



Date :- 01/08/2024

NOTIFICATION

Sub :- CBCS Syllabi of B. Sc. in Physics (Sem. I & II)

Ref. :- Decision of the Academic Council at its meeting held on 27/07/2024.

The Syllabi of B. Sc. in Physics (First and Second Semesters) as per **NATIONAL EDUCATION POLICY – 2020 (2024 Pattern)** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2024-25.

Copy of the Syllabi Shall be downloaded from the College Website
(www.kcesmjcollege.in)

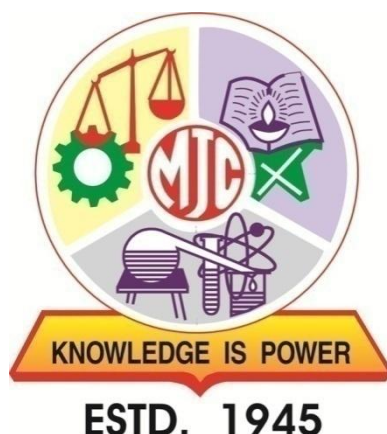
Sd/-
Chairman,
Board of Studies

To :

- 1) The Head of the Dept., M. J. College, Jalgaon.
- 2) The office of the COE, M. J. College, Jalgaon.
- 3) The office of the Registrar, M. J. College, Jalgaon.

Knowledge is Power

Khandesh College Education Society's
Moolji Jaitha College, Jalgaon
An "Autonomous College"
Affiliated to K.B.C.North Maharashtra University, Jalgaon



SYLLABUS

F.Y.B.Sc. Physics

**Under Choice Based Credit System (CBCS)
and
as per NEP-2020 Guidelines**

[w.e.f. Academic Year : 2024-25]

Preface

In present scenario, manpower with skill, knowledge and talent are highly demanded. Person may be born talented but knowledge and skill acquired through learning of theoretical concept and hand-on laboratory method of subject. In order to achieve skill and knowledge, higher education system establish NEP in 2020. The MooljiJatha College (Autonomous) adopt department-specific model as per NEP-2020, guideline of UGC, and Government of Maharashtra. The syllabus is designed for first-year undergraduate of Physics by Board of Studies of Physics of college. The syllabus developed knowledge in learner through theoretical and practical hand-on from different fields of physics. Designed syllabus include basic and fundamental fact of different branches of physics. It may help to strong and clear based for various classical and modern branches of subject. After completion of syllabus learner able to understand various fact in environment using physics also able to apply scientific knowledge toward world. It enhances scientific temperament of learner hence make them able to see world from frame of science.

The whole curriculum of three/four years covers different types of motion, mechanics, sound and optics, thermodynamics, mathematical physics, quantum mechanics, electrodynamics, basic electronics mobile communication, solar technology, battery technology. It also covers vacuum technology and research methodology. Syllabus is designed to fulfill need from different areas such as research, industrial sector, Entrepreneurship etc. emphasizing imparting hands-on skills. Hence, the curriculum is endowed with more experiments that shall run hand-in-hand with theory. The detailed syllabus of each paper is appended with a list of suggested readings.

Program Outcomes (PO) for B.Sc. Program:

Upon successful completion of the B.Sc. program, student will be able to:

PO No.	PO
PO1	Understand the basic concepts and fundamental principles related to various science branches
PO2	Aquaint the skills in handling scientific instruments and performing in laboratory experiments
PO 3	Relate various scientific phenomena and their relevancies in the day-to-day life.
PO4	Analyse experimental data critically and systematically to draw the objective conclusions.
PO 5	Develop various skills such as communication, leadership, teamwork, social, research etc., which will help in expressing ideas and views clearly
PO 6	Develop interdisciplinary approach for providing better solutions and sustainable developments.

Program Specific Outcome PSO (B.Sc. Physics):

After completion of this course, students are expected to learn/understand the:

PO No.	PSO
PSO1	Basic fundamental law in physics and may able to interpret it.
PSO2	Types, Properties and Factor affecting different physical quantities.
PSO 3	They are capable of independent and critical thinking
PSO 4	Students may able to evaluate and validate experimental result starting from principle also draw logical conclusion on the basis of result.
PSO 5	Students may able to pursue career in research, academics, industries and in allied field.
PSO 6	Acquire knowledge and skills appropriate to their professional activities.

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Year Bachelor's Degree	120	132	6	3
6.0	Bachelor's Degree- Honours Or Bachelor's Degree- Honours with Research	160	176	8	4

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

F.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1)	Subject-II (M-2)	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT, RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
I (4.5)	I	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	OE-1(2T)	---	AEC-1(2T) (Eng) VEC-1(2T) (ES) IKS(2T)	CC-1(2T)	22	UG Certificate
	II	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	OE-2(2T) OE-3(2P)	---	AEC-2(2T) (Eng) VEC-2(2T) (CI)	CC-2(2T)	22	
	Cum. Cr.	8	8	8	6	---	10	4	44	
Exit option: Award of UG Certificate with 44 credits and an additional 4 credits core NSOF course/ Internship OR Continue with Maior and Minor.										

S.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1) Major*		Subject-II (M-2) Minor #	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)	(MIN)							
2 (5.0)	III	DSC-5(2T) DSC-6(2T) DSC-7(2P)	---	MIN-1(2T) MIN-2(2T) MIN-3(2P)	---	OE-4(2T)	SEC-1(2T)	AEC-3(2T) (MIL)	CC-3(2T) CEP(2)	22	UG Diploma
	IV	DSC-8(2T) DSC-9(2T) DSC-10(2P)	---	MIN-4(2T) MIN-5(2P)	---	OE-5(2T)	SEC-2(2T) SEC-2(2P)	AEC-4(2T) (MIL)	CC-4(2T) ⊗ FP(2)	22	
	Cum . Cr.	12	---	10	---	4	6	4	8	44	
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major & Minor.											

* Student must choose one subject as a Major subject out of M-1, M-2 and M-3 that he/she has chosen at First year

Student must choose one subject as a Minor subject out of M-1, M-2 and M-3 that he/she has chosen at First year (Minor must be other than Major)

⊗ OJT/Internship/CEP should be completed in the summer vacation after 4th semester

T.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1) Major		Subject-II (M-2) Minor	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)	(MIN)							
3 (5.5)	V	DSC-11(2T) DSC-12(2T) DSC-13(2T) DSC-14(2P) DSC-15(2P)	DSE-1A/B (2T) DSE-2A/B (2P)	---	---	---	VSC-1(2T) VSC-2(2P)	---	OJT/Int (4)	22	UG Degree
	VI	DSC-16(2T) DSC-17(2T) DSC-18(2T) DSC-19(2T) DSC-20(2T) IKS DSC-21(2P) DSC-22(2P)	DSE-3A/B (2T) DSE-4A/B (2P)	---	---	---	VSC-3(2T) VSC-4(2P)	---	---	22	
	Cum . Cr.	24	8	---	---	---	8	---	4	44	
		Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor									

Fourth Year B.Sc. (Honours)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-25(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	---	22	UG Honours Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-29(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	OJT/Int (4)	22	
	Cum. Cr.	28	8	4	---	---	---	4	44	
Four Year UG Honors Degree in Major and Minor with 176 credits										

Fourth Year B.Sc. (Honours with Research)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	RP(4)	22	UG Honours with Research Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	RP(8)	22	
	Cum. Cr.	20	8	4	---	---	---	12	44	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Sem- Semester, **DSC-** Department Specific Course, **DSE-** Department Specific Elective, **OE/GE-** Open/Generic elective, **VSC-** Vocational Skill Course, **SEC-** Skill Enhancement Course, **VSEC-** Vocation and Skill Enhancement Course, **AEC-** Ability Enhancement Course, **IKS-** Indian Knowledge System, **VEC-** Value Education Course, **T-** Theory, **P-** Practical, **CC-** Co-curricular **RM-** Research Methodology, **OJT-** On Job Training, **FP-** Field Project, **Int-** Internship, **RP-** Research Project, **CEP-** Community Extension Programme, **ENG-** English, **CI-** Constitution of India, **MIL-** Modern Indian Language

- Number in bracket indicate credit
- The courses which do not have practical 'P' will be treated as theory 'T'
- If student select subject other than faculty in the subjects M-1, M-2 and M-3, then that subject will be treated as Minor subject, and cannot be selected as Major at second year.

Details of F.Y. B.Sc. (Physics)

Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/ Week			Marks			
					T	P	Total	Internal		External	
								T	P	T	P
Semester I, Level – 4.5											
DSC-1	DSC	PHY-DSC-111	Introduction to Mechanics	2	2	---	2	20	---	30	---
DSC-2	DSC	PHY-DSC-112	Practicals on Mechanics	2	---	4	4	---	20	---	30
OE-1	OE	PHY-OE-111	Basics of Physics	2	2	---	2	20	---	30	---
Semester II, Level – 4.5											
DSC-3	DSC	PHY-DSC-121	Electricity and Magnetism	2	2	---	2	20	---	30	---
DSC-4	DSC	PHY-DSC-122	Practicals on Electricity and Magnetism	2	---	4	4	---	20	---	30
OE-2	OE	PHY-OE-121	Introduction to Applied Physics	2	2	---	2	20	---	30	---
OE-3	OE	PHY-OE-122	Practicals on Applied Physics	2	---	4	4	---	20	---	30

Examination Pattern

Theory Question Paper Pattern:

- 30 (External) +20 (Internal) for 2 credits
 - External examination will be of 1½ hours duration
 - There shall be 3 questions: Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. The tentative pattern of question papers shall be as follows;
 - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
 - Q 2 and Q3 Attempt any 3 out of 4 sub-question; each 4 marks.

Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

1. Continuous & Comprehensive Evaluation (CCE): CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method carrying 10/5 marks:

- i. Individual Assignments
- ii. Seminars/Classroom Presentations/Quizzes
- iii. Group Discussions/Class Discussion/Group Assignments
- iv. Case studies/Case lets
- v. Participatory & Industry-Integrated Learning/Field visits
- vi. Practical activities/Problem Solving Exercises
- vii. Participation in Seminars/Academic Events/Symposia, etc.
- viii. Mini Projects/Capstone Projects
- ix. Book review/Article review/Article preparation
- x. Any other academic activity
- xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

2. Internal Assessment Tests (IAT): IAT will carry a maximum of 10% weightage (10/5 marks) of the total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher is at liberty to decide which units are to be assessed using CCEs and which unit is to be assessed on the basis of IAT. The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The

remaining 60% of the marks shall be allocated to the semester-end examinations. The subject teachers are required to communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

Practical Examination Credit 2: Pattern (30+20)

External Practical Examination (30 marks):

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours duration and shall be conducted as per schedule.
- Practical examination shall be conducted for 2 consecutive days for 2 hr/ day where incubation conditionis required.
- There shall be 05 marks for journal and viva-voce. Certified journal is compulsory to appear for practical examination.
- External practical examination of SEC will be of 25 marks and there will be no internal exam for SEC practical.

Internal Practical Examination (20 marks):

- Internal practical examination of 10 marks will be conducted by department as per schedule given.
- For internal practical examination student must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and the Head of the department.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities assigned by the faculty during regular practicals. For details refer internal theory examination guidelines.
- Finally 40 (10+30) marks performance of student will be converted into 20 marks.

SEMESTER-I

F.Y. B.Sc. Physics (Major)
Semester-I
PHY-DSC-111: Introduction to Mechanics

Total Hours: 30

Credits: 2

Course Objectives	• To impart knowledge of basic concepts in gravitation. • To understand basic principle behind different type of motions. • To study basic mechanical properties of solids and fluids. • To provide the knowledge and methodology necessary for solving problems in Physics and acquire the practical knowledge based on the theory.	
Course outcomes	After successful completion of this course, students are expected to: • Understand different concept of motion in their surroundings and able to apply the of knowledge of motions to real life problems. • Understand the concepts of elasticity, fluid mechanics and be able to perform calculations using them. • Understanding of the course will create scientific temperament. • Demonstrate quantitative problem-solving skills in all the topics covered.	
Unit	Topic Particular	Hours
Unit I	Gravitation Kepler's laws, Newton's law of gravitation, Gravitational constant, acceleration due to gravity of the earth, acceleration due to gravity below and above the surface of earth, Gravitational potential, gravitational potential energy, escape velocity of satellite, gravitational binding energy, Earth satellite, Weightlessness in a satellite, basic idea of global positioning system (GPS), Numerical illustrations.	7
Unit II	Oscillation Oscillations: simple harmonic motion, Differential equation of S.H.M. and its solutions, Equation of displacement, velocity and acceleration, S.H.M. is projectile of UCM along its diameter, Kinetic Energy, Potential Energy, Total Energy and their time averages, natural oscillation and its type, equation for damp harmonic oscillator and its solution, Three different cases in damp oscillation, Numerical illustrations.	8
Unit III	Rotational motion Moment of inertia, expression for moment of inertia, radius of gyration, torque, angular momentum, relation between torque and angular acceleration, angular momentum and angular velocity, Theorems of moment of inertia, value of moment of inertia for simple geometrical objects, Numerical illustrations.	7
Unit IV	Mechanical Properties of solid and Fluids Stress, strain and its types, hooks law, Modulus of elasticity: young's modulus, Bulk modulus, modulus of rigidity, Poisons ratio, relation between y , k and η , work done in stretching and twisting of wire, Torsional Pendulum, Viscosity and co-efficient of viscosity, Streamline and Turbulent flow, Reynolds number, Stokes law and terminal velocity, equation of continuity, Bernoulli's principle, and Poiseuille's equation, Numerical illustrations.	8

References	• Sears F.W., Zemansky, M.W., Young H.D., 13/e, (1986). University Physics, Addison Wesley. • Kittle, C. et. al. (2007), Mechanics Berkeley Physics course, V-1, Tata McGraw Hill. • Bhattacharya, B., (2015), Engineering Mechanics, 2nd edn, Oxford University Press 6. • Reese R. L. (2003). University Physics, Thomson Brooks/Cole. • Mathur, D. S. (2008). Elements of properties of matter. S. Chand Publishing. • Avadhanulu, M. N. (2008). A textbook of engineering physics. S. Chand Publishing. • Gaur R. K., & Gupta, S. L. (1987). Engineering physics. Dhanpat Rai and Sons. • Verma H. C. (2008). Concepts of Physics Volume, Bharati Bhavan. • Halliday D., Resnick R., & Walker, J. (2010). Fundamentals of physics, John Wiley & Sons.	
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F.Y. B.Sc. Physics (Major)
Semester-I
PHY-DSC-112: Practicals on Mechanics

Total Hours: 60

Credits: 2

Course Objectives	• To determine practically acceleration due to gravity using different types of pendulums • To find different modulus of elasticity experimentally. • To study surface tension and viscosity by doing experiments. • To know moment of inertia of various objects practically.	
Course Outcomes	After successful completion of this course, students are expected to: • Understand and practice the skills while doing physics practical. • Understand different mechanical properties of solid and liquid practically. • Correlate their physics theory concepts through practical. • Enlightened subject theoretical background doing hand-on practicals.	
Sr. No.	List of Practicals	Hours
1	Measurements of length (or diameter) using vernier caliper, screw gauge.	4
2	Measurements of thickness of wire using travelling microscope	
3	To determine Young's modulus of the material of a given wire by using Searle's apparatus.	4
4	To calculate the spring constant for a spring.	4
5	To determine the surface tension of water by capillary rise method.	4
6	To determine the Elastic Constants of a Wire by Searle's method.	4
7	To determine 'g' by Bar Pendulum.	4
8	To determine 'g' by Kater's Pendulum.	4
9	To determine 'g' and velocity for a freely falling body using Digital Timing Technique	4
10	To determine the coefficient of viscosity using Stoke's method.	4
11	To determine the Moment of Inertia of a Disc.	4
12	To determine Y by using flat spiral spring.	4
13	To determine Y of a rectangular beam by bending.	4
14	To determine η by using flat spiral spring.	4
15	To determine η by torsional oscillations.	4
16	To determine Y by vibrational cantilever.	4
17	To determine Poisson's Ratio of rubber by using rubber cord/tube.	4
18	Determination of coefficient of viscosity of water by Poiseuille's method.	4
19	Verification of Bernoulli's theorem.	4

20	To determine the Moment of Inertia of a Flywheel.	
References	• Worsnop, B. L., & Flint, H. T. (1927), advanced practical physics for students. Methuen. • Nelson, M. and Ogborn Jon M. (1985), Advanced level Physics Practicals, 4th Edition, reprinted, Heinemann Educational Publishers. • Prakash, I and Ramakrishna, (2011). A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi. • Rajopadhye V. Y., Purohit V.L., and Deshpande A.S., A text Book of Experimental Physics, Continental Prakashan, Poona-30 • Shukla R. K., Srivastava A. (2006). Practical Physics, New Age International • Singh, S.P. (1976). Advance Practical Physics, Pragati Prakashan • Gupta and Kumar (2017). Practical Physics, Pragati Prakashan, Meerut • Tayal, D. C., University Practical Physics, Himalaya Publishing House	

F.Y. B.Sc. Physics (Open Elective)
Semester-I
PHY-OE-111: Basics of Physics

Total Hours: 30

Credits: 2

Course Objectives	- To empower students with basic knowledge of physics and impart knowledge of basic concept and their application in day-to-day life. - To developed interest of students in basic physics. - To understand difference between work, energy and power. - To provide the knowledge and methodology necessary for solving problems in basic physics.	
Course outcomes	After successful completion of this course, students are expected to: - To understand different phenomenon in basic physics, types of error and method of finding error. - Help in enhancing knowledge of students for different phenomenon in motions and the basics of force and friction. - Able to apply theoretical concepts of physics in real life - Understanding of this course will help students for competitive exam preparations.	
Unit	Topic Particular	Hours
Unit I	Measurement and Error Units, Conditions for standard unit, System of units, Types of physical quantities and its dimension, Conventions followed in SI-Multiples & sub-multiples and prefixes of units, Error, types of errors, errors in instruments such as Vernier Calliper, Micro meter screw gauge and Spherometer, Numerical Illustration	7
Unit II	Laws of Motion Motion of an object, types of motion, distance and displacement, speed and velocity, Uniform and non-uniform motion, acceleration, acceleration due to gravity, free fall of an object, Kepler's laws of motion (statement only), uniform circular motion, Newton's Laws of Motion, laws of conservation, Numerical Illustration	8
Unit III	Force and Friction Force and its type, Force and Motion; Inertia of a body, inertia and mass, momentum, force and acceleration, action and reaction forces, Types of Friction, Laws of Friction, Angle of Friction, Angle of Repose, Friction on Horizontal and Inclined Plains, Centripetal and Centrifugal forces, Numerical Illustration	7
Unit IV	Work, Power and Energy Definition of work, energy, and power, work done by variable forces, relation between work and power, work energy theorem, potential energy of spring, mechanical energy and its conservation, collision and its types, types of energy, difference between work, power, and energy, energy meter and billing calculation	8

References	• Verma H. C., Concept of Physics, Vol I, Bharati Bhawan Publisher • Gaikwad D. T., Padmakar S., Rane S. R. & Morankar, V. (2011). Basic Physics, Chand Publisher. • Narlikar J. V., Joshi, A., W. et. (2015). Physics Textbook Part I - Class XI, National Council of Education Research and Training, New Delhi, • Ford, K.W. (1975). Basic Physics, Oxford and IBH publishing Co. • Lal H. H., Applied Physics Vol. I and Vol. II., TTTI Publications • Moebs, W., Ling, S. J., Sanny, J. (2016). University Physics: Volume 1, Publisher, Open Stax, Rice University. • Banwait, R.A.(2018). Applied Physics – I & II, Eagle Prakashan, Jalandhar.	
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SEMESTER-II

F.Y. B.Sc. Physics (Major)
Semester-II
PHY-DSC-121: Electricity and Magnetism

Total Hours: 30

Credits: 2

Course Objectives	- To understand the basic phenomenon in static charge and moving charge. - To empower students with basic knowledge of electrostatics and understand basic concepts of different network theorems. - To impart knowledge of basic concepts in magnetic phenomena, to classify the magnetic materials based on their magnetic properties - To provide the knowledge and methodology necessary for solving problems in magnetism.	
Course outcomes	After successful completion of this course, students are expected to: - To understand different phenomenon in electrostatics and help in enhancing knowledge of students for moving charge. - Build ability to apply different network law in practicals. - Understand the basics of alternating current and electromagnetic induction. - Understanding of the course will create scientific temperament.	
Unit	Topic Particular	Hours
Unit I	Electric Charges and Field Electric charge, basic properties of electric charge, Coulomb's law, limitation of coulombs law, forces between multiple charges, electric field, electric field lines, electric flux, different types of charge density, equation of electric field due to continuous charge distribution, Gauss law and its application, electrostatic potential, potential due to a point charge, potential due to an electric dipole, numerical illustrations.	8
Unit II	Electricity Electric current and voltage, AC Voltage applied to a resistor, inductor, capacitor, AC Voltage applied to a series LCR circuit, Phasor diagram, Ohm's law, limitations of ohm's law, Kirchhoff's current and voltage law, sign convention for Kirchhoff's law, Norton's and Thevenin's law, maximum power transfer theorem, electric power, electricity bill calculations, numerical illustrations.	7
Unit III	Magnetism Magnetic material, properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, Brief introduction of dia-, para- and ferro-magnetic materials, introduction of 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, numerical illustrations.	8
Unit IV	Electromagnetic Induction Introduction, the experiment of Faraday and Henry, magnetic flux, Faraday law of electromagnetic induction, Lenz law, conservation of energy, Eddy current, motional EMF, Inductance, Energy stored in a Inductors, AC generator, Transformer, step-up and step-down transformer, numerical illustrations.	7

References	• Griffiths, D.J. (1998). Introduction to Electrodynamics, 3rd Edn, Benjamin Cummings • Fewkes J.H. & Yarwood J., Electricity and Magnetism, Vol. I, Oxford Univ. Press. • Tayal, D. C. (1988). Electricity and Magnetism, Himalaya Publishing House. • Verma, H. C., Concepts of Physics [Volume 2], Bharati Bhawan, India • Barut A. O. (1980). Electrodynamics and classical theory of fields & particles. Courier Corporation. • Purcell, E. M. (1986). Electricity and Magnetism, McGraw-Hill Education. • Fewkes J.H. & Yarwood, J. (1991). Electricity and Magnetism, Vol. I, Oxford Univ. Press • Reese, R. L. (2003). University Physics, Thomson Brooks/Cole.11	
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F.Y. B.Sc. Physics (Major)
Semester-II
PHY-DSC-122: Practicals on Electricity and Magnetism

Total Hours: 60

Credits: 2

Course Objectives	- To study electrical effect in real life practically. - To study magnetic effect in real life practically. - To distinguish between various magnetic materials and to study their applications. - Knowledge of electricity to be applied in household purposes.	
Course Outcomes	After successful completion of this course, students are expected to: - Understand different electrical effect and magnetic effect - Get knowledge of various electrical components. - Understand and practice the skills while doing physics practical. - Correlate their physics theory concepts through practical.	
Sr. No.	Topic Particular	Hours
1	To use a Multimeter for measuring (a) Resistances, (b) A.C. and D.C. Voltages, (c) D.C. Current, and (d) checking electrical fuses.	4
2	Ballistic Galvanometer: (a) Measurement of charge and current sensitivity (b) Measurement of CDR (c) Determine a high resistance by Leakage Method (d) To determine Self Inductance of a Coil by Rayleigh's Method.	4
3	To compare capacitances using DeSauty's bridge.	4
4	Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).	4
5	To study the Characteristics of a Series RC Circuit.	4
6	To study a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.	4
7	To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q	4
8	To determine a Low Resistance by Carey Foster's Bridge.	4
9	Verification of Kirchhoff's laws.	4
10	To verify Thevenin's theorem	4
11	To verify Norton's theorem	4
12	To verify Maximum Power Transfer Theorem	4
13	To verify Joule's law.	4
14	To determine time constant of R-C circuit using charging and discharging of condenser through resistor.	4
15	Determination of time constant of L-R circuit.	4
16	Electric billing with energy meter.	4
17	Frequency of a. c. using vibrating wire and magnet.	4
18	To determine efficiency and turns ratio of transformer.	4

19	To determine resonant frequency of resistor/capacitor/inductor circuit.	4
20	Use of resistor as current limiting device.	
References	• Flint, B. L. & Worsnop, H. T. (1971). Advanced Practical Physics for students, Asia Publishing House. • Prakash, I. and Ramakrishna (2011). A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi • Panigrahiand, S., Mallick, B. (2015). Engineering Practical Physics, Cengage Learning India Pvt. Ltd. • Nelson, M. and Ogborn, J. M. (1985). Advanced level Physics Practical's, 4th Edition, reprinted Heinemann Educational Publishers. • Gupta and Kumar (2017). Practical Physics, Pragati Prakashan, Meerut • Tayal, D. C., University Practical Physics, Himalaya Publishing House.	

F.Y. B.Sc. Physics (Open Elective)
Semester-II
PHY-OE-121: Introduction to Applied Physics

Total Hours: 30

Credits: 2

Course Objectives	- To understand the mechanical properties of solid and liquid. - To build ability to differentiate material according their mechanical properties. - To empower students with basic knowledge of sound, heat and light. - To provide the knowledge about convection, conduction and radiation of heat phenomenon in real life.	
Course outcomes	After successful completion of this course, students are expected to: - Understand different phenomenon in applied physics and ability to differentiate phenomenon of viscosity and surface tension. - Help in enhancing knowledge of students for mechanical properties and material. - Able to apply theoretical concepts of light and heat in real life - Understanding of the course will create scientific temperament & understand the concepts & to apply them to problems.	
Unit	Topic Particular	Hours
Unit I	Mechanical properties of solid and liquid Mechanical properties of Solids: Stress, Strain and their types, Elastic Limit & Hooke's law, Young's Modulus, Bulk Modules & Modulus of Rigidity, Poisson's Ratio Mechanical Properties of Liquids: Surface Tension & Surface Energy, Cohesive & Adhesive Force, Angle of Contact, Streamline & Turbulent Flow, Reynolds Number, Viscosity & Coefficient of Viscosity, Stoke's law & Terminal Velocity (statement only), Pressure, Thrust, Archimedes principle, density.	8
Unit II	Sound Introduction of sound, pitch, classification of sound, Echo, reverberation, SONAR, noise, Types of waves, Properties of waves, Relation between frequency, velocity and wavelength, Phase and phase difference, Transverse wave, Longitudinal wave, Speed of Travelling waves, Doppler effect of sound.	7
Unit III	Heat Heat, Classification of Heat, Source of heat, Difference between Heat and Temperature, Thermometric scale, conversion of temperature, Modes of Transmission of Heat- Conduction, Convection & Radiation and its examples, Thermal Conductivity, Black Body, Newton's Law of Cooling	7
Unit IV	Light Introduction of light, Characteristics of light, Mirror, lenses, image formation in mirror and lenses, Nature of light, Light as an Electromagnetic wave, Velocity of light, optical medium, Reflection, Refraction and their	8

	laws, Total Internal Reflection, Visible range, Interference, Diffraction, Dispersion and Scattering.	
References	• Verma H. C., Concept of Physics, Vol I, Bharati Bhawan Publisher. • Avadhanulu M. N. and Kshirsagar P.G. (1992), Engineering Physics, S. Chand publishers • Mathur, D. S. (2008). Elements of properties of matter. S. Chand Publishing. • Avadhanulu, M. N. (2008). A textbook of engineering physics. S. Chand Publishing. • Gaur R. K., & Gupta, S. L. (1987). Engineering physics. Dhanpat Rai and Sons. • Moebs, W., Ling, S. J., Sanny, J. (2016). University Physics: Volume 1& 2, Publisher, Open Stax, Rice University.	

F.Y. B.Sc. Physics (Open Elective)
Semester-II
PHY-OE-122: Practicals on Applied Physics

Total Hours: 60

Credits: 2

Course Objectives	• To study mechanical properties of solid and liquid practically. • To study reflection and refraction phenomenon of light. • To distinguish between conduction, convection, and radiation phenomenon and to study their applications. • To understand theoretical topic by performing experiment.	
Course Outcomes	After successful completion of this course, students are expected to: • Understand experimentally different concept of applied physics. • Understand and practice the skills while doing physics practical. • To correlate their physics theory concepts through practical. • Experimental learning opportunities will foster creative thinking & a spirit of inquiry.	
Sr. No.	Topic Particular	Hours
1	To determine Young's modulus of elasticity of the material of a given wire.	4
2	To determine the surface tension of water by capillary rise method.	4
3	To study the relationship between the temperature of a hot body and time by plotting a cooling curve.	4
4	To study the relation between frequency and length of a given wire under constant tension using sonometer	4
5	To study the relation between the length of a given wire and tension for constant frequency using sonometer.	4
6	To determine the speed of sound in air at room temperature using a resonance tube.	4
7	To compare surface tension of water and detergent solution by capillary rise method.	4
8	To determine coefficient of viscosity of liquid using stoke's law.	4
9	To determine temperature gradient of metal rod by conduction process.	4
10	Conversion of given temperature from one measuring system to another.	4
11	To determine heat transfer coefficient in natural convection in vertical tube.	4
12	To determine the refractive index of glass slab using refraction.	4
13	To determine the refractive index of spherical surface by using travelling microscope.	4
14	To study diffraction pattern using laser and grating.	4
15	To study interference pattern of light.	4
16	To study total internal reflection of light.	4

References	• Flint, B. L. & Worsnop, H. T. (1971), Advanced Practical Physics for students, Asia Publishing House. • Prakash I. and Ramakrishna (2011). A Text Book of Practical Physics, 11th Edition, Kitab Mahal, New Delhi • Panigrahiand, S., Mallick, B. (2015). Engineering Practical Physics, Cengage Learning India Pvt. Ltd. • Tayal D. C., University Practical Physics, Himalaya Publishing House. • Nelson M. and Ogborn J. M. (1985), Advanced level Physics Practical's, 4th Edition, reprinted Heinemann Educational Publishers. • Gupta Kumar (1999). Practical Physics, Pragati edition.	
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