



**Central University of Himachal Pradesh**

(ESTABLISHED UNDER CENTRAL UNIVERSITIES ACT 2009)

Dharamshala, Himachal Pradesh-176215



# **NAAC Criterion-I**

## **Key Indicator –1.3.2**

### **List of Value added Courses and Syllabi**

#### **1.3.2 Evidences**



**Department of Physics and Astronomical Science**  
**Central University of Himachal Pradesh, Dharamshala,**  
**Kangra**



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### Department of Physics and Astronomical Science

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**Department of Physics and Astronomical Science**

**List of Value Added Course/Skill/Human Making/Internship/Project offered by the department during the period from 2017-18 to June 2021-22.**

**2017-18**

<b>Name of the value added courses offered</b>	<b>Course Code</b>
Nuclear Radiation and Safety (UG 2Cr)	PAS124
Community Connect Project (UG 8Cr)	PAS351
Science of Yoga (PG 2Cr)	PAS556
History and Philosophy of Science (PG 2Cr)	PAS417A
Project Work (PG 4Cr)	PAS548

**2018-19**

<b>Name of the value added courses offered</b>	<b>Course Code</b>
Nuclear Radiation and Safety (UG 2Cr)	PAS124
Community Connect Project (UG 4Cr)	PAS351A
Science of Yoga (PG 2Cr)	PAS556
Project Work (PG 4Cr)	PAS548
History and Philosophy of Science (PG 2Cr)	PAS417A

**2019-20**

<b>Name of the value added courses offered</b>	<b>Course Code</b>
Nuclear Radiation and Safety (UG 2Cr)	PAS124
Science of Yoga (PG 2Cr)	PAS556
History and Philosophy of Science (PG 2Cr)	PAS417A
Computer Simulation in Physics (PG 2Cr)	PAS414
Project Work (PG 4Cr)	PAS548

**2020-21**

<b>Name of the value added courses offered</b>	<b>Course Code</b>
Nuclear Radiation and Safety (UG 2Cr)	PAS124
History and Philosophy Science (PG 2Cr)	PAS417A
Science of Yoga (PG 2Cr)	PAS556
Scientific Writing and Presentation Skills (PG 2Cr)	PAS427A
Project Work (PG 4Cr)	PAS548

**2021-22**

<b>Name of the value added courses offered</b>	<b>Course Code</b>
Nuclear Radiation and Safety (UG 2Cr)	PAS5203
Bhartiya Astronomy and Kal Ganana (PG 2Cr)	PAS8207
Scientific Writing and Presentation Skills (PG 2Cr)	PAS8208

## History & Philosophy of Science

**Course Code: PAS 417A**

**Course Type: Human Making**

**Credits: 02**

### **Course Objectives:**

*Given the nature of Foundational Course and learners from diverse background, the course is designed to provide an overview of the course to the students i.e. the introduction of eastern philosophical thoughts leading to the evolution of modern scientific paradigm. It will start with the Indian tradition of Science, philosophical thoughts and quest for understanding nature starting from Vedic era, through Greeks and Arabs to the European lead modern science. Finally, the connection between the Indian thought and modern science is also discussed. It is believed that after completion of this course the students will get a holistic insight into the understanding of nature.*

### Course Contents

#### **Unit 1: Indian Tradition of Science (6 hours)**

- Indian efforts for understanding nature and the ultimate reality since the ancient times- starting from the Vedic era to the modern times,
- Science in the ancient texts, Biology, Chemistry, Mathematics and Astronomy, nomenclatures, Scientific Literature,
- Life sketches of ancient Indian scholars,
- Indian schools of thoughts on understanding the origin and evolution of nature and force behind, Kal-Ganana,
- Historical damage to the science and scientific temper, Imprints of science in the Indian social setup i.e. Daily routine, Life style, Festivals and Rituals, Quotes by various researchers.

#### **Unit 2: Nyaya and Vaisheshik Schools of Indian Thought (4 hours)**

- Nine main Indian Schools of Thoughts,
- The Logics of Nyaya to Understand the Nature and its Dynamism;
- Atomic Theory- Concepts of Atom, Molecule and Mind in Pluralistic tradition of Vaisheshik,
- Basic elements, Motion and Action in Space and Time.

#### **Unit 3: Western Ancient Schools of Thought (3 hours)**

- Life sketches and contributions of Scientists and Philosophers,
- Before the Greeks (Pre-history-600 BCE),
- Ancient Greek Science (600 BCE – 300 BCE).

#### **Unit 4: Evolution of Modern Science (5 hours)**

- Period of Stagnancy,
- Scientific Revolution and enlightenment,
- Modern understanding of Life and Universe.

#### **Unit 5: Parallel between Indian Thought and Modern Science (2 hours)**

- The connection between the Indian thought and Modern Science,
- The Unity of all things,
- Beyond the world of opposites,

- Space-Time, The Dynamic Universe,
- Emptiness and Form,
- The Cosmic dance, Patterns of change and Interpenetration.

**Prescribed Textbooks:**

1. S.C. Chatterjee and D.M. Dutta, An Introduction to Indian Philosophy, Calcutta University Press (1948).
2. Thomas L. Isenhour, The Evolution of Modern Science, e-book at bookboon.com (2013).
3. Fritzoff Capra, Tao of Physics, Shambhala Pub. Inc.1975.

**Other Recourses/Reference books:**

1. Keshav Dev Verma, Vedic Physics, Motilal Banarsidass Publishers (2012).
2. P.T. Raju, The Philosophical Tradition in India Motilal Banarsidass Publishers (1992).
3. M. Curd, J.A. Cover and C. Pincock, Philosophy of Science, WW Norton & Co. London 2013.
4. Thomas S. Kuhn, The Structure of Scientific Revolution, the Univ. of Chicago Press, Chicago, 1970.

## Nuclear Radiation and Safety

**Course Code: PAS124**

**Course Type: Skill**

**Credits: 2**

**Course Objectives:** The main aim of this course is to make you aware and understand the radiation hazards and safety. Students renew and expand their knowledge on nucleus and atom structure, and get basis of: different kinds of radioactive transformations, interactions of radiation with matter and its effects on living cells, detection of different kind of radiation, procedures of handling with radiation sources and applying radiation protection, basic knowledge of national and international legislation and recommendations in radiation protection. Students will become capable to implement the fundamental knowledge into everyday life and to critically consider benefits and risks of radiation.

**Course Outcomes:** After the completion of the course, the student will be able to:

**C01:** Understand the consequences of poor safety with regard to handling radioactive sources and nuclear radiations, in general.

**C02:** Be aware of and understand the key factors influencing the basis for nuclear safety.

**C03:** Understand the hazards associated with nuclear plant and how risks can be controlled.

**C04:** Get required to work in a radiation prone allied research fields.

### Course Contents

**Unit 1:** Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission. **(7 Lectures)**

**Unit 2:** Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, Interaction of Photons - Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), Interaction of Neutrons- Collision, slowing down and Moderation. **(7 Lectures)**

**Unit 3:** Radiation detection and monitoring devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived

Air Concentration (DAC). Radiation detection: Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Geiger Muller Counter), Scintillation Detectors (Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry. **(10 Lectures)**

**Unit 4:** Radiation safety management: Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management. **(6 Lectures)**

**Prescribed Text Books:**

1. Introductory Nuclear Physics, K. S. Krane, John Wiley & Sons Ltd
2. An Introduction to Nuclear Physics, W. N. Cottingham, D. A. Greenwood, Cambridge University Press.
3. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
4. Elements of Nuclear Physics, Walter E. Meyerhof, McGraw-Hill Book Company.

# Scientific Writing and Presentation

**Course Code:** PAS 427A

**Course:** Skill Development

**Course Credit:** 2

**Course Objectives:**

*The course is designed to , prepare scientific papers and presentations. These are introduced in Tutorial sessions; effectively use Latex for creating scientific documents and beamer presentations. These are in lab session.*

## Course Contents

### **1. Structure of a Scientific Paper**

- How to read a Scientific Paper
- How to write a Scientific Paper
- Preparation of Tables and Graphs
- Discussion of Results
- Writing an Abstract and choosing a Title
- The way to write a good Introduction
- All about referencing and Bibliography
- Putting it all together: Journal Paper, Research report, Thesis, Book

### **2. Art of making Presentations**

- The DOs and DON'Ts of a Good Presentation
- The Structure of a good presentation
- Tips for making good Oral Presentations

**Lab Sessions:**

#### **Lab 1: Introduction to Latex**

- Creating an article with title, author and date and running it to obtain the output

#### **Lab 2: Important parts of a scientific paper**

- Structure the content as Abstract, sections, sub-sections and the use of list environments, text formatting and page setting

#### **Lab 3: Generating tables of different styles**

- Create tables with multiple columns and multiple rows

#### **Lab 4: Inserting different types of graphs and pictures in different ways and sizes**

- Understand the graphics environment by inserting different types and sizes of graphs

#### **Lab 5: Typesetting equations of varying complexity**

- single line equations and multiple line equations using tabular environment



### **Lab 6: Referencing and Bibliography**

- Different styles of referencing used in various journals and how to prepare the bibtex file appropriately

### **Lab 7: Preparing reports and book**

- How to cross reference figures, tables, equations and references and create list of figures and table of contents

### **Lab 8: How to use Beamer in Latex for creating presentations**

- Creating Title Slide
- Outline of Presentation
- Making Bullets, Enumeration, etc
- Creating blocks
- Splitting the slide into multiple columns

**Reference:** Departmental Lab Manual

## Bharatiya Astronomy and Kal Ganana

**Course Code:**PAS8207

**Course Type:** IKS

**Credits:** 2

**Course Objectives:** *Bharata has a very rich and versatile knowledge system and cultural heritage. The Bharatiya knowledge system was developed during the Vedic period, the Saraswati-Sindhu Civilization, the Middle ages and is being practiced till the conditions of modern times. In this course the development of astronomy in Bharata from the far ancient time to the beginning of 20<sup>th</sup> century CE will be given. The students will learn the history and development of astronomy in Bharata. The main objectives of this course are as follows:*

- *Making students aware of the history and antiquity of astronomy in Bharata;*
- *Bharatiya contribution on the growth and development of modern astronomy;*
- *Contribution of Kerala School on astronomy and heliocentric model;*
- *References of various astronomical instruments;*
- *Astronomical basis of Bharatiya system of time reckoning and calendar;*
- *Archaeoastronomy and references for dating;*
- *Giving them Promoting the youths to do research in the various fields of Bharatiya knowledge tradition;*
- *Converting the Bharatiya wisdom into the applied aspect of the modern scientific paradigm.*

### **Course Outcomes:**

*It is anticipated that after completing this course the students would be quite aware of the rich and versatile knowledge in astronomy in Bharata. They will be clear about the following points:*

**CO1:** *The wonderful and excellence in the field of astronomy in Bharata;*

*Students aware of the history and antiquity of astronomy in Bharata;*

*Bharatiya contribution on the growth and development of modern astronomy;*

**CO2:** *Contribution of Kerala School on astronomy and heliocentric model;*

*Astronomical basis of Bharatiya system of time reckoning;*

*Archaeoastronomy and various astronomical references in the texts and architecture.*

**CO3:** *As such, after completion of this course the students will have a true and wider vision about the history and developments of astronomy and time measurement in Bharata.*

## **Course Contents**

### **UNIT -I: History of Astronomy in Bharata**

**(4 hours)**

History and culture of astronomy, Star observers, Sun, Moon, and Planets, Constellations, Astronomy in ancient Bharatiya literature, Originality of knowledge.

### **UNIT-II: Prominent Scholars and their Contributions**

**(4 hours)**

Aryabhaṭa-I, Varahamihira, Brahmgupta, Bhaskaracharya-II, Samantha Chandrasekhara, Glimpses of Vedanga Jyotisha, Aryabhatiya, Siddhantas, Siddhanta Shiromani, Pancha-Siddhantika, Contributions of Kerala School.

### **UNIT-III: Astronomical Observations and Instruments**

**(4 hours)**

Motion of Sun and Moon, Eclipses, Rotation of Earth, True positions of Sun, Moon, Planets and Stars, Epicycle model; Instruments used by Aryabhata and others, Observatories of Sawai Jai Singh, Megaliths - Some interesting sites.

**UNIT-IV: Bharatiya Kala Ganana**

**(4 hours)**

Micro level measurements, Day, Week, Month, Year, Yugas, Mahayuga, Manvantara, Kalpa, Panchanga, Solar and Lunar calendars.

**UNIT-V: Archaeoastronomy and Ancient Bharatiya Chronology**

**(4 hours)**

Astronomical references in stories, Precession of Equinox and Advances of perihelion position, Saraswati and Indus civilizations, Dating of Vedas and other texts and Mahabharata war.

**Textbooks:**

A Textbook on the Knowledge System of Bharata by Bhag Chand Chauhan, Under Publication by the CUHP Publication Bureau (2022).

The Story of Astronomy in India by Chandra Mohan (2015)  
<https://www.researchgate.net/publication/288838271>.

**Other Reference Books:**

History of Science in India Volume-1, Part-II by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata (2014).

Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).

The Astronomical Code of the Rigveda by Subhash Kak; Aditya Prakashan, New Delhi-110002 (2019).