KUVEMPU UNIVERSITY

BOARD OF STUDIES (BOS) IN PHYSICS
(UNDER GRADUATE PROGRAMME)

APPROVED SYLLABUS

(To be effective from the academic year 2021-22)

For

I AND II SEMESTER PHYSICS PAPERS

of

B.SC./B.SC.(HONS.) DEGREE PROGRAMME

[Framed in according with the National Education policy (NEP-2020)
&basedon ***Model Physics Syllabus***prepared byphysics expert committee,
Karnataka State Higher Education Council, Bangalore]

Syllabus approved in the Board of Studies (BOS) meeting held on …23-09-2021 at the

Department **of Post-Graduate in Physics and Research,Jnana Sahyadri, Shankaraghatta**

Curriculum Structure-Physics
(Core and Electives)
Semesters- I and II

SEM	DSC	Core Papers
Sem-1:	A1	Mechanics&Propertiesof Matter
Sem -2:	A2	ElectricityandMagnetism

Open Electives for 1st and 2nd Semesters

Sl.No.	1st and 2nd Semesters
1.	Sports Science (I semester)
2.	Physics for all (I semester)
3.	Electrical Instruments (II semester)
4.	Space Missions(II semester)

Course Content Semester – I

Mechanics and Properties of Matter

Course Title: Mechanics and Properties of Matter	Course Credits:4
Total Contact Hours: 52	Duration of ESA: 3 hours
Formative Assessment Marks: 30	Summative Assessment Marks: 70

Mechanics & Properties of Matter		
Credit: 4+2		**Theory: 4 hours /Week**
Unit – 1		
Topics to be covered/taught/learnt:		**Teaching Hours**
Chapter No. 1	**Units and measurements:** System of units (CGS and SI), measurement of length, mass and time, dimensions of physical quantities, dimensional formulae. Minimum deviation, errorsand significant figures.	**2**
Chapter No. 2	**Frames of reference:** Inertial frames – Galilean principle of relativity (statement and proof) – Non-inertial frames – To show that uniformly accelerated frame is non-inertial – Pseudo force – examples - Rotating frames of reference - derivation of expression for force. Types of forces in rotating frame. Discussion of the earth as an inertial frame.	**5**
Chapter No. 3	**Momentum and Energy**: - Conservation of linear momentum –examples. Rocket motion – expression for instantaneous and final velocities – effect of earth's gravity. Work done by a variable force: Work – energy theorem(derivation) – conservative force fields, potential energy - conservation of energy, examples – Atwood machine (calculation of acceleration using conservation of energy).	**6**
Topic for self-study	Foucault Pendulum	
Suggested Activities		
Activity No. 1	1. i). Students can measure diameters of small balls of different size and estimate their volumes. 2. ii). Students can measure lengths of nails of different size. iii). Students can measure volume of a liquid iv). Students can measure distances and put the result both in CGS and SI units in 2, 3 and 4 significant figures. Ask them to mention the precession of the measurement. v). students can estimate standard deviations wherever possible.	
Activity No. 2	Students can try and understand conservation of energy in every day examples. For example: i) What happens in solar conservation panels ii) Pushing an object on the table it moves iii) Moving car hits a parked car causes parked car to move. In these cases, energy is conserved. How? Understand and verify if possible.	
Unit – 2		
Chapter No. 4	**Laws of Motion:** Newton's Laws of motion. Dynamics of single and a system of particles- Centre of mass -Equations of motion –-Linear & angular momentum of a system of particles - Conservation of angular momentum – examples.	**2**

Chapter No. 5	**Dynamics of Rigid bodies**: Rotational motion about an axis, moment of inertia (MI) - General Theorems on moment of inertia –(with proofs). M I of a rectangular Lamina and solid cylinders – Derivation of expressions. Relation between torque and angular momentum, Rotational energy. Flywheel–(qualitative discussion) - Theory of compound pendulum and determination of g.	**6**
Chapter No. 6	**Gravitation:** Central force – characteristics & examples - Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant) - Law of Gravitation (Vector form). Kepler's laws (statements)–orbit equation (no derivation) - conditions for different orbits. Satellite in a circular orbit – derivation of expressions for orbital velocity, time period and escape velocity.	**5**
Topics for self-study	Geosynchronous orbits. Basic idea of global positioning system (GPS).	
Suggested Activities		
Activity No.3	Moment of inertia is an abstract concept. It simply gives a measure of rotational inertia of a rigid body and it is proportional to the product of the square of radius, r of the body and its mass, m. Students by referring to websites, can construct and perform simple experiments to verify that MI α mr^2. **Reference:** www.khanacademy.org, www.pinterest.com, www.serc.cerleton.edn	
Activity No. 4	Prepare suitable charts and give seminar talks in the class.	
Unit – 3		
Chapter No. 7	**Elasticity:** Hooke's law - Stress-strain diagram, elastic moduli-relation between elastic constants (Derivation), Poisson's ratio, expression for Poisson's ratio in terms of elastic constants. Work done in stretching (Derivation) and work done in twisting a wire-Twisting couple on a cylinder (Derivation). Torsional pendulum—Expression for Time-period (Derivation) - Determination of rigidity modulus and moment of inertia – Determination of q, η and σ by Searle's method with necessary theory. Bending of beams – Expression for Bending moment (derivation). Theory of Single cantilever.	**13**
Suggested Activities		
Activity No. 5	Arrange a steel spring with its top fixed with a rigid support on a wall and a meter scale alongside. Add 100 g load at a time on the bottom of the hanger in steps. This means that while putting each 100g load, we are increasing the stretching force by 1N. Measure the extension for loads up to 500g. Plot a graph of extension versus load. Shape of the graph should be a straight line indicating that the ratio of load to extension is constant. Go for higher loads and find out elastic limit of the material	
Activity No. 6	Repeat the above experiment with rubber and other materials and find out what happens after exceeding elastic limit. Plot and interpret	

Unit – 4		
Chapter No. 8	**Surface tension:** Definition of surface tension. Surface energy, relation between surface tension and surface energy, pressure difference across curved surface (derivation) -examples, excess pressure inside spherical liquid drop & bubble, angle of contact - Determination of surface tension by drop weight method with necessary theory, Factors affecting surface tension of a liquid.	**8**
Chapter No. 9	**Viscosity:** Streamline flow, turbulent flow, equation of continuity, determination of coefficient of viscosity by Poiseuille's method (derivation), Stokes law (derivation from dimensional formula), terminal velocity, factors affecting viscosity of a liquid.	**5**
Topics for Self-study	Capillarity and its applications.	
Suggested Activities		
Activity No. 7	1. Measure surface tension of water and other common liquids and compare and learn i) Why water has high ST? think of reasons. ii) Check whether ST is a function of temperature? You can do it by heating the water to different temperatures and measure ST. iii) Plot ST versus T and learn how it behaves. Mix some quantity of kerosene or any oil to water and measure ST. Check whether ST for the mixture is more or less than pure water. List the reasons.	
Activity No. 8	2. Collect a set of different liquids and measure their viscosity. i) Find out whether sticky or non-sticky liquids are most viscous. List the reasons. ii) Mix non sticky liquid to the sticky liquid in defined quantities and measure viscosity. Find out viscosity is increasing or decreasing with increase of non-sticky liquid concentration. iii) Do the above experiment by mixing sticky liquid to the non-sticky liquid. Find out change in viscosity with increase of concentration of sticky liquid. List the applications where concept of Viscosity plays a dominant role.	

NOTE: ***Sufficient number of numerical problems must be worked out in each chapter*.**

Text Books:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Mechanics by, New Eition	D. S. Mathur	S.Chand & Co.	2000
2	Mechancis and Relativity by 3rd Edition,	Vidwan Singh Soni,	PHI Learning Pvt. Ltd.	
3	Mechanics Berkeley Physics Course, Vol.1:	Charles Kittel, *et.al*.	Tata McGraw-Hill	2007
4	Properties of Matter	Brijlal & Subramanyam.		

References Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics. 9th Edn,	Resnick, Halliday & Walter,	Wiley	2010
2	Physics Vol-I	Halliday and Resnick,		

List of Experiments to be performed in the Laboratory:

1.	Determination of g using bar pendulum (L versus T and L versus LT^2 graphs).
2.	Determination of moment of inertia of a Fly Wheel.
3.	Determination of rigidity modulus using torsional pendulum.
4.	Modulus of rigidity of a rod – Static torsion method.
5.	Determination of elastic constants of a wire by Searle's method.
6.	Young's modulus by Koenig's method.
7.	Viscosity by Stoke's method.
8.	Verification of Hook's law.
9.	Determination of surface tension of a liquid and the interfacial tension between two liquids using drop weight method.
10.	Study of motion of a spring and to calculate Spring constant, g and unknown mass.
11.	Determination of Young's modulus of a bar by the single cantilever method.
12.	Determination of Young's modulus of a bar by uniform bending method.
13.	Radius of capillary tube by mercury pellet method.
14	Verification of parallel and perpendicular axis theorems.

(Minimum EIGHT experiments have to be carried out)

Reference Book for Laboratory Experiments

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics through experiments	B.Saraf	Vikas Publications	2013
2	A lab manual of Physics for undergraduate classes, 1st Edition,		Vikas Publications.	
3	BSc Practical Physics Revised Ed	CL Arora	S.Chand & Co.	2007
4	An advanced course in practical physics.	D. Chatopadhyay, PC Rakshit, B.Saha	New Central Book Agency Pvt Ltd.	2002

Semester – II

Electricity & Magnetism

Course Title: Electricity and Magnetism	Course Credits: 4
Total Contact Hours: 52	Duration of ESA: 3 hours
Formative Assessment Marks: 30	Summative Assessment Marks: 70
Model Syllabus Authors:	Physics Expert Committee

Electricity & Magnetism		
Credit: 4+2		**Theory: 4 hours /Week**
Unit – 1		
Topics to be covered/taught/learnt:		**Teaching Hours**
Chapter No. 1	**Electric charge and field:** Coulomb's law, electric field strength, electric field lines, point charge in an electric field and electric dipole, work done by a charge (derivation of the expression for potential energy).	**2**
Chapter No. 2	**Gauss's law and its applications** (electric fields of a (i) spherical charge distribution, (ii) line charge and (iii) an infinite flat sheet of charge).	**5**
Chapter No. 3	**Electric potential:** line integral, gradient of a scalar function, relation between field and potential. Potential due to point charge and distribution of charges (Examples: potential associated with a spherical charge distribution, infinite line charge distribution, infinite plane sheet of charges). Potential (and field) due to a dipole (derivation) and electric quadrupole.	**6**
Topic for self-study	Constant potential surfaces.	
Suggested Activities		
Activity No. 1	1. Learn the difference between and DC and AC electricity and their characteristics. Voltage and line frequency standards in different countries. 2. A small project report on production of electricity as a source of energy: Different methods.	
Activity No. 2	1. Learn to use a multimeter (analog and digital) to measure voltage, current and resistance. Continuity testing of a wire. 2. Learn about household electrical connection terminals: Live, neutral and ground and voltage between the terminals. Role of earthing and safety measures	
Unit – 2		
Chapter No. 4	**Conductors in electrostatic field:** Conductors and insulators, conductors in electric field. Capacitance and capacitors, calculating capacitance in a parallel plate capacitor, parallel plate capacitor with dielectric, dielectrics: an atomic view. Energy stored in a capacitor, Gauss's law for a dielectric medium.	**5**
Chapter No. 5	**Electric currents and current density**: Electrical conductivity and Ohm's law. Physics of electrical conduction - conduction in metals and semiconductors.Circuits and circuit elements: Variable (Transient) currents in capacitor circuits, Resistor, inductor and capacitor and their combination (RL & RC) – expression for voltage and current (derivations) – Time constant in each case.	**8**
Topic for self-study	*Currents and voltage behaviour in series combination of R, L and C circuits*	

Suggested Activities		
Activity No. 3	1. Learn about electrical appliances which work with AC and DC electricity 2. Learn about types of resistors and their colour codes and types of capacitors(electrolytic and non-electrolytic).	
Activity No. 4	1. Learn about power transmission: 3-phase electricity, voltage and phase 2. Visit a nearby electrical power station. Interact with line men, Electrical engineers and managers. Discuss about power loss in transmission. How to reduce it? 3. Prepare a small project report on street lighting and types of electrical bulbs.	

Unit – 3		
Chapter No. 6	**Magnetism:** Definition of magnetic field, Ampere's law and Biot-Savart law (magnetic force and magnetic flux) - Application of Ampere's law to calculate magnetic fields due to (a) a straight long conductor (b) a long solenoid. Magnetic force on a moving charge, Magnetic force on a current carrying conductor, Electromagnetic induction, conducting rod moving in a magnetic field – expression for induced emf, law of induction. Relation between self- and mutual inductance for a pair of co-axial coils. Energy stored in a magnetic field.	**7**
Chapter No. 7	**Alternating current circuits:**Types of AC (sinusoidal and non-sinusoidal) - Complex representation (j-operator) of AC- RL, RC, LCR series circuits - derivation of expressions for current and impedance –Condition for Resonance, Bandwidth, quality factor and voltage magnification,Parallel LCR Resonant circuit – Bandwidth, quality factor and Current magnification.Power and energy in AC circuits -power factor.	**6**
Topic for self-study	Hall effect	
Suggested Activities		
Activity No. 5	**Activity:** 1. Prepare a small project report on street lighting and types of electrical bulbs. 2. Learn the measurement of electric current using tangent galvanometer.	
Activity No. 6	Build a small coil with insulated copper wire. Connect an ammeter micro/milli ammeter. Verify magnetic induction using a powerful bar magnet.	
Unit – 4		
Chapter No. 8	**Electromagnetic waves:** Equation of continuity, Maxwell's equations - Deduction of equations from empirical laws of Gauss, Faraday and Ampere, displacement current concept and significance, electromagnetic wave -Derivation of wave equations for E and B - light as an EM wave, Characteristics of EM waves,energy transported by electromagnetic waves -Poynting vector, significance of Poynting vector - Poynting theorem. Electromagnetic waves in different frames of reference (Qualitative).	**9**
Chapter No. 9	Field of a current loop, magnetic moment, Electric current in atoms, electron spin and magnetic moment, magnetization and magnetic susceptibility. Types of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials - Origin of dia, para and ferromagnetism on the basis of electronic structure of atomsVariation of susceptibility with temperature.	**4**
Topic for Self-study	*B-H hysteresis curves and its characteristics - Ferrites*	

Suggested Activities		
Activity No. 7	1. Prepare a small project report on production of magnetic field: Permanent magnets, electromagnets and superconducting magnets. 2. Learn the principle of working of a Gauss meter to measure magnetic field	
Activity No. 8	1. Model the earth's magnetic field with a diagram. Explain the effect of tilt of the earth's axis and reasons for the change in the tilt of the earth's axis over thousands of years.	

NOTE: *Sufficient number of numerical problems must be worked out in each chapter*.

References Books:

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics-Part-II,	David Halliday and Robert Resnick	Wiley Eastern Limited	2001
2	Berkeley Physics Course, Vol-2, Electricity and Magnetism, Special Edition	Edward M Purcell	Tata Mc Graw-Hill Publishing Company Ltd, New Delhi	2008

List of Experiments to be performed in the Laboratory

1.	Experiments on tracing of electric and magnetic flux lines for standard configuration.
2.	Determination of components of earth's magnetic field using a Ballistic galvanometer.
3.	Determination of capacitance of a condenser using B.G.
4.	Determination of high resistance by leakage using B.G.
5.	Determination of mutual inductance using BG.
6.	Charging and discharging of a capacitor(energy dissipated during charging and time constant measurements.
7.	Series and parallel resonance circuits (LCR circuits).
8.	Impedance of series RC circuits- determination of frequency of AC.
9.	Study the characteristics of a series RC and RL Circuit.
10.	Determination of self inductance of a coil.
11.	Verification of laws of combination of capacitances and determination of unknown capacitance using de - Sauty bridge.
12.	Determination of B_H using Helmholtz double coil galvanometer and potentiometer.

(Minimum EIGHT experiments have to be carried out)

Activity Based Pedagogy:

(Design, Activity and Assessment)

Conducting activity based teaching-leaning experience for students empower students with several graduate attributes by addressing several Outcomes at different levels of the Cognitive Blooms Taxanomy of Learning: like Clarity of Concept, ability to apply knowledge, evaluate and analyse the results, while they are also learn through the Affective and Psycho-motor domains of Learning through self-learning, group dynamics and team work, communication and presentation skills, ethics, life-long learning, etc. These experiments must be ones that do not involve sophisticated instrumentation and should be able to be performed outside laboratories.

Example 1: Elastic Properties of Solids:

The most important concept of studying elastic properties of solids is the Hooke's Law, which defines the stress-strain relationship.

Class 1: Defining problems, forming groups and giving instructions:

- The students should be made into forced groups of 6 to 8 members, depending on the class strength, consisting of diverse kinds of students in cognition, cultural, sex, behaviour, etc.
- Different materials of varying elastic properties should be given to each group, and should be asked to plot a graph of stress-strain of these materials in 8-10 days.
- Give clear instructions and clarify doubts, but not giving the procedure for the experiments. Students should discuss among themselves and consult books and internet to identify the procedure to obtain the Stress-strain graph. They should use only house-hold items or other commonly available tools to perform all the experiments.

Class 2: Presentation and discussion by students (max 8-10 mins each)

- Each group will be asked to make a presentation of 2 power point slides, where the first one explains the process they went through to arrive at the results and the second one shows their measured graph and an ideal text book plots. This slide should also contain two or three explanations of why both the plots differ.
- The student who will make the presentation on behalf of the group will be randomly selected just before the presentations. This will ensure that all group members will be mutually train each other for the presentation.
- The teacher should give equal marks to each member of a group depending on the methods adopted and clarity of concepts and results obtained and ability to analyse.

The following Program Outcomes will be attained by the students in such an activity based learning:

P.O. 1 : Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.
P.O. 3 : Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.
P.O. 5 : Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.
P.O. 6 : Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Example 2: Periodic and Non-Periodic Motions

Most important aspect of understanding this topic is to distinguish them with the amplitude versus distance and amplitude versus time plots.

Class 1: Defining problems and giving instructions

- Each student will be asked to list as many observations as possible, under the two types of motion as they observe in the external world (home, market, college, etc) in 8-10 days.
- The student will be asked to identify any one motion in each of the lists and plot graphs of amplitude versus distance and amplitude versus time for each of them in the 8-10 days.

Class 2: Peer evaluation by students and defending self

- Each student is asked to submit the lists of periodic and non-periodic motions observed in everyday life.
- Each student is also asked to submit the amplitude versus distance and amplitude versus time of one periodic motion and one non-periodic motion of his/her choice among his/her list.
- The submissions are randomly distributed among other students. Teacher now discusses the two types of motions in the lists of students and shows how the graphs will ideally look like.
- Now students are asked to evaluate and mark the submissions of other students they have with them and then the marked papers are returned to the respective students.
- Each student should be given an opportunity to question the marks he has got and each student who has given the marks should be able to defend his choice or marks.
- While observing the lists, marks obtained and the plots made, the teacher can assign marks to each student.

The following Program Outcomes will be attained by the students in such an activity based learning:

P.O. 1. Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.
P.O. 4. Ethics: Apply the professional ethics and norms in respective discipline.
P.O. 6. Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Student seminars

Student (4 to 5 students in a group) groups may be assigned to give a seminar on a topic. They need to make a detailed study on the topic and prepare power point slides for the presentation. One student out of the group may be called randomly to present the certain portion of the topic. Similarly, other students may be called randomly to present remaining portion of the topic, so that each student must study whole topic. In a class 2 to 3 groups may present their topic.

Model Seminar Topics

1. Calorimetry
2. Thermometry
3. Kinetic theory of matter
4. Behavior of real gases
5. Transmission of heat
6. Transport phenomena in gases
7. Radiation laws
8. Laws of thermodynamics
9. Thermodynamical relationships
10. Heat engines
11. Production of low temperatures
12. Air conditioning systems
13. Entropy
14. Global warming
15. Classical and quantum statistics

B.Sc. DEGREE FORMATIVE AND SUMMATIVE ASSESSMENTS

(Under New syllabus of NEP-2020 Scheme; Effective from Academic Year 2021-22)

SEMESTER: I/II

CORE COURSE and PAPER: PHYSICS – I/II

1. FORMATIVE ASSESSMENT (Max. Marks = 30)		
ASSESSMENT TYPE	**DETAILS/METHOD**	**MARKS**
Test	Theory paper IA tests	20 (Av. of Two tests)
Activity 1 (Experiment Based)	Experimental Set Up + Measurements + Results	10
Activity 2 (Seminar Based)	Chart/Slide preparation and presentation	10

2. SUMMATIVEASSESSMENT (End Semester Examination)

A. TheoryExamination (Max. Marks = 60; Duration -3 Hrs)

Question Paper Pattern

There are THREE sections A, B and C.

Answer SEVEN questions in section A, FOUR questions in section B and FIVE questions in section C

Section – A (Short Answer questions)

Answer any SEVEN questions out of NINE

- **Each question carries 2 marks**
- Max.Marks = 7 x 2 = 14 Marks.
- ONE question must be of conceptual Reasoning type.
- *TWO questions must be of simple numerical problem type*

Section –B (Medium Length Answer questions/Problems)

Answer any FOUR questions out of SIX

- **Each question carries 4 marks**
- Max.Marks = 4 x 4 = 16 Marks
- *TWO main questions (or 10 Marks) must be of numerical problems type.*

Section –C(Long Answer questions)

Answer any FIVE questions out of SEVEN

- **Each question carries 6 marks**
- Max.Marks = 5 x 6 = 30 Marks
- *Questions requiring detailed explanation, analysis, derivation etc. are to be given.*
- *Numerical problems are to avoided in this section.*

B. Practical Examination (Max. Marks = 50; Duration – 3 Hrs)

Practical internal 25 marks and practical Exam 25 marks

Basis for Awarding Practical Internal Assessment Marks:

SlN	Particulars	IA Marks
1	Practical Test	**10**
2	Report on data sheet of Physics experiments/Seminar on Physics experiments, etc.	**10**
3	Active participation in practical classes	**05**
	TOTAL Practical IA Marks	**25**

SYLLABUS FOR OPEN ELECTIVES

FIRST SEMESTER

PHYSICS FOR ALL

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

Unit I	**Energy and Power** Explosions and energy; Energy, heat and its units; Energy table and discussions; Discussion of cost of energy; Measuring energy; Power; Different power sources; Kinetic energy.	(13 Hours)
Unit II	**Gravity, Force and Space** The force of Gravity; Newton's third law; Weightlessness; Low earth orbit; Geosynchronous satellites; Spy satellites; Medium Earth Orbit satellite; Circular Acceleration; momentum; Rockets; Airplanes, helicopters and fans; Hot air and helium balloons; angular momentum and torque.	(13 Hours)
Unit III	**Nuclei and radioactivity** Radioactivity; Elements and isotopes; Radiation and rays; Seeing radiation; The REM – The radiation poisoning; Radiation and cancer; The linear hypothesis; Different types of radiation; The half-life rule; Smoke detectors; measuring age from radioactivity; Environmental radioactivity; Glow of radioactivity; Nuclear fusion.	(13 Hours)
Unit IV	**Climate change** Global warming; IPCC; A brief history of climate; carbon dioxide; The greenhouse effect; Enhancement of Greenhouse effect; Hurricane and tornadoes; Antarctica; Fluctuations; Paleoclimate; Global warming vs Human caused global warming; Can we stop global warming?, Fossil Fuel Resources; Energy security; Energy efficiency and conservation; Bio-fuels; Nuclear, Wind and Solar power.	(13 Hours)
	References This course is extracted from the book titled "Physics and Technology for Future Presidents: An Introduction to the Essential Physics Every World Leader Needs to Know" by Richard A Muller, WW Norton and Company, 2007. (Unit-1 to 4 are from chapters 1, 3, 4 and 10, respectively).	

Sports Science

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

Content (Use maths of 10th Std only – Only qualitative discussion)		**Hrs**
Unit - 1		
Chapter No. 1	**Measurement**: Physical quantities. Standards and Units. International system of Units. Standards of time, length and mass. Precision and significant figures.	o4
Chapter No. 2	**Newton's laws of motion**: Newton's first law. Force, mass. Newton's second law. Newton's third law. Mass and weight. Applications of Newton's laws.	03
Chapter No. 3	**Projectile motion**: Shooting a falling target. Physics behind Shooting, Javelin throw and Discus throw.	03
Topics for self study (If any)	**https://www.real-world-physics-problems.com/physics-of-sports.html**	
Unit - 2		
Chapter No. 4.	**Conservation laws**: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing)	04
Chapter No. 5.	**Centre of mass**: Physics behind Cycling, rock climbing, Skating,	02
Chapter No. 6.	**Gravitation**: Origin, Newton's law of gravitation. Archimedes's principle, Buoyancy (Physics behind swimming)	04
Topics for self study (If any)	Archimedes' Principle: Made EASY | Physics in You tube	
Unit - 3		
Chapter No.7	**Food and Nutrition:** Proteins, Vitamins, Fat, Blood pressure. Problems due to the deficiency of vitamins.	04
Chapter No. 8	**Energy:** Different forms of Energy, Conservation of mass-energy.	03
Chapter No . 9	**Physical exercises:** Walking, Jogging and Running, Weight management.	03
Topics for self study (If any)	10 Best Exercises for Everyone – Healthline	
	Suggested Activities	
Activity No. 1	Identify the methods of measurement of time, length and mass from ancient time and build models for them.	02
	Reference : History of measurement - Wikipedia *https://en.wikipedia.org › wiki › History_of_measurem*	

Activity No. 2	Identify Physics principles behind various Sports activities.	01
	https://www.real-world-physics-problems.com/physics-of-sports.html	
Activity No. 3	List the difficulties experienced in Gymnastics, Cycling and weight lifting.	02
Activity No. 4	List the difficulties experienced in swimming.	01
Activity No. 3	List the difficulties experienced in Gymnastics, Cycling and weight lifting.	02
Activity No. 4	List the difficulties experienced in swimming.	01
Activity No. 5	Learn breathing exercises.	02
	Reference : 1)Simple Breathing Exercise for Beginners | Swami Ramdev *2) https://www.yogajournal.com*	
Activity No.6	Write an essay on Physical health v/s Mental health or conduct a debate on Physical health v/s Mental health.	01

Text Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics for Entertainment	Yakov Perelman	Createspace Independent Pub.	
2	Physics Everywhere	Yakov Perelman	Prodinnova	2014
3	Mechanics for Entertainment	Yakov Perelman	Prodinnova	2014
4	Handbook of Food and Nutrition	M.Swaminathan	Bangalore Press 2012	2012
5	Food Science	B. Srilakshmi	New Age International Pub	2015

References Books

Sl No	Title of the Book	Authors Name	Publisher	Year of Publication
1	Physics	Resnick, Halliday and Krane, Vol 1	Wiley Student Edition.	
2	For the love of Physics	Walter Lewin	Taxmann Publications Private Limited	2012
3	An Introduction to the Physics of Sports	VassiliosMcInnesSpathopoulos	CreateSpace Independent Publishing Platform	2013

Internet resources
https://www.topendsports.com/biomechanics/physics.htm
https://www.real-world-physics-problems.com/physics-of-sports.html
https://www.healthline.com/

https://www.mayoclinic.org/
https://www.who.int/news-room/

SYLLABUS FOR OPEN ELECTIVES

SECOND SEMESTER

ELECTRICAL INSTRUMENTS

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

Content		H
Unit - 1		
Chapter No. 1	Voltage and current sources, Kirchoff's current and voltage laws, loop and nodal analysis of simple circuits with dc excitation. Ammeters,voltmeters: (DC/AC)	03
Chapter No. 2	Representation of sinusoidal waveforms, peak and rms values, power factor. Analysis of single-phase series and parallel R-L-C ac circuits. Three-phase balanced circuits, voltage and current relations in star and delta connections. Wattmeters: Induction type, single phase and three phase wattmeter, Energy meters: AC. Induction type single phase and three phase energy meter	05
Chapter No. 3	Instrument Transformers: Potential and current transformers, ratio and phase angle errors, phasor diagram, methods of minimizing errors; testing and applications.	05
Topics for self study (If any)	Types of switches and Circuits, Safety precautions and rules in handling electrical appliances, Electric shock, first aid for electrical shocks, Fuses, MCB, ELCB and Relays, Filament lamp, Tube light, CFL and LED	
	Suggested Activities	
Activity No. 1	Identify variety of electrical switches and note down their applications/utility.	
	Reference: Weblink/Youtube/Book	
Activity No. 2	Identify the hazards involved in handling electrical circuits and instruments, make a list of safety precautions as well as first aid for electrical shocks.	
	Reference : Weblink/Youtube/Book	
Unit - 2		
Chapter No. 4.	Galvanometers: General principle and performance equations of D'ArsonvalGalvanometers, Vibration Galva nometer and Ballistic Galvanometer.	03
Chapter No. 5.	Potentiometers: DCPotentiometer, Crompton potentio meter, construction, standardization, application. AC Potentio meter, Drysdalepolar potentio meter; standardization, application.	03

Chapter No. 6.	DC/AC Bridges: General equations for bridge balance, measurement of self inductance by Maxwell's bridge (with variable inductance & variable capacitance), Hay's bridge, Owen's bridge, measurement of capacitance by Schearing bridge, errors, Wagner's earthing device, Kelvin's double bridge.	07
Topics for self study (If any)	Importance of grounding and Earthing, Methods for Earthing,	
	Suggested Activities	
Activity No. 3	Make a study of importance of grounding in electrical circuits.	
	Reference : Weblink/Youtube/Book	
Activity No. 4	Prepare a detailed account of various methods of earthing and their utility/applications	
	Reference : Weblink/Youtube/Book	
Unit - 3		
Chapter No.7	Transducer: Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT), Capacitive Transducers, Peizo-Electric transducers, Optical Transducer, Hall Effect Transducer	06
Chapter No. 8	CRO: Block diagram, Sweep generation, vertical amplifiers, use of CRO in measurement of frequency,phase, Amplitude and rise time of a pulse. Digital Multi-meter: Block diagram, principle of operation	03
Chapter No. 9	Basics of lead acid batteries, Lithium Ion Battery , Battery storage capacity, Coulomb efficiency, Numerical of high and low charging rates, Battery sizing.	04
Topics for self study (If any)	Fuses, MCB, ELCB and Relays, Filament lamp, Tube light, CFL and LED	
	Suggested Activities	
Activity No. 5	Prepare a document on evolution of incandescent bulbs to the present day LED lights	
	Reference : Weblink/Youtube/Book	
Activity No.6	Make a comparative study of Fuses, MCB, ELCB and Relays highlighting their use and applications	
	Reference : Weblink/Youtube/Book	

Text Books

AK.Sawhney, ACourse inElec.&Electronics Measurements&Instrumentation **,Dhanpatrai& Co. 1978**
A.D. Helfrick& W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques **PHI,2016**

References Books

1. D C Kulshreshtha, Basic Electrical Engineering, Mc Graw Hill Publications,**2019**
2. David G Alciatore and Michel B Histand, Introduction to Mechatronics and Measurement Systems, 3rd, Tata McGraw Hill Education Private Limited, New Delhi., 2005
3. Vincent Del Toro, Electrical Engineering Fundamentals Prentice Hall India**2009**

List of Experiments to be performed in the Laboratory

Sl No	Experiment
1	Introduction to Lab Equipment
2	Voltmeter Design
3	Ammeter Design
4	Ohmmeter Design
5	Multimeter Design
6	Measurement of Resistance using Wheatstone Bridge
7	Measurement of Capacitance using Schering Bridge
8	Measurement of Inductance using Maxwell Bridge
9	Measurement of Light Intensity
10	Measurement of Temperature
	Reference Book for Laboratory Experiments
	AK.Sawhney ACourse inElec.&Electronics Measurements&Instrumentation:
	Helfrick& Cooper, Modern Electronic Instrumentation and Measurement Techniques:

SPACE MISSIONS

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

Unit 1:	Introduction to Space Missions : Rockets, types and their applications, Different types of orbits, Artificial satellites – basic idea and their applications, Introduction to Space Missions, Beginning of Space Missions - World and India, Applications of Space Research, Space crafts, Launching Vehicles.	**13 Hours**
Unit 2:	National Aeronautics and Space Administration (NASA) About NASA and its Goals, History of Creation. Foundational human spaceflight: X-15 program (1954–1968), Project Mercury (1958–1963), Project Gemini (1961–1966), Project Apollo (1960–1972), Skylab (1965–1979), Apollo-Soyuz (1972–1975). Modern human spaceflight programs: Space Shuttle program (1972–2011), International Space Station (1993–present), Constellation program (2005–2010), Commercial Crew Program (2011–present), Journey to Mars (2010–2017), Artemis program (2017–present).	**13 Hours**
Unit 3:	Indian Space Research Organisation (ISRO) About ISRO and its Goals, History of Creation. General Satellite Programmes: The IRS series, The INSAT series. Gagan Satellite Navigation System, Navigation with Indian Constellation (NavIC), Other satellites. Launch vehicles: Satellite Launch Vehicle (SLV), Augmented Satellite Launch Vehicle (ASLV), Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle (GSLV). Experimental Satellites: Details and applications (Any Five) Earth Observation Satellites: Details and applications (Any Five) Communication satellites: Details and applications (Any Five)	**13 Hours**
	Self Study: Major Space Centres in the World (at least 10) – brief idea about their location, establishment, capabilities and achievements. People behind space programs – at least 2 from India. Successful Missions (Any Five). **Activities*:** • Design of working model of Rocket launching. • Preparation of report and presentation on application of satellites in agriculture, communication, weather forecasting, exploration of natural resources and Global positioning system (GPS). * Faculty may suggest any other relevant activity as well. Preparation of report and presentation onApollo 11: A Success story **Activities:** • Preparation of report and presentation on the recent space missions of NASA. • Preparation of report on any one proposed space programmeof NASA. * Faculty may suggest any other relevant activity as well. Chandrayaan 1: Details and applications. Mars Orbiter Mission: Details	

	and applications. **Activities:** • Preparation of report and presentation on the recent space missions of ISRO. • Preparation of report and presentation on any one proposed space programmeof ISRO. • Preparation of report and presentation on the contributions of Scientists from Karnataka to Indian Space Program and use of space technology in the local district. * Faculty may suggest any other relevant activity as well.	

B.Sc. DEGREE EXAMINATIONS

(Under New syllabus of NEP-2020 Scheme; Effective from Academic Year 2021-22)

SEMESTER: I/II

ELECTIVE COURSE and PAPER: PHYSICS – I/II

1. FORMATIVE ASSESSMENT (Max. Marks = 10)		
ASSESSMENT TYPE	**DETAILS/METHOD**	**MARKS**
Test	Theory paper IA tests	10
2. SUMMATIVE ASSESSMENT (End Semester Examination)		
Theory Examination (Max. Marks = 40; Duration -2 Hrs)		
Question Paper Pattern		
Section – A (Medium Length Answer questions)		
• Total Questions = 5. Questions to be answered = 4 • **Each question carries 5 marks** • Max. Marks = 4 x 5 = 20 Marks		
Section – B (Long Answer questions)		
• Total Questions = 3. Questions to be answered = 2 • **Each question carries 10 marks** • Max. Marks = 2 x 10 = 20 Marks		