SRI DHARMASTHALA MANJUNATHESHWARA COLLEGE, (AUTONOMOUS),UJIRE-574240

(Re-Accredited by NAAC at 'A' Grade with CGPA 3.61 out of 4)

DEPARTMENT OF PHYSICS

SYLLABUS

AS PER NEP 2020

(With effect from 2021-22)

SRI DHARMASTHALA MANJUNATHESHWARA COLLEGE, (AUTONOMOUS),UJIRE-574240

(Re-Accredited by NAAC at 'A' Grade with CGPA 3.61 out of 4)

DEPARTMENT OF PHYSICS

Syllabus of

Honour's Degree in Science
Subject: PHYSICS

(AS PER NEP 2020 GUIDELINES)
2021– 2022 onwards

Approved in BOS meeting on

……16-11-2021……..

Approved in Academics Council meeting held on

……

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SDM COLLEGE (AUTONOMOUS),UJIRE
DEPARTMENT OF PHYSICS

SYLLABUS -FOUR YEARS UNDERGRADUATE PROGRAMME

PREAMBLE

This program is a fundamental transformation to the current undergraduate education which replaces the conventional undergraduate programmes of Universities in the State. Outcome Based Education (OBE) practices will be used to design curriculum. It is proposed to develop Graduate Attributes at appropriate level which will act as common denominator for curriculum across universities. Curriculum shall focus on critical thinking and problem solving. Conscious efforts to develop cognitive and non-cognitive problem-solving skills among the learners shall be part of the curriculum. The programmes designed shall empower graduates as expert problem solvers using their disciplinary knowledge and collaborating in multi-disciplinary teams

SALIENT FEATURES

The program shall be structured in a semester mode with multiple exit options with Certification, Diploma and Basic Bachelor Degree at the completion of first, second and third years, respectively. The candidate who completes the four years Undergraduate Program, either in one stretch or through multiple exits and re-entries would get a Bachelors degree with Honours.

The students who exit with Certification, Diploma and Basic Bachelor Degree shall be eligible to re-enter the Programme at the exit level to complete the programme or to complete the next level

Graduate attributes

Some of the characteristic attributes of a graduate in Physics are

- Disciplinary knowledge and skills
- Skilled communicator
- Critical thinker and problem solver
- Sense of inquiry
- Team player/worker
- Skilled project manager
- Digitally Efficient
- Ethical awareness / reasoning
- Lifelong learners

Programme objectives

- To enhance Subject knowledge of all branches of Physics with exposure to new and recent developments in Physics
- To develop Experimental skills/Communication and Learning skills
- To enable ICT exposure through computer simulation experiments/presentations
- To have Research exposure through SRPs
- To develop Additional skills in the field of interest through CC
- To develop Scientific approach in attitude and reasoning, creativity and innovative ideas
- To create Awareness on energy conservation/environment/cleanliness
- To develop Motivation on Nation development

Programme Outcomes (POs)

PO-1: Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO-2: Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO-3: Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO-4: Ethics: Apply the professional ethics and norms in respective discipline.

PO-5: Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO-6: Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Programme specific outcomes

PSO1: Apply knowledge for developing technology to ease the problems related to the society.

PSO2: Understand the physical laws, concerning the motion of bodies, under the influence of system of forces.

PSO3: Understand the relationship between matter and energy

PSO4: Demonstrate the understanding of the core theories & principles of Physics, such as mechanics, electromagnetism, thermodynamics, & quantum mechanics.

PSO5: Understand the concepts, terminologies, methodologies of Physics

PSO6: Understand the fundamental theory of nature at small scale & levels of atom & sub-atomic particles

PSO7: Relate the structure of atoms & subatomic particles

PSO8: Understand physical properties of molecules and crystal structure

PSO9: Apply suitable mathematical theories to understand the laws of Physics

Curriculum Structure

(Core and Electives)

Semesters- I to X

SEM	DSC	Core Papers
Sem-1	A1	Mechanics & Properties of Matter
Sem-2	A2	Electricity and Magnetism
Sem-3	A3	Wave Motion and Optics
Sem-4	A4	Thermal Physics & Electronics
Sem-5	A5 A6	1. Classical Mechanics and Quantum Mechanics- I 2. Elements of Atomic, Molecular Physics
Sem-6	A7 A8	1. Elements of Nuclear Physics and Nuclear Instruments 2. Elements of Condensed Matter Physics
Sem-7	A9 A10 A11	1. Mathematical Methods of Physics – I 2. Classical Electrodynamics. 3. Experimental methods of Physics 4. Research Methodology (Select Two DSE subjects from the Pool B-I shown below)
Sem-8	A12 A13 A14	1. Classical Mechanics and Quantum Mechanics-II 2. Statistical Mechanics 3. Astrophysics & Astronomy 4. Research Project* (Select Two DSE subjects from the Pool B-II shown below) *In lieu of the research Project, two additional elective papers/ Internship may be offered.
Sem-9	A15	1. Mathematical Methods of Physics – II (Select One DSE subjects from the Pool B-III shown below) 2. Research Project
Sem-10	A17	1. Quantum Mechanics – III (Select One DSE subjects from the Pool B-IV shown below) 2. Research Project

Open Electives for 1st to 4th Semesters

Sem.	Courses
1.	P1. Energy Sources P2. Physics of devices and measuring instruments
2.	P1. Astronomy, Space Science P2. Basics of remote sensing and GIS
3.	Optical Instruments
4.	Physics for all

Discipline Specific Electives for 7th to 10th Semesters

	7th Sem Electives Pool B-I (Select any two)		8th Sem Electives Pool B-II (Select any two)
A.	Condensed Matter Physics-1	A.	Atomic & Molecular Physics-1
B.	Nuclear and Particle Physics	B.	Materials Physics & Nano materials
C.	Theoretical and Computational Physics-I	C.	Lasers and non-linear optics
D.	Biophysics	D.	Plasma Physics
E.	Astronomy and Astrophysics	E.	Physics of Semiconductor devices

	9th Sem Electives (Specialization papers) Pool B-III		10th Sem Electives (Specialization papers) Pool B-IV
A.	Condensed Matter Physics-2	A.	Condensed Matter Physics-3
B.	Nuclear and Particle Physics-2	B.	Nuclear and Particle Physics-3
C.	Atomic & Molecular spectroscopy-1	C.	Atomic & Molecular spectroscopy-2
D.	Materials Physics & Nanophysics –1	D.	Materials Physics & Nanophysics -2
E.	Theoretical and Computational Physics-I	E.	Theoretical and Computational Physics-2
F.	Astronomy and Astrophysics-1	F.	Astronomy and Astrophysics-2

COURSE PATTERN AND SCHEME

Core/ Elective	Paper Code	Title of the Paper	Instruction Hours	Duration of the Examination (Hrs)	Max. Marks			Credits
					Exam	IA	Total	
I Semester B.Sc.								
DSC1	Theory BSCPHDSC131	Mechanics and Properties of Matter	4	2	60	40	100	4
	Practical BSCPHDSP 132	Physics Practical I	4	4	25	25	50	2
OE1	Theory BSCPHOE1A,1B	Energy Sources Physics of devices and measuring instruments	3	2	60	40	100	3
Total number of Credits in I Semester: 09								
II Semester B.Sc.								
DSC2	Theory BSCPHDSC 181	Electricity and Magnetism	4	2	60	40	100	4
	Practical BSCPHDSP 182	Physics Practical II	4	4	25	25	50	2
OE2	Theory BSCPHOE2A,2B	Astronomy and Space science Basics of remote sensing and GIS	3	2	60	40	100	3
Total number of Credits in II Semester: 09								

Outline for Internal assessment (Theory)

Activity	1	2	Total marks
Internals	10	10	20
Assignments/Projects	10	10	20
Total	20	20	40

Outline for Internal assessment (Practicals)

Activity	Marks
Model Practical Exam	15
Continuous assessment	10
Total	25

Allotment of Marks for Practicals for I, II Semesters
(Max – 50)

Internal Assessment (Max. Marks 25)

Splitting:

Lab performance based on Continuous assessment	: 10
Model practical examination after completing the minimum number of experiments	:15
Total Marks.	: 25

Practical Examination

Practical Examination Paper of 4 hours duration paper (Max. Marks 25)

Formula	:	03
Diagram/circuit/setup	:	03
Observations and no. of trials	:	06
Knowledge about the Expt/Viva	:	03
Result and accuracy with units	:	02
Class Record	:	08

Total Marks -Practical Exam 25 (Minimum marks for pass =9/25)

Class records shall be valued at the time of Practical Exam by the External Examiner in consultation with Internal Examiner.

Record marks:

Regularity and completing the minimum number = 05marks
Neatness / General impression = 03 marks
Total = 08 marks

Total Marks = Internal Assessment marks +Practical Exam
= Max.25 + Max. 25 = 50

Resolutions of BOS Physics (approved)

1. Question once given to the candidate during the practical examination should not be changed under any circumstances.
2. Practical record shall be valued by the external examiner in consultation with the internal examiner.
3. Practical examination answer scripts should be valued jointly by the external and internal examiners.
4. The candidates shall produce a certified practical record book while appearing for the practical examination.
5. Scientific calculators without programming facility are only allowed.
6. Each candidate has to use his/her own calculator at the time of practical examination.

Detailed Syllabus for Semesters I & II

B.Sc., Physics

Semester – I

Code No : BSCPHDSC131

Mechanics and Properties of Matter

Programme Outcomes (POs)

PO-1: Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO-2: Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO-3: Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO-4: Ethics: Apply the professional ethics and norms in respective discipline.

PO-5: Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO-6: Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix:

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
CO-1: Will learn fixing units, tabulation of observations, analysis of data (graphical/analytical)	**x**	**x**				x
CO-2: Will learn about accuracy of measurement and sources of errors, importance of significant figures.	**x**	**x**				
CO-3: Will know how g can be determined experimentally and derive satisfaction.	**x**					
CO-4: Will see the difference between simple and torsional pendulum and their use in the determination of various physical parameters.	**x**			**x**	**x**	**x**
CO-5: Will come to know how various elastic moduli can be determined.	**x**				x	**x**
CO-6: Will measure surface tension and viscosity and appreciate the methods adopted.	**x**	**x**				
CO-7: Will get hands on experience of different equipment.	**x**	**x**	**x**		**x**	**x**

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course are Marked ‘X’ in the intersection cell if a course outcome addresses a particular program outcome.

Mechanics & Properties of Matter

Credits : 4+2 **Theory : 4 hours /Week**

Unit – 1

Chapter 1

Units and measurements: System of units (CGS and SI), dimensions of physical quantities, dimensional formulae. Minimum deviation, errors and error analysis **Vectors**: Instantaneous velocity and acceleration, Derivative of planar vector of constant magnitude but changing direction. Arbitrary planar motion, radial and transverse component of velocity and acceleration, deduction of the results of uniform circular motion. Problems

Chapter 2

Momentum and Energy: Work and energy, Conservation of linear and angular momentum. Conservation of energy with examples. Work energy theorem, Motion of rockets. Problems

Chapter 3

Special Theory of Relativity: Inertial and no-inertial frames of reference, Galilean transformation equation, Galilean principle of relativity. Search for absolute frame of reference, Ether concept, Null result of Michelson Morley experiment, Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Twin paradox, Doppler effect and applications Relativistic addition of velocities, Einstein's mass energy relation-photon box experiment. Problems 13 Hrs

Topics for self -study

Units and measurements: Measurement of length, mass and time. Laws of Motion: Newton's Laws of motion. Dynamics of single and a system of particles. Centre of mass.

Activities

i). Students can measure diameters of small balls of different size and estimate their volumes.

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

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. Students can try and understand conservation of momentum with help of coins and balls by referring to websites.

iv) Students can demonstrate law of conservation of momentum

Unit 2

Chapter 4

Laws of Motion: Conservative and non-conservative forces. Deduction of conservation of energy in conservative force field. Centre of mass. Simple harmonic motion – vertical oscillations of the light loaded spring, expression for force constant and determination of acceleration due to gravity, Damped oscillations (mention)-Problems

Chapter 5

Dynamics of Rigid bodies: Rotational motion about an axis, Relation between torque and angular momentum, Rotational energy. Moment of inertia: Theorem of perpendicular axis and Theorem of parallel axes, Moment of Inertia of a rectangular Lamina, Circular disc and ring and solid cylinders. Flywheel, its use, theory of compound pendulum and determination of 'g'. Problems

Chapter 6

Gravitation: 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). Dynamics of a Top ,Kepler's laws (statements)-Derivation of Kepler's Laws from Newtons law-. Satellite in a circular orbit. Problems

Chapter 7

Escape velocity, Geosynchronous orbits. Basic idea of global positioning system (GPS). Basics of remote sensing and GIS and applications 13 Hrs

Self-study

Calculation of MI of different objects, Kepler's laws

Activities

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, students can construct and perform simple experiments to verify that MI α mr2.

Students can try to understand law of inertial with the help of coins and balloons by referring to websites

Reference: www.khanacademy.org, www.pinterest.com, www.serc.cerleton.edn, https://www.youtube.com

Prepare suitable charts and give seminar talks related to moment of inertia, gravitation and planetary motion

(i) Rolling of different disc and cylinders on inclined plane to understand the moment of inertia. (ii) Listing and discussing the moment of inertia of bodies come across in daily life.

Unit 3

Chapter 8

Elasticity: Hooke's law - Stress-strain diagram, elastic moduli-relation between elastic constants, Necking and breaking strength. Elasticity and plasticity- graphical explanation. Creep, stress relaxation and fatigue. Thermal effect on stress and strain, practical applications 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. Torsional pendulum-Determination of rigidity modulus and moment of inertia - q, η and σ by Searle's method Bending moment of beams, Cantilever bending and uniform bending, I - section of girders. Application of elasticity (materials).Resistance of bent beams, columns pillars, struts, critical load-different cases- Problems 13 Hrs

Activities

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.

Repeat the above experiment with rubber and other materials and find out what happens after exceeding elastic limit. Plot and interpret.

Classifying different materials in to elastic and plastic materials. Studying the bending magnitudes of different shape and material rods

Unit 4

Chapter 9

Surface tension: Definition of surface tension. Surface energy, relation between surface tension and surface energy, pressure difference across curved surface example, excess pressure inside spherical liquid drop, angle of contact. Variation of surface tension with temperature and impurity and contamination, Effect of evaporation and condensation, Surface tension by drop weight method, Interfacial surface tension, Problems.

Chapter 10

Viscosity: Streamline flow, turbulent flow, equation of continuity, determination of coefficient of viscosity by Poiseuille's method, Stoke's method. Brownian motion. Super fluidity. Viscosity of gases , Problems. 13 Hrs

Self-study

Variation of surface tension with temperature, Surface tension by Capillarity rise, Application of viscosity.

Activities

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.

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

Text Books:

1) Mechanics by, New edition D. S. Mathur S. Chand & Co. 2000

2) Mechanics and Relativity by 3rd Edition, Vidwan Singh Soni, PHI Learning Pvt. Ltd. 2013

3) Mechanics- Berkeley Physics Course, Vol.1: Charles Kittel, et.al. Tata McGraw-Hill 2007

4) Properties of Matter by Brijlal & Subramanyam. S.Chand & Co 2014

5) Physics for Degree Students CL Aurora S.Chand & Co 2010

6) Mechanics J C Upadhyaya Himalaya 2016

References Books

1) Principles of Physics, 9 th Edn, Resnick, Halliday & Walker, Wiley 2013

2) Conceptual Physics, 10th Edn Paul G Hewit Pearson 2012

3) Introduction to Special Theory of Relativity Robert Resnick Wiley Student Edition 2014

4) Physics for Scientists and Engineers Jewett & Serway Cengage learning India Pvt Ltd, Delhi 2012

5)The Feynman Lectures on Physics – Vol 1 Richard P Feynman, Robert B Leighton, Mathew Sands Narosa Publishing House 1986

6)Physics – (International Student Edition) Marcelo Alonso & Edward J Finn Addison – Wesley 1999

7) Concepts of Modern Physics Arthur Beiser Tata McGraw Hill 1998

8) Modern Physics Kenneth Krane Wiley 2012
9) Newtonian Mechanics AP French Viva Books 2017
10) Modern Physics G Aruldhas & P Rajgopal PHI Learning Pvt. Ltd. 2009

BSCPHDSP 132: Practical 1 **4 Hrs Per week**

List of Experiments

(Minimum EIGHT experiments have to be carried out)

1. Determination of g using bar pendulum (two -hole method and L versus T 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 Stokes' method.
8. Verification of Hooke's law by stretching and determination of Young's Modulus.
9. Determination of surface tension of a liquid by drop weight method.
10 Study of motion of spring and to calculate the 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.
15 Determination of interfacial tension between two liquids using drop weight method.
16 Determination of viscosity of liquids by Poiseuille's method.
17.Computer simulation Experiment

Reference Book for Laboratory Experiments

1) Advanced Practical Physics for students B.L. Flint and H.T. Warson Asia Publishing House. 1971
2)A Text Book of Practical Physics I. Prakash & Ramakrishna Kitab Mahal, 11th Edition 2011
3) Advanced level Physics Practicals Michael Nelson and Jon M. Ogborn Heinemann Educational Publishers, 4th Edition 1985
4)A Laboratory Manual of Physics for undergraduate classes D.P. Khandelwal, Vani Publications. 1985
5) BSc Practical Physics Revised Ed CL Arora S. Chand & Co 2007
6) An advanced course in practical physics D. Chattopadhyay, PC Rakshit, B.Saha New Central Book Agency Pvt Ltd 2002

Semester – II

CODE NO:BSCPHDSC 181

Electricity & Magnetism

Programme Outcomes

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
i. Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.	x	x				
ii. Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.	x					
iii. Apply Gauss's law of electrostatics to solve a variety of problems.	x	x			x	
iv. Describe the magnetic field produced by magnetic dipoles and electric currents.	x					
v. Explain Faraday-Lenz and Maxwell laws to articulate the relationship between electric and magnetic fields.	x					
vi. Describe how magnetism is produced and list examples where its effects are observed.	x				x	x
vii. Apply Kirchhoff's rules to analyse AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor.	x	x			x	x
viii. Apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity, Maximum Power Transfer, etc. and their applications in electronics, electrical circuit analysis, and electrical machines.	x	x			x	x

Electricity & Magnetism

Credits: 4+2 **Theory: 4 hours /Week**

Unit I

Chapter 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), Problems. 3 Hrs

Chapter 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). 3 Hrs

Chapter 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). Constant potential surfaces, Potential due to a dipole and electric quadrupole. Problems 7 Hrs

Self study topics

Electric charge and field Coulomb's law, electric field strength, electric field lines, point charge in an electric field and electric dipole . Constant potential surfaces - for self learning Work out problems listed in the reference

Activity

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
3. With the help of glass rod, plastic rod, silk, and fur demonstrate the generation of charge and electrostatic attraction and repulsion.

4.Learn to use a multimeter (analog and digital) to measure voltage, current and resistance. Continuity testing of a wire.

5. Learn about household electrical connection terminals: Live, neutral and ground and voltage between the terminals. Role of earthing and safety measures

6.Study the working principle of house hold electrical devices

Unit 2

Chapter 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, Dielectric and Gauss's law, Problems. 6 Hrs

Chapter 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 currents in capacitor circuits, Resistor, inductor and capacitor and their combination, charging and discharging of capacitor. Force on a moving charge. Smart electrical devices, Problems. 7 Hrs

Self study

Currents and voltage in combination of R, L and C circuits, Kirchhoff's laws of voltage & Current

Activity

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)

3.Learn about power transmission: 3-phase electricity, voltage and phase

4. Visit a nearby electrical power station. Interact with line men, Electrical engineers and managers. Discuss about power loss in transmission. How to reduce it?

5. Prepare a small project report on street lighting and types of electrical bulbs

Unit 3

Chapter 6

Magnetism Definition of magnetic field, Ampere's law and Biot-Savart law (magnetic force and magnetic flux), Magnetic force on a current carrying conductor, Hall effect. Electromagnetic induction, conducting rod moving in a magnetic field, law of induction and mutual inductance, self- inductance and energy stored in a magnetic field. Problems 5 Hrs

Chapter 7

Alternating current circuits: Resonant circuit, alternating current, quality factor, RL, RC, LC, LCR circuits, admittance and impedance, power and energy in AC circuits. Filters – High and Low and band pass filters (qualitative) Applications, Problems. 8 Hrs

Self study

Force acting on a moving charge in electric and magnetic fields – Lorentz force, Magnetic dipole moment – torque on a magnetic dipole.

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.

3.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 8

Electromagnetic waves: Scalar and vector fields, operator grad, the gradient of a scalar function, integration theorems – line integral, surface integral, volume integral, divergence and curl of a vector, Gauss and Stokes theorems (qualitative), Equation of continuity, Maxwell's equations, displacement current, electromagnetic wave, energy transported by electromagnetic waves. Electromagnetic waves in different frames of reference, the field of a current loop, magnetic moment, Electric current in atoms, electron spin and magnetic moment, magnetization and magnetic susceptibility. 10 Hrs

Chapter 9

Types of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials. B-H hysteresis curves 3 Hrs

Self study

B-H curves and its characteristics Ferrites

Activity

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

3.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.

4.Identifying the magnetic meridian of the earth and measuring the magnetic dip at a place using the magnetic pointer. Discussion on magnetic equator

Text Books

1) Physics for Degree Students Volume 1 CL Aurora & PS Hemne S.Chand & Co 2010

2) Fundamentals of Magnetism and Electricity DN Vasudeva S Chand & Co 2011

3) Electricity and Magnetism R Murugesan S Chand & Co 2019

4) Electricity and Magnetism D C Tayal Himalaya 1989

Reference Books

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

3) The Feynman Lectures on Physics – Vol II Richard P Feynman, Robert B Leighton, Mathew Sands Narosa Publishing House 1986

4) Physics for Scientists and Engineers Jewett & Serway Cengage learning India Pvt Ltd, Delhi 2012

5) Physics – (International Student Edition) Marcelo Alonso & Edward J Finn Addison – Wesley 1999

BSCPHDSP 182: Practicals: List of Experiments for Practicals :4 Hrs Per week

(Minimum 8 to be performed)

1. Experiments on tracing of electric and magnetic flux lines for standard configuration.

2. Verification of Maximum Power Transfer Theorem.

3. Analysis of Phasor diagram.

4. Determination of capacitance of a condenser 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's bridge.

12. Determination of BH using Helmholtz double coil galvanometer and potentiometer.

13. Low pass and high pass filters.

14. Charge sensitiveness of BG.

15. Field along the axis of a coil.

16. Low resistance by potentiometer

17.Computer simulation experiment

Reference Books for Practicals

1) Advanced Practical Physics for students B.L. Flint and H.T. Worsnop Asia Publishing House. 1971

2) A Text Book of Practical Physics I. Prakash & Ramakrishna Kitab Mahal, 11th Edition 2011

3) Advanced level Physics Practicals Michael Nelson and Jon M. Ogborn Heinemann Educational Publishers, 4th Edition 1985

4) A Laboratory Manual of Physics for undergraduate classes D.P.Khandelwal Vani Publications. 1985

5)BSc Practical Physics Revised Ed CL Arora S.Chand & Co 2007

6) An advanced course in practical physics D. Chattopadhyay, PC Rakshit, B.Saha New Central Book Agency Pvt Ltd 2002

OPEN ELECTIVES

Open Elective 1 P1 **SEM I** **3 Hrs Per week**

CODE NO:BSCPHOE1A:ENERGY SOURCES
Programme Outcomes

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
CO - 1: Will be able to comprehend the varieties of energy sources and differentiate between the renewable and non-renewable sources of energy	**x**	**x**				
CO - 2: Will know the significance of solar energy and the different techniques to harness the solar energy	**x**	**x**				
CO - 3: Will gain the idea of the formation of waves and standing wave pattern, analysis of longitudinal and transverse waves.	**x**	**x**			**x**	
CO - 4: Will acquire the knowledge of wind energy and the methods to tap the energy from the blowing wind to generate electrical power.	**x**	x		x		
CO - 5: Will come to know about the conventional energy sources and its impact on the climate	**x**	x			**x**	
CO - 6: Will acquire the skill to set up a model to show the production of energy from different energy sources	**x**				**x**	**x**
CO - 7: Will be able to explain the different energy sources and how they are beneficial for the development of Technology.	**x**	**x**			**x**	**x**
CO - 8: Will be able to understand the problems of global warming and other climatic impact of the reckless usage of energy resources	**x**			**x**	**x**	**x**

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Unit 1

Non -Renewable energy sources

Chapter 1: Introduction-Energy concept-sources in general, its significance & necessity. Classification of energy sources: Primary and Secondary energy, Commercial and Non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy, Based on Origin-Examples and limitations. Importance of Non-commercial energy resources. 4 Hrs

Chapter-2: Conventional energy sources-Fossil fuels & Nuclear energy- production & extraction, usage rate and limitations. Impact on environment and their issues& challenges. Overview of Indian & world energy scenario with latest statistics- consumption & necessity. Need of eco-friendly & green energy & their related technology. 9 Hrs

Unit 2

Renewable energy sources

Chapter-1: Introduction: Need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity. 5 Hrs

Chapter 2 : Solar energy: Solar Energy-Key features, its importance, Merits & demerits of solar energy, Applications of solar energy. Solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell -brief discussion of each. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

8 Hrs

Unit 3

Chapter-3: Wind and Tidal Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy. 7 Hrs

Chapter-4 : Geothermal and hydro energy: Geothermal Resources, Geothermal Technologies. Hydropower resources, hydropower technologies, environmental impact of hydro power sources. Carbon captured technologies, cell, batteries, power consumption.

Energy storage techniques and devices, electrochemical energy storage, Magnetic and electrical energy storage 6Hrs

Activity

1. Demonstration of on Solar energy and wind energy using training modules at Labs.

2. Conversion of vibration to voltage using piezoelectric materials.

3. Conversion of thermal energy into voltage using thermoelectric (using thermocouples or heat sensors) modules.

4. Project report on Solar energy scenario in India

5. Project report on Hydro energy scenario in India

6. Project report on wind energy scenario in India

7. Field trip to nearby Hydroelectric stations.

8. Videos on solar energy, hydro energy and wind energy.

Reference Books:

1). Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi

2). Solar energy - M P Agarwal - S Chand and Co. Ltd.

3). Solar energy - Suhas P Sukhadev Tata McGraw - Hill Publishing Company Ltd.

4). Godfrey Boyle, “Renewable Energy, Power for a sustainable future”, 2004, Oxford University Press, in association with The Open University.

5). Dr. P Jayakumar, Solar Energy: Resource Assessment Handbook, 2009

6). J.Balfour, M.Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA).

7). http://en.wikipedia.org/wiki/Renewable_energy

OPEN ELECTIVES

Open Elective 1 P2 **SEM I** **3 Hrs Per week**

CODE NO:BSCPHOE1B

PHYSICS OF DEVICES AND MEASURING INSTRUMENTS

Programme Outcomes

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
CO - 1: Will be able to understand working principle of electronic devices	**x**	**x**				
CO - 2: Will be able to understand working principle of electrical devices	**x**	**x**				
CO - 3: will understand mobile communication process	**x**	**x**	x			
CO - 4: Will acquire the knowledge of digital cameras and digital storage techniques	**x**		x			x
CO - 5: Will understand the working principle of lightning arrestor	**x**	x	x			
CO - 6: Will acquire the knowledge on measuring instruments	**x**		x	x	**x**	**x**
CO - 7: Will be able to explain the working principle of CRO	**x**	**x**		x		**x**
CO - 8: Will be able to understand the use of CRO for measuring	**x**					**x**

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Unit 1

Working Principle of Electronic devices

Electric current, Ohms law, emf, Electric Power, KWh, generator, reactance, impedance, capacitor, inductor, choke &transformer. Introduction to Current and voltage measuring instruments: AC & DC Ammeter, AC & DC Voltmeter, watt hour meter, Potentiometer, Multi meter, use of CRO –Measurement of frequency/voltage/phase difference- Basic working principle of Radio/TV /-Mobile phones-Chargers-remote controllers-Blue tooth-2G/3G/5G Concepts-GPRS-Digital devices –digital measuring instruments-digital display-Digital camera-Resolution–Pixels-advantages and limitations-Digital Zoom-Optical Zoom. Digital storage devices-CD/DVD/Pen drive. 13hr

Unit 2

Working Principle of Electrical devices:

Working of switches (1-way 2-way), Principle and working of regulator, principle and working of starter and chokes, Domestic wiring -Application of Fuses, ELCB (Earth Leakage Circuit Breaker) Principle and working of lightning arrester-precautions during lightning-, Principle and working of Iron box, Mixer grinder-induction coil- Principle and working of filament bulb, tube light, fluorescent bulb and LED bulbs, Working of ceiling & table fan, working of Mixer and Grinder, Working of Fridge/ AC/-washing machine. Smart electrical devices 13 Hrs

Unit 3

Basics of Measurements: Instrument accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity

Cathode Ray Oscilloscope: Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only no mathematical treatment), . Specifications of a CRO and their significance. Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace 13hrs

Activity

- Opening some electronic devices and understanding the construction and working
- Opening electrical devices and understanding the construction and working
- Studying all functions of multimeter
- Using multimeter for measurement of different electrical parameters
- Opening an old CRO and studying its construction
- Visiting nearby work shops /laboratories
- List out the least counts of different instruments

- Design a voltage regulator with out put 5 V
- List out different sensors used in electronic appliances

Reference Books:

1. A text book in Electrical Technology - B L Theraja - S Chand and Co.
2. Performance and design of AC machines - M G Say ELBS Edn.
3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
4. Logic circuit design, Shimon P. Vingron, 2012, Springer.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
6. Electronic Devices and circuits, S. Salivahanan& N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill.
7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer 8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson
8.Electrical Engineering, MV Rao, Subhas Stores Books Corner, 2013
9. Electrical Wiring, SL Uppal, GC Gang, Khanna, 1986
10.. Electrical Engineering, NL Anwani, Dhanpat Rai& Sons, 1978

OPEN ELECTIVES

Open Elective 2 P1 **SEM 2** **3 Hrs Per week**

CODE NO:BSCPHOE2A
ASTRONOMY AND SPACE SCIENCE

PROGRAMME OUTCOMES

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
CO – 1: Will come to know the historical growth of Astronomy and the accumulation of knowledge.	**x**	**x**				
CO – 2 : Will be able to understand the basic principle of optical instruments such as telescope, binoculars.	**x**	**x**				
CO – 3: Will acquire the skills to set up the telescope and recognize the star clusters and also the planets and satellites.	**x**	**x**			**x**	
CO- 4: Will acquire the knowledge of wind energy and the methods to tap the energy from the blowing wind to generate electrical power.	**x**	x	x			
CO – 5: Will come to know about the conventional energy sources and its impact on the climate	**x**	x			**x**	
CO-6: Will be able to explain the stellar evolution and evolution of the universe.	**x**				**x**	**x**
CO- 7: Will be able to explain the principle of Rocket launching and other space machines.	**x**	**x**			**x**	**x**

CO-8: Will know the Indian Space program and its contribution for the nation building.	x			x	x	x

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Astronomy & Space Science

Unit 1

History and Introduction

Ancient Astronomy: Vedic Astronomy, Ancient Astronomy – Aryabhata, Varahamihira, Bhaskara Greek, Sumerian, Mayan, Egyptian, Arabic and Chinese Observations.

Medieval Astronomy: Geocentric Model, Heliocentric Model Observations by Tycho Brahe, Kepler, Galileo, Herschel and others.

Tools for Astronomy: Invention of Telescopes Pin Hole, Binoculars, Telescopes & Imaging.

Modern Astronomy :Hubble's discovery, Stellar Evolution (Brief), Microwave, Radio Telescopes. Observational Terminologies: Cardinal Directions, Azimuth, Altitude, Measurements using Compass and Hand. Equatorial Co-ordinates, Light years, Magnitude, Colors. 13 Hrs

Unit 2

Observational Astronomy

The Sun

Ecliptic and the Orientation of the Earth, Seasons - Solstices and Equinox, Observations of the Sun from Earth during seasons. Zero-shadow day Sunspots.

The Moon

Earth-Moon system – Phases, Lunar Eclipses, Ecliptic and Lunar Orbital Plane – Nodes, Lunar Month, Full Moon Names.

Inner Planets: Mercury & Venus

Observational History, Observational Windows, Appearance, Apparitions, Elongations, Superior Conjunctions, Inferior Conjunctions, Transits.

Outer Planets: Mars, Jupiter & Saturn

Observational History, Observational Windows, Appearance, Frequency of Oppositions Opposition, Conjunctions, Galilean Moons, Saturn's Rings

Distant or Minute Objects: Uranus, Neptune & Asteroids

Observational History, Observational Windows, Asteroid Belt, Prominent Asteroids.

Comets & Meteors

Origin, Orbital Nature, Historical Observations, Prominent Comets and Asteroids., Meteors, Origins and Showers

Occultations, Transits and Eclipses

Definitions, Prominent Occultations and Transits, Eclipses – Types and prominent occurrences. Famous Eclipses in the past. 13 Hrs

Unit 3

Space Missions

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.

Topics for 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).

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)

Topics for Self-study: Chandrayaan 1: Details and applications. Mars Orbiter Mission: Details and applications 13 Hrs

Reference Books

1) The Amateur Astronomer Sir Patrick Moore Springer 2006

2) Handbook of Practical Astronomy Gunter D. Routh Springer 2009

3) Fundamental Astronomy Hannu Karttunen Springer 2007

4) Guide to Night Sky P. Shankar KRVP 2007

5)The Complete Idiot's Guide to Astronomy Christopher De Pree and Alan Axelrod Pearson 2001

6) The story of Astronomy In India Chander mohan Research Gate 2015

7) Trigonometry - Inc. Bar Charts

8.) Stargazing for Dummies Steve Owens John Wiley & Sons 2013

9.) A Sky watcher's Year Jeff Kanipe Cambridge University Press 1999

10) The Casual Sky Observer’s Guide Rony De Laet Springer 2012

11). https://www.isro.gov.in/

OPEN ELECTIVES

Open Elective 2 P2 **SEM 2** **3 Hrs Per week**

Total 39 Periods

CODE NO: BSCPHOE2B:
BASICS OF REMOTE SENSING AND GIS

Programme Outcomes

PO - 1 Discipline Knowledge: Knowledge of science and ability to apply to relevant areas.

PO - 2 Problem solving: Execute a solution process using first principles of science to solve problems related to respective discipline.

PO - 3 Modern tool usage: Use a modern scientific, engineering and IT tool or technique for solving problems in the areas of their discipline.

PO - 4 Ethics: Apply the professional ethics and norms in respective discipline.

PO - 5 Individual and teamwork: Work effectively as an individual as a team member in a multidisciplinary team.

PO - 6 Communication: Communicate effectively with the stake holders, and give and receive clear instructions.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Program Outcomes (POs)

Course Outcomes (COs)	1	2	3	4	5	6
CO - 1: Will be able to understand remote sensing techniques	**x**	**x**				
CO - 2: Will know satellite data processing and available data products	**x**	**x**				
CO - 3: Will gain the idea of decision making on DBMS	**x**	**x**			**x**	
CO - 4: Will be able to utilise these advanced techniques in addressing the real world problems.	**x**	x				x
CO - 5: Will come to know about water management	**x**	x			**x**	
CO - 6: Will acquire the skill to understand GIS in agriculture	**x**		x	x	**x**	**x**
CO - 7:. Will acquire the skill to understand soil making	**x**	**x**			**x**	**x**
CO - 8: Will be able to understand image processing	**x**			**x**		**x**

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

OBJECTIVES:

- To introduce the principles and basic concepts of Remote Sensing and GIS
- To introduce the remote sensing systems, data products and analysis
- To introduce the spatial data models, analysis and presentation techniques
- To study the applications of Remote Sensing and GIS in agriculture, soil and water resources

Unit 1

Concepts of Remote sensing

Definition- Historical background - Components of remote sensing – Energy source, electromagnetic spectrum, radiation principle, platforms and sensors - Active and passive remote sensing interference - Atmospheric effects on remote sensing – Energy interaction with earth surface feature - Data acquisition - Reflectance, spectral signatures for water, soil and vegetation.- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT,SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution - Recent satellites with its applications

Data products –based on level of processing- o/p – scale – area/coverage – data availability – data ordering- data price - Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.

Unit 2

GIS and Data inputs and outputs

Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.

Data – Spatial, Non-Spatial – Database models – Hierarchical network, Relational and Object Oriented Data Models – Raster and Vector – Methods of Data input – Data Editing – Files and formats – Data structure – Data compression. Introduction to analysis – Measurements – Queries – Reclassification – Simple spatial analysis – Buffering – Neigh boring functions – Map overlay – Vector and raster – Spatial interpolation – Modelling in GIS – Digital Elevation Modelling – Expert systems

Unit 3

Applications

Crop Acreage estimation - Estimation of Crop Water Requirement – Crop condition - Soil mapping – classification of soil with digital numbers – soil erosion mapping- reservoir sedimentation using image processing - Inventory of water resources – water quality assessment - Application of Remote Sensing and GIS in Precision Agriculture - Monitor Crop Health - Management Decision Support Systems

ACTIVITY

- Studying electromagnetic spectrum
- Collecting data of different geostationary satellites
- Studying Patterns, geometry, graph analysis scale drawings.
- Studying data collected from internet
- Classification of different types of soils
- Testing of water types and qualities
- Collect the satellite images of clouds and try to analyse
- Study the sensors used in RS satellites

TEXT BOOKS:

1. Anji Reddy. M, Remote Sensing and Geographical Information Systems, BS Publications, Hyderbad, 2001
2. Lillesand, T. M., and Kiefer, R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 2000.

REFERENCES:

1. Bettinger, P., and Michael, G.W., "Geographical Information System: Applications in Forestry and Natural Resources Management," Tata McGraw–Hill Higher Education, New Delhi, 2003
2. Ian Heywood., "An Introduction to GIS", Pearson Education, New Delhi, 2001.
3. Jeffery Star and John Estes, "Geographical Information System – An Introduction," Prentice Hall India Pvt. Ltd., New Delhi, 1998.
4. Patel A.N & Surendra Singh, "Remote sensing principles & applications", Scientific Publishers , Jodhpur 1992

QUESTION PAPER PATTERNS

Question paper Pattern for I, II Semester end examinations

CODE NO: Reg No:

SRI DHARMASTHALA MANJUNATHESHWARA COLLEGE (AUTONOMOUS),UJIRE
CORE SUBJECT-SEMESTER END EXAMINATIONS-CBCS
B.Sc.-PHYSICS

PAPER-SEMESTER I/II

TOPIC-

TIME: 2HRS Max Marks 60

Note: Answer all Parts

PART- A

I. **Answer any FOUR of the following** 2X4=8

1)
2)
3)
4)
5)
6)

PART B

Answer all Units

UNIT-1

7. a) 4 marks
b) 6 marks

OR

c) 4 marks
d) 6 marks

UNIT-II

8. a) 4 marks
b) 6 marks

OR

c) 4 marks
d) 6 marks

UNIT-III

9. a) 4 marks
b) 6 marks

OR

c) 4 marks
d) 6 marks

UNIT-IV

10 a) 4 marks
b) 6 marks

OR

c) 4 marks
d) 6 marks

Part C

Solve any **THREE** of the following (one PROBLEM from each unit).

3x4=12

11(a)

(b)

(c)

(d)

xxxxxxxxxx

SHREE DHARMASTHALA MANJUNATHESHWARA COLLEGE (AUTONOMOUS), UJIRE

CORE SUBJECT-INTERNAL EXAMINATIONS-

PHYSICS

CODE NUMBER **PAPER -** **SEMESTER- 1/II**

TOPIC-

Time::1 hr **Max marks: 30**

I Answer any THREE of the following **2X3=6**

1.
2.
3.
4.

II Answer any TWO of the following

1

a) 4 Marks

b) 6Marks

2.

a) 4 Marks

b) 6 Marks

3

a) 4 Marks

b) 6Marks

III Solve any ONE of the following

4X1=4

1
2.

Xxxxxxxxx

SHREE DHARMASTHALA MANJUNATHESHWARA COLLEGE (AUTONOMOUS), UJIRE

OPEN ELECTIVES-INTERNAL EXAMINATIONS-

PHYSICS

CODE NUMBER **PAPER -** **SEMESTER- I/II**

TOPIC-

Time::1 hr **Max marks: 30**

I Answer any FIVE of the following **2X5=10**

1.
2.
3.
4.
5.
6.
7.

III Answer the Two the following

1a) 4 Marks

b) 6 Marks

2a) 4Marks

b) 6 Marks

3a) 4Marks

b) 6 Marks

Xxxxxxxxxx

QUESTION PAPER PATTERN –ELECTIVES-(TERM END EXAMINATION)

CODE NO: Reg No:

B.Sc.-PHYSICS

PAPER- **SEMESTER I/II**

TOPIC-

TIME: 2HRS **MARKS:60**

Answer all Parts

PART- A

I. **Answer any FOUR of the following** 2X4=8

1)
2)
3)
4)
5)
6)

PART-B

II. **Answer any FOUR of the following** 4X13=52

7)a)	5 Marks
b)	8 Marks
8)a)	5 Marks
b)	8 Marks
9)a)	5 Marks
b)	8 Marks
10)a)	5 Marks
b)	8 Marks
11)a)	5 Marks
b)	8 Marks

Xxxxxxxxxx