

**Multidisciplinary Course (3 Credit)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Physics Around Us	3	3	0

**Course Outcomes**

After completion of the course, the student will be able to-

- CO 1-Understand the physical laws governing climate and atmosphere  
 CO2- Explore the use of Physics in agriculture and its product Preservation.  
 CO3-Importance of Renewable energy and Physics behind its various harvested types.

**Physics Around Us**

UNIT 1 01 Credit (15 hrs)

**Climate Science**

Atmospheric science as multidisciplinary science, physical and dynamical metrology weather climate variables, and their difference. Surface weather station weather forecasting, Greenhouse effect, Physics of Climate change and Climate model

Unit 2 01 Credit (15 hrs)

**Applications of Physics**

Application in Agriculture, Agro Physics, Agro ecosystem, Soil Physics, Food preservation, Physics behind medical imaging, LASER –Surgery.

Unit 3 01 Credit (15 hrs)

**Energy Sources-** Importance of Renewable energy ; solar energy, hydro thermal energy, Geothermal Energy, Hydrogen based Fuel , CNG , Energy Harvesting

Shankar  
14-06  
APD  
14.6.23.

Adhra  
14/6/23

B  
14.6.2023

### Multidisciplinary Course (3 Credit)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Crystallography	3	3	0

(03 Credit)

#### Course Outcomes

After completion of the course, the student will be able to-

CO 1-understand the structure of various crystal

CO2- know the theoretical framework like symmetry and space groups

CO3-know characterization of crystal using diffraction technique

CO4-know the analysis of collected diffraction data

### Crystallography

Unit 1

01 Credit (15 hrs)

Elements of Crystallography

Unit cell, Lattice and Basis, Symmetry operation for a two dimensional crystal, Two and Three dimensional Bravais lattice. Reciprocal lattice, Lattice constant crystal plane and Miller indices, Inter planar spacing, Simple crystal structure - hcp, fcc, bcc SC diamond and Cesium Chloride Structure.

Unit II

01 Credit (15 hrs)

Crystal Type and Crystal Binding

Ionic Crystal. Covalent crystal, Metal crystal, Molecular crystal. Hydrogen bonded crystal, Calculation of BE in different type of crystals, Crystal of inert gases.

Unit III

01 Credit (15 hrs)

XRay Diffraction

Diffraction, Bragg's law, Diffraction methods, Scattering by electrons, atoms. Laue, Bragg and Ewald Work on X-ray diffraction, Indexing of X-ray diffraction

Shanta K.  
14-06  
APd  
14.6.23.

Adhva  
14/6/23  
B  
14-6-2023

## Semester – III

### MDCPHY- 3 Mesoscopic Materials

Course Title	Credit	Credit Distribution	
		Theory	Practical
Mesoscopic Materials	3	3	0

#### Course Outcome

- The Students will be able to understand
- the mysterious world of Mesoscopic materials
- comprehend the use of nano-structured materials in our daily life
- develop a multidisciplinary scientific logic and connect it to our day-to-day life
- the fascination of the diversity of mother nature

#### Unit 1

(10 Hours)

Mesoscopic sizes materials of bulk size materials of sub molecular sizes, sizes of nanometer range

#### Unit 2

(10 Hours)

Specialty in Physical Properties: Size dependents of physical properties like mechanical strength electrical conduction and magnetic properties of materials, applications of materials properties at Nanoscale

#### Unit 3

(10 Hours)

Mesoscopic materials in daily life: computers, Sensors, High-efficiency lasers and LEDs, ductile, ceramics drugs delivery

References:

*Handwritten notes and signatures:*

*Archi*  
*up...*  
*21/09/23*

*BIS*  
*NO*  
*ADD*  
*Graded*

*H.S.J*  
*M*  
*P*  
*S*

*Ashutosh*

*Aprajita kushna*  
*21/9/23*

## MDCPHY3: Acquaintance of Electrical and Electronic Appliances

Course Title	Credit	Credit Distribution	
		Theory	Practical
Acquaintance of Electrical and Electronic Appliances	3	3	0

### Unit – I

#### Circuit Fundamental:

(10 Hours)

Voltage, Current, Power, Work, Short circuit, open circuit, Ohm's Law.

Definition of Resistance, Capacitance, Inductance, Series Resistance, Parallel Resistance

Passive circuit Element, General, Resistors, types of Resistors, Resistors color code, SI unit, Checking Resistance with ohm meter.

Multimeter, components testing using a multimeter, Inductor, Inductance of Inductor, Mutual Inductance, SI unit. Capacitor, Capacitance, types of Capacitors, Checking capacitor with ohm meter. SI unit.

### Unit – II

(10 Hours)

#### Electronic Devices:

Diode, Transistor, LED, definition of symbol of these.

AC Circuit definition, Sine wave, DC current.

Power socket Identifying the phase, neutral, earth on power socket.

IC, PCB, bread Board, use a tester to monitor AC power, soldering, fuse definition, definition of an analog circuit, Decimal circuit,

### Unit – III

(10 Hours)

#### Hands on Training

- How to repair an electric cord
- Installing a new plug
- Disassembling the Fan
- How to repair electric Fan

#### Reference:

A Course in Electrical. & Electronics Measurements & Instrumentation-AK. Sawhney, (Dhanpatrai & Co.) 1978

*Arjun*  
*Shreshth*  
*21/09/23*  
*Neeraj*  
*Ad*  
*1*  
*Shukla*  
*21/09/23*  
*MSA*  
*M*  
*un*  
*B*  
*Ashutosh*  
*Basu*  
*Aranya*  
*Aprijita*  
*Kyha*  
*21/9/23*



## History and Philosophy of Science

Course Title	Credit	Credit Distribution	
		Theory	Practical
<b>History and Philosophy of Science</b>	<b>3</b>	<b>3</b>	<b>0</b>

**L T P C**  
**3 0 0 3**

### Subject Objective

- To introduce some fundamental issues in the history and philosophy of science
- To provide some understanding of the general principles of scientific thinking and methodology.
- To aim at understanding and debating what is meant by scientific enterprise
- To explore the connection between history, science and philosophy.

### Expected Outcome

The Student will be able to learn

- Scientific method, reasoning, truth and evidence
- The contrast between empirical facts and philosophical facts.
- The change from Aristotelian worldview to the Newtonian worldview
- The recent developments in science especially relativity theory and evolutionary theory

### Unit 1: Fundamental Issues

(06)

What is science? , Science and its difference from other systems of belief and knowledge; science as a profession; difference between pure science and technology. Falsifiability, Instrumentalism and realism, problems and puzzles of Induction

### Unit 2: Science & Technology: from the Aristotle to the Newton

(12)

Greek Science. Seventeenth - century attack on Aristotelian Philosophy, Logical Reconstructionist, Philosophy of Science, Astronomical Data: The Philosophical Facts, The Ptolemaic System, The Copernicus System, Kepler's System, Galileo, Philosophical and conceptual connections in the Development of the New Science, Scientific Law Development of the Newtonian worldview 1700-1900

### Unit 3: Metaphysical foundations of Science : Recent Developments in Science and Worldviews

(12)

David Hume and the problem of causation, Naturalism and Anti-naturalism, Realism and antirealism about scientific theories; scientific explanation; and laws of nature, Karl

Anshu  
 SRD  
 21/09/23  
 APD  
 MSJ  
 All over  
 Ashutosh  
 21/09/23  
 Ashutosh  
 Apajita kishna  
 21/9/23

popper inductivism and falsificationism, Thomas s Kuhn Rationality in Paradigm Change, normal science and scientific revolutions, Feyeraband scientific rationality and irrationality

The special Theory of relativity, the general theory of relativity, Overview of the theory of Evolution, Philosophical and conceptual implications of Evolution, Worldviews: concluding Thoughts.

### Text Books:

- [1] Okasha Samir, *Philosophy of Science: A Very Short Introduction*, Oxford: Oxford University Press, 2002.
- [2] Richard DeWitt, *Worldviews: An Introduction to the History and Philosophy of Science*, Blackwell publishing, 2004.
- [3] Chalmers A. F., *What Is This Thing Called Science?*, (3<sup>rd</sup> ed.) Buckingham: Open University Press, 1999.
- [4] Christopher R. Hitchcock, *Contemporary Debates in the Philosophy of Science*, Blackwell, 2004.
- [5] John Losee, *A Historical Introduction to the Philosophy of Science*, Oxford University Press, 2001.
- [6] Hard M., A. Jamison, *Hubris and Hybrids. A Cultural history of Technology and Science*, Routledge, 2005.
- [7] Peter Godfrey-Smith *Theory and Reality: An Introduction to the Philosophy of Science*, University of Chicago

### Reference Books:

- Erickson, M, "Scientists and Scientific Communities" (Chapter 5) *Science, Culture and Society: Understanding Science in the 21st Century*, Cambridge: Polity, 2005.
- Haacking I., 'What is Scientific Realism?', in *Haacking, Representing and Intervening*, Cambridge: Cambridge University Press, 1983
- Popper K.R., Ch. 11, *Conjectures and Refutations*. Routledge & Kegan Paul.1963, pp. 253-292.
- Searle J., 'The Building Blocks of Social Reality' in Searle, *The Construction of Social Reality*, London: the Penguin Press, 1995, pp.1- 29.
- Shapin Steven, "Don't Let That Crybaby in Here Again," *London Review of Books*, September, 2000,

Aspir - Sharika 21/09/23  
Ganesh 21/09/23  
Ashtor  
Aprajita kshma 21/9/23  
APR - M.S.A.  
Ganesh  
A. M.

### MDCPHY3: Physics of Communication Technology

Course Title	Credit	Credit Distribution	
		Theory	Practical
Physics of Communication Technology	3	3	0

*Anshu*      *ms*      *PT-11*  
*Man*      *Nave*  
*Alpel*  
*Alud*  
*Shruti*      *21/09/2023*  
*Ashtor*  
*21/09/23*  
*Sukola*  
*21/09/2023*  
*Aprajita kishra*  
*21/9/23*

**SEMESTER-III**  
**MDCPHY-3 SPORTS SCIENCE**

Course Title	Credit	Credit Distribution	
		Theory	Practical
<b>SPORTS SCIENCE</b>	<b>3</b>	<b>3</b>	<b>0</b>

**Unit – 1:** **(10 Hours)**

Measurement: Physical quantities. Standards and Units. International System of Units. Standards of time, length and mass. Precision and significant figures.

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.

Projectile motion: Shooting a falling target. Physics behind Shooting, Javelin throw and Discus throw

**Unit 2:** **(10 Hours)**

Conservation laws: Conservation of linear momentum, collisions — elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing)

Centre of mass: Physics behind Cycling, rock climbing, Skating, Gravitation: Origin, Newton's law of gravitation. Archimedes's principle, Buoyancy (Physics behind swimming)

**Unit 3:** **(10 Hours)** Food and

Nutrition: Proteins, Vitamins, Fat, Blood Pressure. Problems due to the deficiency of vitamins. Energy: Different forms of Energy, Conservation of mass-energy.

Physical exercises: Walking, Jogging and Running, Weight management.

**Suggested Books:**

1. Physics for Entertainment-Yakov Perelman, Createspace Independent Pub.
2. Physics Everywhere, Yakov Perelman - Prodinova
3. Mechanics for Entertainment- Yakov Perelman – Prodinova
4. Food Science- Sri Lakshami, New Age Publications
5. Physics, Resnick, Holiday and Krane, Wiley Student Edition
6. An introduction to the Physics of Sports-Vassilios McInnes Spathopoulos, Createspace Independent publishing Platform

Internet resources <https://www.topendsports.com/biomechanics/physics.htm>

<https://www.real-world-physics-problems.com/physics-of-sports.html>

Topics for Self Study: <https://www.real-world-physics-problems.com/physics-of-sports.html>

Archimedes Principle: Made EASY Physics in You tube

*Anshu Sarda*  
21/05/23

*ADD TUT*  
*Arjun*

*Ashtor*  
Aparita kishna  
21/05/23



## SEMESTER III

### Atmospheric & SPACE SCIENCE

Course Title	Credit	Credit Distribution	
		Theory	Practical
<b>Atmospheric &amp;SPACE SCIENCE</b>	<b>3</b>	<b>3</b>	<b>0</b>

#### Objective:

(30 Hours)

To understand the basics of atmospheric and space science dealing with the structure of atmosphere, and stellar objects.

#### Expected Outcome

After this course, students will be able to

understand the structure of atmosphere

deal with tools and techniques used for space observation,

familiarize with our solar system,

realize the idea of the formation, evolution and classification of stars and

develop an idea of nucleosynthesis and formation of heavy nuclei and theories of the Universe

connect the multi-disciplinary nature of development in science and technology to enhance the capability of space observation

#### UNIT I

(10 Hours)

##### Earth and its atmosphere

Earth as a planet of the solar system: origin and internal structure, crustal types, heat flow and temperature gradient.

Elementary concepts of weather and climate; structure and composition of the atmosphere, Passage of solar radiation through the atmosphere, Atmospheric Windows, emissivity, Absorption spectra of atmospheric gases.

#### UNIT II

(10 Hours)

##### Introduction:

Perception of Space from early civilization to pre-telescopic era and post-telescopic era, Important International Organizations involved in Space Exploration.

Observation of Space through our eyes, its limitations, and further explorations through instrumental aids.

*Asish*  
*21/09/23*

*Shruti*  
*21/09/23*

*ABJ*

*Arshita*  
*21/09/23*

*Aparajita Kohra*  
*21/9/23*

Distance measuring units and Techniques for Distance Measurement, Use of Non-Optical Telescopes and its importance in space observation.

### UNIT III

(10 Hours)

### Solar system, Star - Formation, Evolution and Classification

Formation of our Solar System, Origin and Fate of our Sun and its source of energy, Solar Wind, Planets, Asteroids, Satellites and Comets.

Star Formation, Nucleo-Synthesis and Formation of Elements, Stellar Evolution and Stellar Remnants and Classification of Stars: Harvard Classification & Hertzsprung-Russell Diagram.

#### Suggested Books:

1. Astrophysics: A modern Perspective - K. S. Krishnaswami (New Age International)
2. Atmospheric Sciences: An introductory Survey - J.M. Wallace and P.V. Hobbs (Academic Press)
3. An Introduction to Astrophysics - Baidyanath Basu, T. Chattopadhyay, S. N. Biswas (PHI 2<sup>nd</sup> Eds.)
4. An Introduction to Atmospheric Radiation - K. N. Liou (Academic Press).

Anjali  
Sudhakar  
21/09/23  
M  
K-FI  
Kamp  
APD  
A.  
Anshu  
21/09/23  
Anshu  
Aprajita  
Kshne  
21/9/23