VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in

Physics

II Semester Syllabus

Bachelor of Science

With effect from 2021-22 and onwards

Semester-II

DSC 2: Electricity and Magnetism

Course Title: Electricity and Magnetism	**Course code: : 21BSC2C2EML**
Total Contact Hours: 55	**Course Credits: 04**
Internal Assessment Marks: 40 marks	**Duration of SEE: 03 hours**
Semester End Examination Marks: 60 marks	

Course Outcomes (CO's):

At the end of the course, students will be able to:

1. Apply electric field concepts to physical systems.
2. Interpret DC & AC electrical circuits.
3. Apply magnetism concepts to physical systems.
4. Apply vector analysis in electromagnet theory.
5. Explain magnetic properties of materials.

DSC 2: Electricity and Magnetism

Unit	Description	Hours
1	**Electric charge and field:** Coulomb's law and its limitations, Electric field strength, Electric field lines, Electric field due to a point charge, Electric field due to an electric dipole, Gauss's law and its applications (electric fields of a (i) uniformly charged sphere, (ii) uniformly charged hollow cylinder and (iii) an infinite flat sheet of charge). (5 hours) Electric potential, relation between field and potential, Potential due to a point charge (derivation), Potential due to an electric dipole and quadruple (derivation). Electrostatic potential energy of a system of charges (derivation). (6 hours)	11
2	**Basic Electrical components, Network theorems and AC:** Definition of resistance, Capacitance and Inductance and their expressions. Colour code and tolerance, Ideas of reactance, impedance and admittance. Review of Kirchhoff's Current and Voltage law, Thevenin's, Norton's, Reciprocity and maximum power transfer theorems with examples. (6 hours) Alternating Current: Expressions for mean and rms values of AC, Circuit analysis: RL, RC and LCR – series & parallel circuits using j-operator, Expression for Band width (derivation), Q- factor and Power in AC circuits. (5hours)	11
3	**Magnetism:** Statement of Biot-Savart law, Applications – (a) Magnetic field due to steady current in a long straight wire (b) Expression for force between twolong straight conductors, Ampere's circuit law, Applications – (a)	11

	Magnetic field near a long wire carrying current (b) Magnetic field due toa solenoid, Current loop as a dipole, Torque on a dipole.(5 hours) Electromagnetic induction: Review of Faradays laws of electromagneticinduction, Deduction of Faradays laws from Lorentz force. Induction andRelative Motion: A Conducting rod moving in a uniform magnetic field, Concept of self induction and mutual induction, Energy stored in amagnetic field (derivation). (6 hours)	
4	**Vector analysis and Electromagnetic theory:** **Vector Analysis:** Scalar and Vector products, Gradient of a Scalar and its physical significance, Divergence of a Vector and its physical significance, Curl of a Vector and its Physical significance. Vector integration: line, surface and volume integrals of a vector field, Gauss divergence theorem and Stokes theorem (statements). (5 hours) **Electromagnetic theory**: Equation of continuity, displacement current, Mention of Maxwell's equations - differential and integral forms and their physical significance, Electromagnetic waves in free space – speed of light, Derivation of Poynting theorem, Hertz experiment - Production of electromagnetic waves. (6 hours)	11
5	**Magnetic properties of matter:** Introduction to Magnetism: Magnetic dipole, magnetic dipole moment. Magnetisation, permeability and susceptibility, Relation between them, Concept of atomic currents, Gauss law of magnetism (Explanation), Relation between magnetic moment and angular momentum (derivation), Concept of orbital gyromagnetic ratio, Concept of Electron spin. (5 hours) Types of magnetic materials: Diamagnetic, paramagnetic and ferromagnetic materials and their B-H curves. Theories of magnetism: Langevin's theory of diamagnetism, Langevin's theory of Para magnetism and Domain theory of ferromagnetism. Hysteresis: Understanding the curve and its physical significance. (6 hours)	11

Text Books:

1. Electricity and magnetism with Electronics by Dr.K.K.Tewari, S Chand Publication.
2. Electricity and magnetism by Brijlal and N Subrahmanyam, Rathanprakashan, nineteenth edition
3. Electricity and magnetism with electronics by R. Murugeshan, S Chand Publication
4. Fundamentals of magnetism & Electricity by Vasudeva, S Chand Publication (2011)
5. Electricity and magnetism by N S Khare & S.S Srivastav, Atmaram & Sons, NewDelhi
6. Electricity and magnetism by B.S.Agarwal, KedarnathRamanath Publication(2017)

Reference Books:

1. Physics-Part-II, David Halliday and Robert Resnick, Wiley Eastern Limited, 2001
2. Berkeley Physics Course, Vol-2, Electricity and Magnetism, Edward M Purcell,Special Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008

DSC 2: Electricity and Magnetism Lab

Course Title: Electricity and Magnetism Lab	Course code: 21BSC2C2EMP
Total Contact Hours: 56	Course Credits: 02
Internal Assessment Marks: 25	Duration of SEE: 03 hours
Semester End Examination Marks: 25	

Course Outcomes (CO's):

At the end of the course, students will be able to:

1. Design experiments in electricity and magnetism.
2. Execute experiments in electricity and magnetism.
3. Experientially verify electrical theorems and measure electrical properties ofmaterials.

DSC 2: Electricity and Magnetism Lab

List of Experiments

1. Verification of Thevinin's theorem and Reciprocity theorem.
2. Verification of Norton's theorem and Maximum power theorem.
3. LCR Series and Parallel resonance- determination of resonance frequency, band widthand Q- factor.
4. Variation of electrical conductivity with temperature in Metals.
5. Variation of electrical conductivity with temperature in Semiconductors.
6. Determination of time constant of an RC Circuit (both charging and discharging)
7. Frequency of an AC using Sonometer.
8. Determination of capacitance using DeSauty's DC bridge using spot Galvanometer.
9. DeSauty's A C Bridge – determination of capacitance of a given capacitor.
10. Impedance of series RC circuits- determination of frequency of AC
11. Determination of components of earth's magnetic field.
12. Anderson's Bridge to determine the self inductance of a coil.

Note:

1. Minimum of EIGHT experiments must be carried out.
2. Experiments may be added as and when required with the approval of BoS.

References:

1. Physics through experiments, by B.Saraf, 2013, Vikas Publications.
2. Lab manual of Physics for undergraduate classes, 1st Edition, Vikas Publications.
3. B.Sc. Practical Physics by CL Arora, Revised Edition 2007, S. Chand & Co.
4. An advanced course in practical physics, D. Chatopadhyay, PC Rakshit, B.Saha,Revised Edition 2002, New Central Book Agency Pvt Ltd.

OEC 2: Physics in Everyday Life

Course Title: Physics in Everyday Life	**Course code: 21BSC2O2PH2**
Total Contact Hours: 42	**Course Credits: 03**
Internal Assessment Marks: 40 marks	**Duration of SEE: 03**
Semester End Examination Marks: 60 marks	
Prerequisites: High school level Science Knowledge **(Offered only to Non-ScienceStudents)**	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Explain physics in everyday life based on the concepts of mechanics.
2. Explain physics in everyday life based on the concepts of optics.
3. Explain physics in everyday life based on resistance, heat flow and heat transfer.

OEC 2: Physics in Everyday Life

Unit	Description	Hours
1	**The Laws of Motion:** Qualitative discussion of Newton's first law of motion, Inertia and types of inertia; Examples in everyday life: Falling backward when a bus moves quickly from rest, Moving forward when driver of a bus suddenly applies break, Getting down from a moving bus or train, Athlete taking a short run before a jump. Qualitative discussion of Newton's second law of motion; Examples in everyday life: Pushing a car and a truck, Pushing a shopping cart, Hitting a ball, Rocket launch, Driving a car and car crash. Qualitative discussion of Newton's third law of motion; Examples in everyday life: Pulling an elastic band, Swimming, Standing on the groundor sitting on a chair, Bouncing of a ball and the recoil of a gun.	09
2	**Projectile Motion, Friction, Periodic Motion and Law of Forces:** Qualitative discussion of projectile motion – maximum height, time of flightand range of the projectile; Examples in everyday life: Firing a Canon,Javelin throw, Hitting a Cricket Ball, Archery, Car and Bike Stunts, Discthrow. Qualitative discussion of friction and its types; Examples in everyday life: Walking, Writing, Skating, Lighting a matchstick, Driving of a vehicle on the surface, Flight of aeroplanes, Drilling of a nail into the wall. Qualitative discussion on Law of parallelogram of forces: Swimming, Boat movement, Flying of a bird, Shot of an arrow with Bow, Weight lifting. Qualitative discussion of periodic motion; Examples in everyday life: Swing, Hands of a clock, Motion of earth round the Sun, Motion of Moon around the Earth, Heartbeats, Rocking chair.	09

3	**Reflection and Refraction of Light:** Qualitative discussion of Reflection of light, laws of reflection; Examples in everyday life: Make-up mirrors, Mirrors in ammeters & voltmeters, Rear –view mirrors in cars, Mirrors in microscopes, Mirrors in Astronomical reflecting telescope, Parabolic mirrors in torches and car head lamps, Mirrors in dentist, Shop security mirrors. Qualitative discussion of Refraction of light , laws of refraction; Examples in everyday life: Twinkling of stars, Splitting of white light – VIBGYOR, Mirage formation, Rainbow formation, Image formation by lenses, Normal shifts and lateral shifts with examples. Qualitative discussion of Total internal reflection (TIR), Conditions for TIR; Examples in everyday life: TIR Prisms – Turning of light direction, Brilliance/Shining of diamond, Mirage formation, Optical fiber cable.	08
4	**Lenses, Scattering of light and lasers:** Qualitative discussion of lens, types of lenses, focal point and focal length;Examples in everyday life: Human eye as a lens, magnifying lens, eyeglasses – lenses for long sightedness and short sightedness, camera lens Qualitative discussion of scattering of light, types of scattering; Examples ineveryday life: Blue colour of sky, Red colour of the Sun during Sunset andSunrise, White colour of sky at noon, White colour of clouds. Qualitative discussion of laser light, ordinary light versus laser light; Examples in everyday life: communication, military, laser show, eye surgery, endoscopy, dentistry, laser drilling, laser cutting, laser welding.	08
5	**Resistance, Fluid flow and Heat transfer:** Qualitative discussion of Resistance, Heating effect of electric current; Examples in everyday life: Electric Stove, Iron Box, Electric heater, Electric bulb. Qualitative discussion on Streamline and turbulent flow; Examples in everyday life: flow of water in a pipe, flow of water in a river, waterfalls, Qualitative explanation of Bernoulli's principle, Examples in everyday life: Sprayer, gas burner, Carburetor. Qualitative discussion of heat transfer – conduction, convection & radiation; Examples in everyday life: Copper vessels, Packing of ice in saw dust, Wearing two shirts reduces cold, Bricks for cold storage, Wooden / ebonite handles of utensils, Heating of water in a vessel, Heat energy from the Sun.	08

References:

1. How Things Work – The Physics of Everyday Life by Louis A. Bloomfield, Wiley,6th Edition, 2016.
2. PUC I and II Year NCERT Text Books.
3. https://examples.yourdictionary.com/examples-of-inertia.html
4. https://byjus.com/physics/newtons-second-law-of-motion-and-momentum/

CBCS Question Paper Pattern for UG Semester End Examination with effect from the AY 2021-22

Languages /Discipline Core Courses (DSC) & Open Elective Courses (OEC)

Paper Code: **Paper Title:**

Time: 3 Hours **Max. Marks: 60**

Instruction: Answer all Sections

SECTION-A

1. Answer the following sub-questions, each sub-question carries **ONE** mark. (10X1=10)a).

b).

c).

d).

e).

f).

g).

h).

i).

j).

Note for Section-A: Two sub-questions from each unit.

SECTION-B

Answer any **FOUR** of the following questions, each question carries **FIVE** marks. (4X5=20)2.

3.

4.

5.

6.

7.

Note for Section-B: Minimum One question from each unit (Q No 2 to 6) and remaining one questionfrom unit II to V (Q.No. 7)

SECTION-C

Answer any **THREE** of the following questions, each question carries **TEN** marks. (3X10=30)8.

9.

10.

11.

12.

Note for Section- C: One question from each unit. Sub-questions such as 'a' and 'b' may be given fora question in section-C only.

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SEC & AECC Subjects

Paper Code: **Paper Title:**

Time: 1 Hours **Max. Marks: 30**

There shall be Theory examinations of **Multiple Choice Based Questions [MCQs]with Question Paper of A, B, C and D Series** at the end of each semester for **AECCs (Environmental Studies and (ii) Constitution of India) and SECs (SEC-1: Digital Fluency, SEC-2: Artificial Intelligence, SEC-3: Cyber Security and SEC-4: Societal Communication) for the duration of One hour (First Fifteen Minutes for the Readiness of OMR and remaining Forty- Five Minutes for Answering thirty Questions). The Answer Paper is of OMR (Optical Mark Reader) Sheet.**

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B.Sc. Physics Labs Semester End Examination Evaluation Scheme

Max. Marks: 25

Sl.No.	Attribute	Marks
1	Laboratory Record	05
2	Circuit Diagram / Ray diagram / Block diagram/Formulae / Tabular column	05
3	Procedure	02
4	Experimental Skill – Setup/Design & Conduct of Experiment	05
5	Calculation and Result accuracy	05
6	Viva Voce	03
	Total	**25**

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