulum.
4. To determine the Modulus of rigidity (η) by statical method.
5. To determine the Modulus of rigidity (η) by tortional pendulum
6. To calculate the acceleration due to gravity by Simple pendulum.
7. To calculate the acceleration due to gravity by compound pendulum.
8. To study the Lissajous's figure.
9. To determine the Young's Modulus (Y) by bending of beam.
10. To determine the Young's Modulus (Y) by cantilever.
11. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g.
12. To determine the surface tension (T) of the liquid by Fergusson method.
13. To determine the surface tension (T) by capillary rise method.
14. To determine the coefficient of viscosity (η) by using Poiseuille's method.

Reference Books:

- Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
- Engineering Practical Physics, S.Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.
- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Shiksha Mandal's

Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. I (SEM-I) w.e.f. 2023-24

PHYSICS MINOR 1: MECHANICS

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Course Description:

PHYSICS MINOR 1: MECHANICS is designed for students of undergraduate course. This course will be of 60 hours theory and 60 hours practical. 4 credits are allotted to the theory course whereas 2 credits are allotted for practical.

Course Objective:

Basics of Astronomy course will facilitate undergraduate students:

- To know vectors and scalars and their fundamentals.
- To study Newtonian motions.
- To study conservation of momentum and energy.
- To study rotational motion
- To study gravitational Force.
- To study Simple harmonic motions.
- To study free, damped and forces Oscillations.
- To study elasticity and its applications.
- To calculate elastic modulus.
- To calculate g, spring constant and frequency

Course Learning Outcome:

Upon completion of course student will be able to:

- CO1: Identify vectors and scalars.
- CO2: Relate Newtonian motions with day-to-day physics.
- CO3: Understand conservation of momentum and energy in daily life.
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Course Contents (Theory)

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Laws of Motion: Vector algebra. Scalar and vector products, Velocity and Acceleration, Inertia, Contact Forces, Friction, Newton's laws of motion, impulse, Coriolis forces, its consequences and applications, Motion in a plane, Dynamics of a system of particles, Centre of Mass and its applications. **(10 Lectures)**

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Momentum and Energy: Conservation of momentum, Work and energy, Conservation of energy. Elastic and inelastic collision, Angular velocity and angular momentum. Torque. Conservation of angular momentum, single stage and multistage rockets. **(10 Lectures)**

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Unit V

Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion – Torsional Pendulum-Determination of Rigidity modulus and moment of inertia - q, η and σ by Searles method. Bending of beam, Bending moment, Internal and external bending moment, Cantilever, Maxwell's needle. **(10 Lectures)**

Unit VI

Fluids: Introduction, Streamline and turbulent flow, Equation of continuity, Bernoulli's theorem and its applications, Poiseuille's Law, Reynold's number, Terminal, Velocity, Stoke's law, Variation of viscosity with temperature, Introduction of Surface Tension, Angle of contact and wetting, Surface energy, Surface tension by Quincke's and Capillary rise methods, Modern applications of Viscosity and Surface Tension: Hydrophobic surfaces, Fluid Merging Viscosity Measurement. **(10 Lectures)**

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PHYSICS MINOR 1 LAB: MECHANICS
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8. To study the Lissajous's figure.
9. To determine the Young's Modulus (Y) by bending of beam.
10. To determine the Young's Modulus (Y) by cantilever.
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- A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Shiksha Mandal's

Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. I (SEM-I) w.e.f. 2023-24

Generic Elective (GE-I)

Course Name: BASIC PHYSICS: CONCEPTS AND APPLICATIONS

(Credits: Theory-02)

Theory: 30 Lectures

Course Description: This generic elective course is designed for undergraduate students. It deals with basic understanding about the physical parameters, basic calculations and various phenomenon and applications in daily life that can be explained on the basis of concepts in Physics.

Course Objectives: The objectives of this course are to enable the student to :

1. Learn the basic concepts in Physics.
2. Perform the basic calculations and estimate the errors.
3. Understand the Physics behind various phenomenon occurring in nature.
4. familiarize with application of Physics in day to day life.
5. learn about commonly used electrical components and instruments in Physics.

Course Learning Outcomes (COs): Upon completion of this course students will be able to:

- **CO1.** Develop an understanding about Physical parameters in Physics and their units of measurement.
- **CO2.** Analyze a problem, perform mathematical calculation, estimate the error and do some statistical calculations.
- **CO3.** Develop the skills to handle the basic instruments.
- **CO4.** Understand the Physics concept behind various naturally occurring phenomenon, commonly used components, apparatus and meters in Laboratory.
- **CO5.** Learn about certain human body parameters and applications of Physics in daily life.

Course Content: (30 Lectures)

Unit I [10 Lectures]

Physical parameters, their SI and CGS units and inter conversation, type of errors, absolute, mean absolute, relative and percentage errors, Error due to addition, subtraction, multiplication and division, Statistical analysis: Mean , Median, Geometric Mean, Standard Deviation.

Resistance, Capacitance (in series & parallel), Inductance, Transformer, Semiconductor: intrinsic and extrinsic , Diode, Transistor, Galvanometers, Voltmeters, ammeter, multimeter ,Cathode Ray Oscilloscope.

Unit II [10 Lectures]

Force: Pressure, centripetal and centrifugal force, Torque , couples, Friction: causes of friction, Advantage & disadvantage , Reducing friction, Elasticity : Stress , Strain , Hook's law , Modulus of elasticity , Behaviour of metal wire with load, Applications of Elasticity, Fluids : Archimedes Principle, variation of pressure, Mercury Barometer, Bernoulli's principle and its application , velocity of efflux, Blood pressure , Surface tension Examples in daily life, Capillarity and its examples, Viscosity and its applications.

Unit III [10 Lectures]

Heat: Concept of temperature, Different scales of temperature and relation between them. Mercury thermometers, Examples of thermal expansion in daily life, heat energy, conduction, convection, Radiation, Clausius Clapeyron equation.

Optics : Nature of light , Electromagnetic spectrum, Snell's law , Interference, refraction, diffraction, Total internal Reflection and its Consequences, , some natural Phenomena's of light : Rainbow, scattering etc, Refraction by lens, Combination of lens, power of eye lens human eye, its defects and corrections.

Laboratory Sessions:

1. Estimation of error and percentage error in given calculation.
2. Statistical analysis of given data.
3. Identification of components and determination of their values.
4. Applications of multimeter.
5. Applications of CRO.

References:

1. A Textbook of Electrical Technology – B L Theraja (S Chand & Co.)
2. Enjoyable Physics Volume-1 Neil Chatterjee, Macmillan Publishers India Ltd.
3. Concepts of Physics, Part-1, H C Verma, Bharati Bhawan Publishers.
4. Concepts of Physics, Part-2, H C Verma, Bharati Bhawan Publishers.

Note: Mode of evaluation:

Continuous Internal Assessment (No end semester examination)(Poster presentation / Project/ Presentation/ Assignment/ quiz)

Total Mark: 100

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Bajaj College of Science, Wardha

Department of Physics

Vocational Skill Enhancement Course-VSC-I (w.e.f 2023-24)

B.Sc. Sem I

Course Title: Laboratory Training in Physics

Course Overview: This course is designed to provide undergraduate students with the skills and knowledge necessary to work as laboratory facilitators in the field of physics. Students will learn how to perform experiments, collect data, and analyze results in a physics laboratory setting.

Course Credits: 2

Course Duration: 60 hours

Course Objectives:

Couse has the main objective to provide the skills and knowledge necessary to work as laboratory technicians in the field of physics, including academic research labs and industrial labs.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to:

CO1: Demonstrate knowledge of laboratory safety procedures specific to physics laboratory settings, including the proper handling and disposal of hazardous materials.

CO2: Use laboratory equipment and tools correctly and safely.

CO3: Perform basic laboratory procedures such as calibration, measurement, and error analysis with accuracy and precision.

CO4: Collect data using appropriate methods and techniques used in physics experiments, and analyze data using statistical software commonly used in physics research.

CO5: Present data using graphs and charts specific to physics experiments, and communicate findings effectively both orally and in writing.

CO6: Manage laboratory inventory and supplies specific to physics experiments, and maintain accurate records of laboratory activities.

Course Contents:

Unit I: Introduction to Physics Laboratory Techniques

- Overview of laboratory safety procedures and records specific to physics.
- Introduction to laboratory equipment and tools used in physics experiments.
- Basic laboratory calculations and measurements used in physics experiments.

(20 hours)

Unit II: Laboratory Skills and Techniques in Physics

- Laboratory equipment and its uses in physics experiments.
- Basic laboratory procedures, including calibration, measurement, and error analysis.
- Introduction to microscopy and spectroscopy techniques used in physics experiments.

(20 hours)

Unit III: Data Collection and Analysis in Physics

- Introduction to data collection methods and techniques used in physics experiments.
- Data analysis using open access software.
- Presentation of data using graphs and charts specific to physics experiments.

(20 hours)

Practicals/activities that can be conducted for the mentioned topics:

1. Safety Procedures Demonstration: Conduct a demonstration on laboratory safety procedures specific to physics experiments, including handling of equipment.

2. Equipment Familiarization: Provide hands-on experience with various laboratory equipment and tools used in physics experiments, such as oscilloscopes, multimeters, and vernier calipers.

3. Measurement Practice: Engage students in basic laboratory calculations and measurements, emphasizing the use of units, significant figures, and measurement uncertainties by using a physical pendulum.

5. Calibration and Error Analysis: Conduct practical exercises on equipment calibration, measurement techniques, and error analysis to familiarize students with the importance of precision in experimental work using simple pendulum experiment.

6. Microscopy and Spectroscopy: Introducing microscopy and spectroscopy techniques, allowing students to observe and analyze spectrum using microscopes and spectrometers.

7. Data Collection Methods: Engage students in hands-on data collection methods, including experiments involving motion, and demonstrate the use of mobile phone sensors and data loggers.

8. Data Analysis Software Tutorial: Provide training on open access software for data analysis, such as Excel, focusing on statistical analysis and visualization of experimental data.

9. Graphical Data Presentation: Task students with presenting experimental data using graphs and charts specific to physics experiments, emphasizing the selection of appropriate graph types for different data sets.

10. Experiment Design and Analysis: Encourage students to design and conduct their own physics experiments, collect data, analyze results, and present their findings, promoting independent inquiry and critical thinking skills through making of pin hole camera.

Reference Books:

1. Experimental Physics: A Manual for the Laboratory by A.K. Ghatak and S. Lokanathan.
2. Laboratory Techniques in Physics and Electronics by R. K. Shukla.
3. Laboratory Management: A Comprehensive Guide to Best Practices and Tools by Sunita Singh and Ramesh C. Gupta.
4. Personnel Management in the Laboratory by J.K. Sharma.
5. Introduction to Experimental Physics by Colin Cooke.

Note: Mode of evaluation:
End Semester Exam + Continuous Internal Assessment (Poster presentation / Project/ Presentation/ Assignment/ quiz)
Total Mark: 50

Shiksha Mandal's

Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. I (SEM-II) w.e.f. 2023-24

PHYSICS DSC-II: ELECTRICITY AND MAGNETISM

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Course Description:

This course can be taken by undergraduate students as a major course to understand the basic concepts of electricity and magnetism The course covers vector calculus, electrostatics, magnetostatics, electromagnetic induction and an introduction to Maxwell's equations (including wave solutions) as well as electric and magnetic fields in matter.

Learning Objectives:

This course aims to introduce students to the fundamental mathematical concepts related to vector calculus and their applications in the field of electrostatics. Through this course, students will gain an understanding of the concepts of magnetostatics and magnetic properties, as well as the principles of electromagnetic induction. Additionally, students will learn about the generation of electromagnetic waves and the principles of electrodynamics. By the end of this course, students will have a solid foundation in these key concepts and be well-equipped to apply them for solving problems.

Course Learning Outcomes (COs):

Upon completion students will be able to:

CO1: Understand the basic mathematical concepts related to electromagnetic vector fields.

CO2: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.

CO3: Apply the principles of magnetostatics to the solutions of problems relating to Magnetic field density.

CO4: Understand the difference between magnetic materials from magnetic properties.

CO5: Understand the concepts related to Faraday‘s law and induction concepts for its applications in transformer to seek employment.

CO6: Apply Maxwell‘s equations to solutions of problems relating to wave propagation.

Course Contents (Theory)

Unit I

Vector Calculus: Scalar and Vector product, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors.

(10 Lectures)

Unit II

Electrostatics I: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential.

(10 Lectures)

Unit III

Electrostatics II: Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor filled with dielectric.

(10 Lectures)

Unit IV

Magnetic properties and Magnetostatics:

Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials. Lorentz force, Force on a current carrying conductor in a magnetic field. Biot-Savart's law & its applications- straight conductor, circular coil. Ampere's circuital law and its applications- straight conductor, solenoid and toroid carrying current.

(10 Lectures)

Unit V

Electromagnetic Induction

Faraday's laws of electromagnetic induction, Lenz's law, self and mutual induction, Measurement of self and mutual inductance. Energy stored in magnetic field. Transformer (types, theory, characteristics, applications, losses)

(10 Lectures)

Unit VI

Electrodynamics:

Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves.

(10 Lectures)

Reference Books:

- D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn.1998, Benjamin Cummings.
- Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
- Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.

PHYSICS DSC- II LAB: ELECTRICITY AND MAGNETISM (Credits 02)

1. To study the magnetic field on the axis of current carrying circular coil.
2. To calculate the magnetic field on the axis of solenoid.
3. To calculate the magnetic susceptibility of paramagnetic materials.
4. To study the variation of magnetic field of a magnet as a function of distance.
5. To calculate the dielectric constant.
6. To calculate the self-inductance of the coil.
7. To study the characteristics of transformer.
8. To calculate the capacitance of the capacitor.
9. To study the various relationships of capacitance of capacitor using pHET simulations.
10. To calculate the magnetic moment of a bar magnet using vibration magnetometer.

Activities:

1. To use multimeter and CRO for measuring (a) Resistances, (b) ac and dc voltages, (c) dc current.
2. Fabrication of inductor and measurement of its inductance.

(60 Lectures)

Reference Books

- Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
- A textbook of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

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Syllabus for B. Sc. I (SEM-II) w.e.f. 2023-24

PHYSICS MINOR 2: ELECTRICITY AND MAGNETISM

(Credits: Theory-04, Practicals-02)

Theory: 60 Lectures

Course Description:

This course can be taken by undergraduate students as a major course to understand the basic concepts of electricity and magnetism The course covers vector calculus, electrostatics, magnetostatics, electromagnetic induction and an introduction to Maxwell's equations (including wave solutions) as well as electric and magnetic fields in matter.

Learning Objectives:

This course aims to introduce students to the fundamental mathematical concepts related to vector calculus and their applications in the field of electrostatics. Through this course, students will gain an understanding of the concepts of magnetostatics and magnetic properties, as well as the principles of electromagnetic induction. Additionally, students will learn about the generation of electromagnetic waves and the principles of electrodynamics. By the end of this course, students will have a solid foundation in these key concepts and be well-equipped to apply them for solving problems.

Course Learning Outcomes (COs):

Upon completion students will be able to:

CO1: Understand the basic mathematical concepts related to electromagnetic vector fields.

CO2: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.

CO3: Apply the principles of magnetostatics to the solutions of problems relating to Magnetic field density.

CO4: Understand the difference between magnetic materials from magnetic properties.

CO5: Understand the concepts related to Faraday‘s law and induction concepts for its applications in transformer to seek employment.

CO6: Apply Maxwell‘s equations to solutions of problems relating to wave propagation.

Course Contents (Theory)

Unit I

Vector Calculus: Scalar and Vector product, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors.

(10 Lectures)

Unit II

Electrostatics I: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential.

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Unit III

Electrostatics II: Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor filled with dielectric.

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Magnetic properties and Magnetostatics:

Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials. Lorentz force, Force on a current carrying conductor in a magnetic field. Biot-Savart's law & its applications- straight conductor, circular coil. Ampere's circuital law and its applications- straight conductor, solenoid and toroid carrying current.

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Unit V

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Faraday's laws of electromagnetic induction, Lenz's law, self and mutual induction, Measurement of self and mutual inductance. Energy stored in magnetic field. Transformer (types, theory, characteristics, applications, losses)

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Unit VI

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Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves.

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1. To study the magnetic field on the axis of current carrying circular coil.
2. To calculate the magnetic field on the axis of solenoid.
3. To calculate the magnetic susceptibility of paramagnetic materials.
4. To study the variation of magnetic field of a magnet as a function of distance.
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9. To study the various relationships of capacitance of capacitor using pHET simulations.
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Bajaj College of Science, Wardha (Autonomous)

Proposed Syllabus for Four Year Multidisciplinary UG Program with DSC as Major (e.g. Four Year B.Sc. Honors/Research Program)

Program: B.Sc.
(Academic Session 2023-24)
Syllabus

SKILL ENHANCEMENT COURSE (SEC)

Semester II courses in
Physics
Syllabus under Autonomy

Shiksha Mandal's

Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. I (SEM-II) w.e.f. 2023-24

Skill Enhancement Course (SEC-I)

Course: ELECTRICAL CIRCUITS AND NETWORK SKILLS

(Only Practical Component)

(Credits: 02) (60 Hours)

Lab (Credit: 02) **60 Hrs**

Course description:

The course is designed for the students of science faculty who choose Physics as major in their B.Sc. Programme. The course comprises of basic electrical skills to be acquired by undergraduate students.

Course Objectives:

The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode.

Course learning outcomes: Upon completion of this course students will

CO1: Learn to understand basics of electrical wiring and use of electrical protection devices.

CO2: Acquire necessary skills/hands on experience/working knowledge of electrical equipment like Generators, motors, multi meters, voltmeters, ammeters, electric circuit elements.

CO3: Understand various types of DC and AC circuits and making electrical drawings with symbols for various systems.

CO4: Get the knowledge of various components of electrical circuits and networks.

Syllabus

Unit-I

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

Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources.

Unit-II

Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyse DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Rules to analyse AC sourced electrical circuits. Power factor. Saving energy and money.

Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating.

Unit-III

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electrical Drawing and Symbols: Drawing symbols. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop.

Practical (02 Credit)

1. Verification of Ohm's law.
2. Study of transformer.
3. Study of I-V character of diode.
4. Characteristics of Zener diode
5. Study of full wave and half wave rectifiers using CRO.
6. Measurement of current and voltage in electrical networks.
7. Estimation of power consumption and electric bill.
8. Time constant of RC circuit.
9. Capacitive reactance measurement.
10. Determination of inductance using LC circuit.
11. Measurement of average and RMS values of electrical signals.

Reference Books:

- A text book in Electrical Technology - B L Theraja - S Chand & Co.
- A text book of Electrical Technology - A K Theraja - S Chand & Co.
- Principles of Electronics- V. K. Mehta, Rohit Mehta- S Chand & Co.
- Basics of electronics-Solid State, B. L. Thereja- S Chand & Co.

Note: Mode of evaluation:

- **Continuous Internal Assessment (No end semester examination)(Poster presentation / Project/ Presentation/ Assignment/ quiz)**
- **Total Mark: 50**