Annexure 2-A

PARISHKAR COLLEGE OF GLOBAL EXCELLENCE (AUTONOMOUS)

SCHEME OF EXAMINATION COURSE STRUCTURE & SYLLABUS

AS PER UGC

ज्ञान-विज्ञान विमुक्तये

CHOICE BASED CREDIT SYSTEM (CBCS)

WITH

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK

FOR

B.Sc. COURSE

(PHYSICS, CHEMISTRY, MATHEMATICS)

(2022)

Department Overview

The Department aims at developing young talent for the Physical industry and academia. The curriculum is developed by highly Qualified faculty of **Parishkar** in such a way that the students are able to venture into allied fields also. The aim of the department through the programmes is to provide "a cut above" man-power to the ever growing demands of the industry and to prepare students for higher studies and research devoted to society. The interactive method of teaching at **Parishkar College of Global Excellence** is to bring about attitudinal changes to future professionals of the industry with an edge of creativity.

Equal importance is given to practical and theoretical aspects apart from experiential and digital modes of learning. Industrial projects form an integral part of the curriculum. Along with the syllabus, the **Parishkar College of Global Excellence** emphasizes on Value Addition Programs like Holistic Education, open elective programmes and Placement Training Programs, which include training students in group discussions, facing interviews and so on.

Programme Outcomes

On successful completions of the B.Sc. Programme students will be able to

- Understand and apply the fundamental principles, concepts and methods in key areas of science and multidisciplinary fields
- Demonstrate problem solving, analytical and logical skills to provide solutions for the scientific requirements.
- Develop the critical thinking with scientific temper.
- Communicate the subject effectively.
- Understand the importance and judicious use of technology for the sustainable growth of mankind in synergy with nature.
- Understand the professional, ethical and social responsibilities.
- Enhance the research culture and uphold the scientific integrity and objectivity.
- Engage in continuous reflective learning in the context of technological and scientific advancements.
- Express proficiency in oral and written communications to appreciate innovation in research.
- Develop industry-focused skills to lead a successful career.

Programme Highlights

Salient Features

- Approaching the subject from theoretical and practical points of view.
- Opportunity to attend seminars, workshops etc.
- Extra-curricular activities for peer interaction, growth of organizational skills and personality development.
- Well-equipped and spacious laboratories.
- Well qualified and experienced staff.
- Industrial collaboration/training.
- Placement opportunities.
- Good library and internet facilities.
- Industrial /Institutional projects.
- Guest lectures by experts from the field.

Proposed scheme for choice based credit system in B.Sc. Physical Science

Sem.	CORE COURSE (CP) (12)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (4)	Discipline Specific Elective (DSE) (6)	Cr
I	Physics Mechanics(6) Mathematics(6) Chemistry (6)	English/Hindi Communication (4)	SEC-I (4)		26
II	Physics Electricity & Magnetism(6) Mathematics(6) Chemistry (6)		SEC-II (4)		22
III	Physics Thermal Physics and Statistical Mechanics (6) Mathematics (6) Chemistry (6)		SEC-III (4)		22
IV	Physics (6) Waves and Optics Mathematics (6) Chemistry (6)		SEC-IV (4)		22
V				DSE-1 A Physics (6) DSE-2 A Mathematics (6) DSE-3 A Chemistry (6)	18
VI		EVS (4)		DSE-1 B Physics/ Dissertation (6) DSE-2 B Mathematics/ Dissertation (6) DSE-3 B Chemistry/ Dissertation (6)	22
				Total	**132**

Note: -

- Switch Dissertation with either of the Elective Paper (Only One).
- Freedom of selection of various subjects for industrial exposure.
- **Student can opt any SEC offered by any Department**

B.Sc. Course (PHYSICS)

Core papers Physics

S.No.	Paper Code	Core Papers (CP) Name	Credits			Practical Paper Code
			L	T	P	
1.	CP/PHY/MEC101	Mechanics	4	0	2	CP/PHY/MEC102
2.	CP/PHY/EMT201	Electricity and Magnetism	4	0	2	CP/PHY/ EMT202
3.	CP/PHY/TPSM301	Thermal Physics and Statistical Mechanics	4	0	2	CP/PHY/TPSM302
4.	CP/PHY/WO401	Waves and Optics	4	0	2	CP/PHY/WO402

Discipline Specific Elective papers

S.No.	Paper Code	Discipline Specific Elective (DSE) papers Name	Credits		
			L	T	P
Discipline Specific Elective (DSE1A) (Choose Any One)					
1.	DSE1A/PHY/NPP1	Nuclear & Particle Physics and Solid State Physics	2	0	2
	DSE1A/PHY/MP2	Mathematical Physics	2	0	
2.	DSE1A/PHY/EMP1003	Elements of Modern Physics	4	0	2
Discipline Specific Elective (DSE1B)					
1.	DSE1B/PHY/QM1007	Quantum Mechanics	2	0	2
	DSE1B/PHY/DAI1001	Digital, Analog and Instrumentation	2	0	
OR					
Dissertation					

Skill Enhancement Course (any four)

S.No.	Paper Code	Core Papers (CP) Name	Credits	
			L	T
1.	SEC/PHY/REH2001	Renewable Energy And Energy Harvesting	4	0
2.	SEC/PHY/AO2002	Applied Optics	4	0
3.	SEC/PHY/ECN2003	Electrical circuits and Network Skills	4	0
4.	SEC/PHY/BI2004	Basic Instrumentation Skills	4	0
5.	SEC/PHY/CP2005	Computational Physics Skills	4	0

Semester	Paper code	Course opted	Course name	Credits
I		Ability Enhancement Compulsory Course	English/Hindi Communication	4
	CP/PHY/MEC101	Core course-1	Mechanics	4
	CP/PHY/MEC102	Core Course-1 Practical/Tutorial	Mechanics Lab	2
		Core course-2	Mathematics	6
		Core course-3	Chemistry	6
		Skill Enhancement Course-1	SEC-I	4
			Total	**26**
II	CP/PHY/EMT201	Core course-4	Electricity and Magnetism	4
	CP/PHY/ EMT202	Core Course-4 Practical/Tutorial	Electricity and Magnetism Lab	2
		Core course-5	Mathematics	6
		Core Course-6	Chemistry	6
		Skill Enhancement Course-2	SEC-II	4
			Total	**22**
III	CP/PHY/TPSM301	Core course-7	Thermal Physics and Statistical Mechanics	4
	CP/PHY/TPSM302	Core Course-7 Practical/Tutorial	Thermal Physics and Statistical Mechanics Lab	2
		Core course-8	Mathematics	6
		Core Course9	Chemistry	6
		Skill Enhancement Course-3	SEC-III	4
			Total	**22**
IV	CP/PHY/WO401	Core course-10	Waves and Optics	4
	CP/PHY/MP402	Course-10 Practical/Tutorial	Waves and Optics Lab	2
		Core course-11	Mathematics	6
		Course-12	Chemistry	6
		Skill Enhancement Course -4	SEC-IV	4
			Total	**22**
V		Discipline Specific Elective -1 (Physics)	DSE-1 (Physics)	4
		Discipline Specific Elective -1 (Physics) Lab	DSE-1 (Physics) Lab	2

		Discipline Specific Elective -1 (Mathematics)	DSE-1 (Mathematics)	6
		Discipline Specific Elective -1 (Chemistry)	DSE-1 (Chemistry)	6
			Total	**18**
VI		Ability Enhancement Compulsory Course	EVS	4
		Discipline Specific Elective -1 (Physics)	DSE-1 (Physics)	4
		Discipline Specific Elective -1 (Physics) Lab	DSE-1 (Physics) Lab	2
		Discipline Specific Elective -1 (Mathematics)	DSE-1 (Mathematics)	6
		Discipline Specific Elective -1 (Chemistry)	DSE-1 (Chemistry)	6
			Total	**22**
Total Credits				**132**

SEMESTER-I

SYLLABUS

NAME OF PAPER: MECHANICS

Paper Code: CP/PHY/MEC101 **Credits: 04**

Total Teaching Hours: 60

Course Objectives/Course Description

This course is aimed to provide a thorough knowledge of the basics of kinematics, gravitation, work, energy, oscillations, properties of matter and special theory of relativity. Each topic includes problem-solving which develops the thinking process and application skills of the students.

Course Outcome

Familiarisation of the fundamental mathematical formulations in mechanics and development of application skills.

Unit-I Teaching Hours: 15

Laws of Motion: Motion in one dimension-Motion with uniform velocity, uniform acceleration and non-uniform acceleration, Motion in two dimensions-projectile motion-Motion along a curve in a plane (radial and transverse components of velocity and acceleration), examples. Drag force terminal velocity, Newton's Laws.
Frames of reference: Inertial and non-inertial, two frames of reference moving with uniform relative velocity, uniform acceleration, rotating frames, fictitious forces-Examples - (Banking of curved railway track, Accelerometer, freely falling elevator).
Coriolis force: Centripetal and Centrifugal force, Coriolis force and its applications.
Centre of mass, Conservative and non-conservative forces.

Unit-II Teaching Hours: 15

Momentum and Energy: Conservation of momentum and energy, work-energy theorem, motion of rockets.
Rotational motion: Angular velocity and angular momentum, torque, conservation of angular momentum, rigid body motion.
Fluids: Surface tension: Synclastic and antisynclastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaeger's method, Drop weight method.
Viscosity: Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Stoke's method, Variation of viscosity of a liquid with temperature, kinematics of moving fluids, equation of continuity, Euler's equation, Bernoulli's theorem, Streamline (laminar) flow.

Unit-III Teaching Hours: 15

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 (qualitative). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of Global Positioning System (GPS).
Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped harmonic oscillations, normal modes.

Unit-IV Teaching Hours: 15

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 - Torsion pendulum-Determination of Rigidity modulus and moment of inertia - q, η and σ by Searle's method.
Special theory of relativity: Lorentz transformation, Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.

Text books And 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 Mc Graw 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.
• Mechanics, M.P. Saxena, P.R. Singh, S.S. Rawat, Deepak Bhatnagar, 2022, College Book House Publication.
• Mechanics, Ashok Kumar Nagawat, Deepak Raj Malhotra, N.L. Gupta, Subhash Chandra Agarwal, 2022, Jaipur Publishing House.
• Physics for Degree Students, C.L. Arora, P.S. Hemne, 2016, S. Chand & Company Pvt. Ltd.

PRACTICAL LAB-SYLLABUS

NAME OF PAPER: MECHANICS LAB

Paper Code: CP/PHY/MEC102 **Credits: 02**

Total Teaching Hours: 60

Course Objectives/Course Description

The mechanics related experiments included in this course enables the students to understand the theory better and develops the application skills in a practical situation.

Course Outcome

Better understanding of theory and development of practical application skills.

Mechanics Experiments

S.No.	Experiments
1.	Measurements of length (or diameter) using a vernier calliper, screw gauge.
2.	To determine the Height of a Building using a Sextant.
3.	To determine the Moment of Inertia of a Flywheel.
4.	To determine the Young's Modulus of a Wire by Optical Lever Method.
5.	To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6.	To determine the Elastic Constants of a wire by Searle's method.
7.	To determine g by Bar Pendulum.
8.	To determine g and velocity for a freely falling body using Digital Timing Technique
9.	To study the Motion of a spring and calculate (a) Spring Constant (b) Value of g.
10.	To determine surface and interfacial tension between kerosene and water.
Any other Experiments/Innovations related to mechanics can be added.	

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T.Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practical, 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.

SEMESTER-II

SYLLABUS

NAME OF PAPER: ELECTRICITY AND MAGNETISM

Paper Code: CP/PHY/EMT201 **Credits: 04**

Total Teaching Hours: 60

Course Objectives/Course Description

This course on electricity and magnetism enables the students to understand the fundamentals of electrostatics, magnetostatics, electromagnetic induction and electromagnetic theory.

Course Outcome

On successful completion of the course, the students will be able to demonstrate knowledge and understanding of:

- The use of Coulomb's law and Gauss' law for the electrostatic force
- The relationship between electrostatic field and electrostatic potential
- The use of the Lorentz force law for the magnetic force
- The use of Ampere's law to calculate magnetic fields
- The use of Faraday's law in induction problems
- The basic laws that underlie the properties of electric circuit elements

Unit-I Teaching Hours: 10

Vector analysis: Review of vector algebra (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 (statement only).

Unit-II Teaching Hours: 20

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

Unit-III Teaching Hours: 18

Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law, Ballistic Galvanometer.
Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia, para and ferromagnetic materials.
Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

Unit-IV Teaching Hours: 12

Electromagnetic theory: Maxwell`s equations and Electromagnetic wave propagation: 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, polarization.

Text Books and Reference Books:

• Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.

• Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.

• Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.

• University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

• D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

• Electromagnetics, M.P. Saxena, PR. Singh, S.S. Rawat, 2022, College Book House publication.

• Physics for Degree Students, C.L. Arora, P.S. Hemne, 2016, S. Chand & Company Pvt. Ltd.

• Electromagnetism, R.N. Sharma, Bhwani Sankar Sharma, Anil Kumar Gupta, Sandeep Sharma, 2022 Jaipur Publishing House.

• Electromagnetics, Manoj Kumar Tiwari, Avinash Kumar Sharma, Amar Kumar Dhariwal, 2015, Krishna Prakashan Media Pvt. Ltd.

PRACTICAL LAB-SYLLABUS

NAME OF PAPER: ELECTRICITY AND MAGNETISM LAB

Paper Code: CP/PHY/EMT202 **Credits: 02**

Total Teaching Hours: 60

Course Objectives/Course Description

The experiments related to electricity and magnetism included in this course enables the students to understand the theory better and develops the application skills.

Course Outcome

On completion of this course, students will be able to measure resistances, voltages, current, charge and current density, magnetic field strength, self-inductance of a coil and mutual inductance of a pair of coils using appropriate instruments and experimental setup.

Electricity and Magnetism experiments

S.No.	Experiments
1.	To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC current.
2.	Ballistic Galvanometer: (i) Measurement of charge and current sensitivity. (ii) Measurement of CDR. (iii) Determine a high resistance by Leakage Method. (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3.	To compare capacitances using De'Sauty's bridge.
4.	Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5.	To study the characteristics of a Series RC Circuit.
6.	To study the series LCR circuit and determine its (a) Resonant Frequency, (b) Quality factor.
7.	To study the parallel LCR circuit and determine it's (a) Anti-resonant frequency and (b) Quality factor Q.
8.	To determine a Low Resistance by Carey Foster's Bridge.
9.	To identify and determine the values of L, C and R in a black box.
10.	To verify the Maximum power transfer theorem.
11.	To determine the inductance of a coil using Anderson's bridge.
Any other Experiments/Innovations related to electricity and magnetism can be added.	

Text Books and Reference Books:

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