Anekant Education Society's

Tuljaram Chaturchand College
of Arts, Science and Commerce, Baramati
(Empowered Autonomous)

Three/Four Year Honours/ Honours with Research B.Sc. Degree

Program in Physics

(Faculty of Science)

CBCS Syllabus

F.Y.B.Sc. (Physics) Semester – I & II

For Department of Physics

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

NEP-2.0

Choice Based Credit System Syllabus

(2024 Pattern)

(As Per NEP- 2020)

To be implemented from Academic Year 2024-2025

Title of the Programme: F.Y.B.Sc. (Physics)

Preamble

AES's Tuljaram Chaturchand College has made the decision to change the syllabus of across various faculties from June, 2024 by incorporating the guidelines and provisions outlined in the National Education Policy (NEP) 2020. The NEP envisions making education more holistic and effective and to lay emphasis on the integration of general (academic) education, vocational education and experiential learning. The NEP introduces holistic and multidisciplinary education that would help to develop intellectual, scientific, social, physical, emotional, ethical and moral capacities of the students. The NEP 2020 envisages flexible curricular structures and learning based outcome approach for the development of the students. By establishing a nationally accepted and internationally comparable credit structure and courses framework, the NEP 2020 aims to promote educational excellence, facilitate seamless academic mobility and enhance the global competitiveness of Indian students. It fosters a system where educational achievements can be recognized and valued not only within the country but also in the international arena, expanding opportunities and opening doors for students to pursue their aspirations on a global scale.

In response to the rapid advancements in science and technology and the evolving approaches in various domains of Physics and related subjects, the Board of Studies in Physics at Tuljaram Chaturchand College, Baramati - Pune has developed the curriculum for the first semester of F.Y.B.Sc. Physics, which goes beyond traditional academic boundaries. The syllabus is aligned with the NEP 2020 guidelines to ensure that students receive an education that prepares them for the challenges and opportunities of the 21st century. This syllabus has been designed under the framework of the Choice Based Credit System (CBCS), taking into consideration the guidelines set forth by the National Education Policy (NEP) 2020, LOCF (UGC), NCrF, NHEQF, Prof. R.D. Kulkarni's Report, Government of Maharashtra's General Resolution dated 20th April and 16th May 2023 and the Circular issued by SPPU, Pune on 31st May 2023. Physics is concerned with the study of the universe from the smallest to the largest scale: it is about unraveling its complexities to discover the way it is and how it works. Discoveries in physics have formed the foundation of countless technological advances and play an important role in many scientific areas. Many techniques used in medical imaging, nanotechnology and quantum computing are derived from physics instrumentation. Even the World Wide Web

was a spin-off from the information processing and communications requirements of high-energy particle physics. The contributions of physics to solving global problems such as energy production, environmental protection, global warming and public health are essential and have an enormous impact on our society.

The systematic and planned curricula from first year to third year/fourth year honours shall motivate and encourage the students for pursuing higher studies in Physics and for becoming an entrepreneur.

• Programme Specific Outcomes (PSOs)

PSO1: Understand basic mechanics and properties of matter.

PSO2: Illustrate the principles of electricity, magnetism, thermodynamics, optics and spectroscopy.

PSO3: Identify, formulate and analyze complex problems using basic principles of mathematics, physics and statistics.

PSO4: Design, construct and analyze basic electronic and digital circuits.

PSO5: Understand the basics of programming language and apply it to various numerical problems

PSO6: Develop effective communication skills

PSO7: Develop experimental skills and independent work culture through a series of experiments that compliment theories and projects.

Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

Board of Studies (BOS) in Physics

From 2022-23 to 2024-25

Sr. No.	Name	Designation
1	Prof.Dr.A.E.Kalange	Vice-Principal, Chairman, BOS
2	Prof.Dr.S.S.Veer	Member, Expert from SPPU, Pune
3	Prof.Dr.K.Y.Rajpure	Member, Exprt from Shivaji University, Kolhapur
4	Prof.Dr.K.R.Priolkar	Member, Exprt from Goa University
5	Mr.Subhash Zambare	Representative from Industry
6	Dr.Swapnil Nardekar	Alumni & Research Scholar at Jehu National University, South Korea
7	Dr.R.D.Kale	Member
8	Dr.R.T.Sapkal	Member
9	Dr.S.B.Kulkarni	Member
10	Mr.S.B.Kakade	Member
11	Dr.V.S.Mohite	Member
12	Mrs.S.E.Bhosale	Member
13	Mr.S.S.Mhaske	Member
14	Mr.S.M.Thorat	Member
15	Phadtare Dnyneshwari	Student Representative
16	Hole Dhanshree	Representative Student

Credit Distribution Structure for Three/Four Year Honours/Honours with Research Degree Programme
With Multiple Entry and Exit options as per National Education Policy (2024 Pattern as per NEP-2020)

Level/ Difficulty	Sem	Subject DSC-1				Subject DSC-2	Subject DSC-3	GE/OE	SEC	IKS	AEC	VEC	CC	Total
4.5/100	I	2(T)+2(P)				2(T)+2(P)	2(T)+ 2(P)	2(T)	2 (T/P)	2(T) (Generic)	2(T)	2(T)	--	22
	II	2(T)+2(P)				2(T)+2(P)	2(T)+2(P)	2(P)	2 (T/P)	--	2(T)	2(T)	2(T)	22
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/Internship OR Continue with Major and Minor **Continue option**: Student will select one subject among the (subject 1, subject 2 and subject 3) as major and other as minor and third subject will be dropped.														
Level/ Difficulty	**Sem**	**Credits Related to Major**				**Minor**	--	**GE/OE**	**SEC**	**IKS**	**AEC**	**VEC**	**CC**	**Total**
		Major Core	**Major Elective**	**VSC**	**FP/OJT/CEP/RP**									
5.0/200	III	4(T)+2(P)	--	2 (T/P)	2(FP)	2(T)+2(P)	--	2(T)	--	2(T)	2(T)	--	2(T)	22
	IV	4(T)+2(P)	--	2 (T/P)	2(CEP)	2(T)+2(P)	--	2(P)	2 (T/P)	--	2(T)	--	2(T)	22
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4credits core NSQF course/Internship OR Continue with Major and Minor														
5.5/300	V	8(T)+4(P)	2(T)+2(P)	2 (T/P)	2(FP/CEP)	2(T)	--	--	--	--	--	--	--	22
	VI	8(T)+4(P)	2(T)+2(P)	2 (T/P)	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 3Years		**44**	**8**	**8**	**10**	**18**	**8**	**8**	**6**	**4**	**8**	**4**	**6**	**132**
Exit option: Award of **UG Degree in Major** with 132 credits OR Continue with Major and Minor														
6.0/400	VII	6(T)+4(P)	2(T)+2 (T/P)	--	4(RP)	4(RM)(T)	--	--	--	--	--	--	--	22
	VIII	6(T)+4(P)	2(T)+2 (T/P)	--	6(RP)	--	--	--	--	--	--	--	--	22
Total 4Years		**64**	**16**	**8**	**22**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year **UG Honours with Research Degree** in Major and Minor with 176 credits														
6.0/400	VII	10(T)+4(P)	2(T)+2 (T/P)	--	--	4(RM) (T)	--	--	--	--	--	--	--	22
	VIII	10(T)+4(P)	2(T)+2 (T/P)	--	4 (OJT)	--	--	--	--	--	--	--	--	22
Total 4Years		**72**	**16**	**8**	**14**	**22**	**8**	8	**6**	**4**	**8**	**4**	**6**	**176**
Four Year **UG Honours Degree** in Major and Minor with176 credits														

T = Theory **P** = Practical **DSC** = Discipline Specific Course **OE** = Open Elective **SEC** = Skill Enhancement Course
IKS = Indian Knowledge System **AEC** = Ability Enhancement Course **VEC** = Value Education Course **CC** = Co-curricular Course **VSC**= Vocational Skill Course
OJT= On Job Training **CEP**= Community Engagement Project **FP**= Field Project **RP**= Research Project

Course Structure for F.Y.B.Sc. (2024 Pattern) as per NEP-2020

Sem	Course Type	Course Code	Course Title	Theory/ Practical	Credits
I	DSC-I (General)	-101-GEN		T	02
		-102-GEN		P	02
	DSC-II (General)	-101-GEN		T	02
		-102-GEN		P	02
	DSC-III (General)	PHY-101-GEN	Mechanics & Properties of Matter	T	02
		PHY-102-GEN	Physics Practical-I	P	02
	Open Elective (OE)	PHY-103-OE	Indian Astronomy-I	T	02
	Skill Enhancement Course (SEC)	PHY-104-SEC	Applications of Internet of Things-I	P	02
	Ability Enhancement Course (AEC)	ENG-104-AEC		T	02
	Value Education Course (VEC)	ENV-105-VEC		T	02
	Generic Indian Knoweldge System (GIKS)	GEN-106-IKS		T	02
	Total Credits Semester-I				**22**
II	DSC-I (General)	-151-GEN		T	02
		-152-GEN		P	02
	DSC-II (General)	-151-GEN		T	02
		-152-GEN		P	02
	DSC-III (General)	PHY-151-GEN	Heat and Thermodynamics	T	02
		PHY-152-GEN	Physics Practical –II	P	02
	Open Elective (OE)	PHY-153-OE	Indian Astronomy -II	P	02
	Skill Enhancement Course (SEC)	PHY-154-AEC	Applications of Internet of Things-II	P	02
	Ability Enhancement Course (AEC)	ENG-154-AEC		T	02
	Value Education Course (VEC)	COS-155-VEC		T	02
	Co-curricular Course (SS)	YOG/PES/CUL/ NSS/NCC-156-CC	To be selected from the CC Basket	T	02
	Total Credits Semester-II				**22**
	Cumulative Credits Semester-I + Semester-II				**44**

• Programme Outcomes (POs)

PO1: Disciplinary knowledge

PO2: Critical thinking and problem solving

PO3: Social compitence

PO4: Research related skills and scientific temper

PO5: Trans-disciplinary knowledge

PO6: Personal and professional competence

PO7: Effective citizenship and ethics

PO8: Environment and sustainability

PO9: Self-directed and life-long learning

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc Physics (2024 Pattern)

Name of the Programme : B.Sc. Physics
Programme Code : USPH
Class : F.Y.B.Sc.
Semester : I
Course Type : General (Theory)
Course Code : PHY-101-GEN
Course Title : Mechanics & Properties of Matter
No. of Credits : 02
No. of Teaching Hours : 30

Course Objectives:

The student will learn:

1. Understanding of basic laws of motion
2. Application of laws of motion
3. Concept of work, energy and power
4. Understanding of conservation of energy and its applications
5. Basic definitions (stress, strain, Hooke's law, and Poisson's ratio) of elasticity
6. Definition of Cantilever and expression for depression and elevation &Torsional Pendulum - determination of rigidity modulus and time period.
7. Bending of beams and expression for bending moment

Course Outcomes:

On successful completion of this course students will be able to do the following:

CO1. Understand the concepts of energy, work, power, conservation of energy and be able to perform calculations using them.
CO2. Understand the concepts of elasticity and be able to perform calculations using them.
CO3. Understand the concepts of surface tension and viscosity and be able to perform calculations using them.
CO4. Use of Bernoulli's Principle in real life examples.
CO5. Demonstrate quantitative problem-solving skills in all the topics covered.
CO6. Apply the equation of motion to one or two dimensions of the system in order to understand kinematics of the body under the various conditions of applied force

CO7. Apply knowledge in understanding the flow of liquid and surface tension applied on the surface of liquid

Topics and Learning Points

UNIT 1: Motion (5L)

1.1 Introduction (motion, displacement, velocity, acceleration, forces)
1.2 Various types of forces in nature
1.3 Newton's laws & its applications.
1.4 Limitation of Newton's laws of motion
1.5 Newton's law of gravitation.
1.6 Frame of reference: Inertial and non- inertial
1.7 Introduction to classical relativity
1.8 **Problem Solving**

UNIT 2: Work and Energy (6L)

2.1 Introduction (work, energy, power)
2.2 Work and Work-Energy theorem
2.3 Calculation of work done with constant force and variable force
2.4 Conservative and non-conservative forces
2.5 Potential energy and conservation of mechanical energy
2.6 Change in potential energy in rigid body motion
2.7 Mass-energy equivalence
2.8 **Problem Solving**

UNIT 3: Properties of Matter (12L)

3.1 Introduction: **(**surface tension, angle of contact)
3.2 Rise of liquid in a conical capillary tube
3.3 Jaeger's method for determination of surface tension
3.4 Factors affecting surface tension
3.5 Applications of surface tension (washing of cloths with detergents, surfactants, capillary action)
3.6 Work done during longitudinal strain, volume strain, shearing strain and Poisson's ratio.
3.7 Determination of Y of thin rectangular bar loaded at the center

3.8 Torsional oscillations

3.9 **Problem solving**

Unit 4: Fluid Mechanics **(7L)**

4.1 Introduction**:** (Concept of viscous force and viscosity, Pressure in a fluid, buoyancy, Pascal's law, and Archimedes Principle)

4.2 Atmospheric Pressure and Barometer

4.3 Pressure difference in liquid accelerating vertically upward with an acceleration a0

4.4 Steady and turbulent flow, Reynolds's number

4.5 Equation of continuity

4.6 Poiseuille's equation

4.7 Bernoulli's Principle and its application (Venturimeter, Aspirator Pump)

4.8 **Problem Solving**

References:

1) University Physics: Sears and Zeemansky, XIth edition, Pearson education

2) Concepts of Physics: H.C. Varma, Bharati Bhavan Publishers

3) Problems in Physics: P.K. Srivastava, Wiley Eastern Ltd.

4) Applied Fluid Mechanics: Mott Robert, Pearson Benjamin Cummir, VI Edition,

5) Pearson Education/Prentice Hall International, New Delhi

6) Properties of Matter: D. S. Mathur, ShamlalChritable Trust New Delhi

7) Mechanics: D.S Mathur, S Chand and Company New Delhi-5.

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc (Sem- I) **Subject**: Physics

Course: Mechanics and Properties of matter **Course Code**: PHY-101-GEN

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3		1	2	2		1		3
CO 2	3		1	2	2		1		3
CO 3	3		1	2	2		1		3
CO 4		3	1	2	2		1		3
CO 5		3	1	2	2		1		3
CO 6			1	2	2	3	1		3
CO7			1	2	2		1	2	3

Justification

PO1: Disciplinary Knowledge

CO1. Understand the concepts of energy, work, power, conservation of energy and be able to perform calculations using them. Weightage: 3

The understanding and application of energy concepts are fundamental to disciplinary knowledge in physics.

CO2. Understand the concepts of elasticity and be able to perform calculations using them. Weightage: 3

Elasticity is a key concept in physics, and understanding it is crucial for disciplinary knowledge.

CO3. Understand the concepts of surface tension and viscosity and be able to perform calculations using them. Weightage: 3

Surface tension and viscosity are essential concepts within the discipline of physics.

PO2: Critical Thinking and Problem Solving

CO4. Use of Bernoulli's Principle in real-life examples Weightage: 3

The application of Bernoulli's Principle involves critical thinking and problem-solving skills.

CO5. Demonstrate quantitative problem-solving skills in all the topics covered. Weightage: 3

Quantitative problem-solving is a central aspect of critical thinking in physics.

PO3: Social Competence

All COs: CO1 to CO7 Weightage: 1

The technical nature of the content in CO1 to CO7 is not directly related to social competence (PO3).

PO4: Research-related Skills and Scientific Temper

All COs: CO1 to CO7 Weightage: 2

There is a moderate connection as the application of scientific principles (PO4) is involved in understanding and solving problems related to CO1 to CO7.

PO5: Trans-disciplinary Knowledge

All COs: CO1 to CO7 Weightage: 2

There is a moderate connection as the application of disciplinary knowledge (PO1) involves aspects that may span multiple disciplines.

PO6: Personal and Professional Competence

CO6. Apply the equation of motion to one or two dimensions of the system in order to understand kinematics of the body under the various conditions of applied force.

Weightage: 3

The application of the equation of motion (CO6) directly contributes to personal and professional competence (PO6).

PO7: Effective Citizenship and Ethics

All COs: CO1 to CO7 Weightage: 1

The direct connection to effective citizenship and ethics (PO7) is weak in the technical content areas covered.

PO8: Environment and Sustainability

CO7. Apply knowledge in understanding the flow of liquid and surface tension applied on the surface of liquid. Weightage: 2

The application of knowledge in understanding the flow of liquids (CO7) has some relevance to environmental and sustainability considerations (PO8).

PO9: Self-directed and Life-long Learning

All COs: CO1 to CO7 Weightage: 3

The continuous learning aspect (PO9) is inherent in understanding and applying the principles in all the specified content areas (CO1 to CO7).

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Physics (2024 Pattern)

Name of the Programme : B.Sc. Physics

Programme Code : USPH

Class : F.Y.B.Sc.

Semester : I

Course Type : General (Practical)

Course Code : PHY-102-GEN

Course Title : Physics Practical-I

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To help develop habit of practice in the experimental skill developments.
2. To develop experimental skills in due course of time.
3. To introduce students to different apparatus & instruments, and demonstrate the skill based experiments.
4. To explain association between theoretical ideas and experimental skills.
5. To emphasize the need of practice in the skill developments.
6. To develop experimental skills in due course of time.
7. To help grow confidence while performing the practical individually.

Course Outcome:

After successfully completing this laboratory course, the students will be able to do the following:

CO1. Acquire technical and manipulative skills in using laboratory equipment, tools and materials.

CO2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data.

CO3. Demonstrate an understanding of laboratory procedures including safety and scientific methods.

CO4. Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena.

CO5. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.

CO6. To correlate their physics theory concepts through practical

CO7. To understand and practice the skills while doing physics practical.

List of Practicals

1. Mechanics

1 Use of tools and instruments as a measuring device
(Vernier calliper, micrometer screw gauge, travelling microscope etc.)

2 Determination of M.I of disc using ring

3 Moment of inertia of Flywheel

4 Determination of coefficient of Viscosity by Poiseuille's method

5 Determination of Y by flat spiral spring

6 Determination of η by flat spiral spring

7 Determination of Y by method of bending

8 Surface Tension by Jaeger's method.

2. Additional Activities

1. Demonstrations (Any two demonstrations equivalent to two experiments)

1. Magnet –Magnet interaction
2. Collision by using balls
3. Use of CRO (measurement of AC voltage, frequency)
4. Measurement of sound pressure level

2. Computer aided demonstrations using computer simulations or animations (Any one demonstrations equivalent to two experiments) / Virtual lab

1. Coulomb's law
2. Visualization of vectors
3. Bohr's model

2 Student Involvement (Any one equivalent to two experiments)

1. Mini Projects

Group of 4 students should carry out mini project with the report.

Students have to perform at least one additional activity out of three activities in addition to eight experiments mentioned above. Total Laboratory work with additional activities should be equivalent to ten experiments.

OR

2. Industrial Visit /Study Tour / Field Visit

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc (Sem- I) **Subject**: Physics

Course: Physics Practical-I **Course Code**: PHY-102-GEN

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3				2	2	2		3
CO 2	3			3	2	2	2		3
CO 3	3				2	2	2	2	3
CO 4		3			2	2	2		3
CO 5			3		2	2	2		3
CO 6					2	2	2		3
CO7		7			2	2	2		3

Justification

PO1: Disciplinary Knowledge

CO1. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials. Weightage: 3

Acquiring technical and manipulative skills in the laboratory is directly related to gaining disciplinary knowledge (PO1).

CO2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data. Weightage: 3

The ability to collect and interpret data through observation and experimentation is crucial for developing disciplinary knowledge (PO1).

CO3. Demonstrate an understanding of laboratory procedures including safety and scientific methods. Weightage: 3

Understanding laboratory procedures, safety, and scientific methods directly contributes to disciplinary knowledge (PO1).

PO2: Critical Thinking and Problem Solving

CO4. Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena. Weightage: 3

Experiencing and visualizing abstract concepts in the laboratory setting involves critical thinking and contributes to problem-solving skills (PO2).

CO7. To understand and practice the skills while doing physics practical with Problem-solving ability & Critical Analysis. Weightage: 3

Understanding and practicing physics skills in the laboratory setting with problem-solving ability and critical analysis directly align with critical thinking and problem-solving (PO2).

PO3: Social Competence

CO5. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings. Weightage: 3

Collaborative learning and teamwork in the laboratory contribute to social competence (PO3).

PO4: Research-related Skills and Scientific Temper

CO2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data. Weightage: 3

Collecting data through observation and experimentation is a fundamental aspect of research-related skills and scientific temper (PO4).

PO5: Trans-disciplinary Knowledge

All COs: CO1 to CO7 Weightage:

The laboratory activities involve aspects that may contribute to trans-disciplinary knowledge (PO5).

PO6: Personal and Professional Competence

All COs: CO1 to CO7 Weightage: 2

The skills acquired in the laboratory contribute to personal and professional competence (PO6).

PO7: Effective Citizenship and Ethics

All COs: CO1 to CO7 Weightage: 2

Adhering to laboratory procedures, safety, and ethical considerations contributes to effective citizenship and ethics (PO7).

PO8: Environment and Sustainability

CO3. Demonstrate an understanding of laboratory procedures including safety and scientific methods. Weightage: 2

Understanding laboratory procedures, safety, and scientific methods can have implications for environment and sustainability (PO8).

PO9: Self-directed and Life-long Learning

All COs: CO1 to CO7 Weightage: 3

The continuous learning aspect is inherent in laboratory activities, contributing to self-directed and life-long learning (PO9).

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Physics (2024 Pattern)

Name of the Programme : B.Sc. Physics

Programme Code : USPH

Class : F.Y.B.Sc.

Semester : I

Course Type : OE (Theory)

Course Code : PHY-103-OE

Course Title : Indian Astronomy-I [आकाशाशी जडले नाते – भाग १]

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

A) अभ्यासक्रमाची उद्दिष्टे

१.विद्यार्थी पृथ्वी, चंद्र आणि सूर्य यांच्यातील परस्परसंबंधांचेअन्वेषण आणि वर्णन करतील.

२. विद्यार्थी सूर्यमालेतील ग्रहांची तुलना करतील.

३. विद्यार्थी प्रकाश, सूर्य आणि इतर तारे यांच्यातील संबंधओळखतील.

४. विद्यार्थी ताऱ्याचे जीवनचक्र समजावून सांगतील.

५. विद्यार्थी विश्वाची रचना आणि इतिहासाचे विश्लेषण करतील.

६. विद्यार्थी प्रमुख नक्षत्र ओळखतील आणि ते आकाशात का फिरताना दिसतात ते स्पष्ट करतील

७. विद्यार्थी सूर्यमालेची उत्पत्ती शास्त्रीय भाषेत सांगतील

Course Outcomes:

B) अभ्यासक्रमाचीफलिते

CO1. खगोलशास्त्र म्हणजे काय? याचा अभ्यास कसा केला जातो? खगोलशास्त्राचा अभ्यास करण्याचे परिणाम काय आहेत आशा सर्व प्रश्नाची उत्तरे विद्यार्थी स्वत शोधू शकतील.

CO2. खगोलशास्त्रातील घटकांची माहिती सांगता येईल

CO3. खगोलशास्त्रामध्ये टेलेस्कोप (दुर्बीण) जरी महत्त्वाची वस्तू असली तरी दुर्बीणीचा वापर न करता विद्यार्थी सुरवातीला नुसत्या डोळ्यांनी दिसणाऱ्या ताऱ्यांचा अभ्यास करून तारका समूह ओळखणे, विशिष्ट ताऱ्यांचे नाव सांगु शकतील.

CO4. ताऱ्यांचा रंग पाहून, त्याची दीप्ती (Magnitude) किती आहे हे सांगु शकतील

CO5. ताऱ्यांचे वर्गीकरण करता येईल

CO6. सौरमंडळात तसेच दूरच्या ताराभोवती भ्रमण करणार्या जगात (ग्रह, चंद्र, रिंग, लघुग्रह आणि धूमकेतू) याबद्दल माहिती सांगता येईल.

CO7. तारे व आकाशगंगा यांच्या दृष्टीकोनातून हे सांगता येईल की आपल्या विश्वाचे अस्तित्व कसे आले आणि कसे कार्य करते.

Topics and Learning Points

प्रकरणे

प्रकरण पहिले : धरतीमातेला सोडून जाताना **(०७ तास)**

१. जेव्हा सूर्य पश्चिमेकडे उगवला

२. काळ्याकुट्ट आकाशात तळपणारा सूर्य कुठे असेल ?

३. चंद्रावरून आकाशदर्शन

४. ग्रहमालीकेतील अत्भुत दृश्ये

प्रकरण दु सरे: ग्रहमालीकेच्या परिसरात **(०८ तास)**

१. ग्रहमालीकेची व्याप्ती

२. ग्रहां च्यागतीचे विज्ञान

३. काही ऐतिहासिक किस्से

४. सूर्यमालिकेची उत्पत्ती

५. ग्रहमालेतल्या टकरी

प्रकरण तिसरे : भौतिकशास्त्राचा पाया **(०७ तास)**

१. हे विश्वचि प्रयोगां चे घर

२. गुरुत्वाकर्षण

३. विद्युचुंबकीय शास्त्र

४. तीव्र आणि मंद क्रिया

प्रकरण चौथे : दु र्बिणीच्या जगात **(०८ तास)**

१. दुर्बिणीच्या पूर्वी

२. गॅलिलिओची दुर्बीण

३. हर्शलते केक: दुर्बिणीचा वाढता आवाका

४ दृश्य प्रकाशाची छाननी करणारी साधने

५. रेडिओ दु र्बिणी

६. अंतराळातून विश्वाचेवेध

References

संदर्भ ग्रंथ/पुस्तके :

१. आकाशाशी जडले नाते – जयंत नारळीकर

२. आकाश कसे पहावे –आनंद घैसास

३. आपली सूर्यमाला -आनंद घैसास

४. दुर्बिणी आणि वेधशाळा -आनंद घैसास

५. आकाश गंगा – शिरीष पै

६. आकाश गमती – हेमंत मोने

७. आकाश कवेत घेताना – मानसी कुलकर्ण

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc (Sem- I) **Subject**: Physics

Course: Indian Astronomy-I [आकाशाशी जडले नाते – भाग १] **Course Code**: PHY-103-OE

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3				2	2	1		
CO 2	3			3	2	2	1		
CO 3		3			2	2	1	2	
CO 4		3			2	2	1		
CO 5			1		2	2	1		
CO 6					2	2	1		
CO7					2	2	1		

Justification

PO1: Disciplinary Knowledge

CO1. खगोलशास्त्र म्हणजे काय? याचा अभ्यास कसा केला जातो? खगोलशास्त्राचा अभ्यास करण्याचे परिणाम काय आहेत आशा सर्व प्रश्नाची उत्तरे विद्यार्थी स्वत शोधू शकतील. Weightage: 3

This outcome directly assesses the student's understanding of what astronomy is and their ability to articulate the results and impact of studying astronomy.

CO2. खगोलशास्त्रातील घटकांची माहिती सांगता येईल Weightage: 3

This outcome assesses the knowledge of the components of astronomy, directly contributing to disciplinary knowledge.

PO2: Critical Thinking and Problem Solving

CO3. खगोलशास्त्रामध्ये टेलेस्कोप (दुर्बीण) जरी महत्त्वाची वस्तू असली तरी दुर्बीणीचा वापर नकरता विद्यार्थी सुरवातीला नुसत्या डोळ्यांनी दिसणार्या तार्यांचा अभ्यास करून तारका समूह ओळखणे, विशिष्ट तार्यांचे नाव सांगु शकतील.Weightage: 3

This outcome involves hands-on experience and problem-solving skills, contributing to critical thinking in astronomy.

CO4. तार्यांचा रंग पाहून, त्याची दीप्ती (Magnitude) किती आहे हे सांगु शकतीलWeightage: 3

Analyzing the color and brightness of stars involves critical thinking and problem-solving skills in the context of observational data.

PO3: Social Competence

CO5. ताऱ्यांचे वर्गीकरण करता येईल Weightage: 1

The skill of classifying stars is not strongly related to social competence.

PO4: Research-related Skills and Scientific Temper

CO2. खगोलशास्त्रातील घटकांची माहिती सांगता येईल. Weightage: 3

Providing information about the components of astronomy contributes to research-related skills and scientific temper.

PO5: Trans-disciplinary Knowledge

All COs: CO1 to CO7 Weightage: 2

The study of astronomy can have connections to various disciplines, contributing to trans-disciplinary knowledge.

PO6: Personal and Professional Competence

All COs: CO1 to CO7 Weightage: 2

The skills acquired through the study of astronomy contribute to personal and professional competence.

PO7: Effective Citizenship and Ethics

All COs: CO1 to CO7 Weightage: 1

The direct connection to effective citizenship and ethics is weak in the technical content areas covered.

PO8: Environment and Sustainability

CO3. खगोलशास्त्रामध्ये टेलेस्कोप (दुर्बीण) जरी महत्त्वाची वस्तू असली तरी दुर्बीणीचा वापर नकरता विद्यार्थी सुरवातीला नुसत्या डोळ्यांनी दिसणार्या तार्यांचा अभ्यास करून तारका समूह ओळखणे, विशिष्ट तार्यांचे नाव सांगु शकतील. Weightage: 2

The environmental aspect is considered when choosing not to use a telescope if not necessary.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Physics (2024 Pattern)

Name of the Programme : B.Sc. Physics

Programme Code : USPH

Class : F.Y.B.Sc.

Semester : I

Course Type : SEC (Practical)

Course Code : PHY-104-SEC

Course Title : Applications of Internet of Things-I

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. Appreciate the role of big data, cloud computing and data analytics in a typical IoT system
2. Understand where the IoT concept fits within the broader ICT industry and possible future trends
3. Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis
4. Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack
5. Explain the definition and usage of the term “Internet of Things” in different contexts
6. Understand the key components that make up an IoT system
7. Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

Course Outcomes:

Student will be able to

CO1. Able to understand the application areas of IOT

CO2. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

CO3. Able to understand building blocks of Internet of Things and characteristics

CO4. Understand the concepts of Internet of Things

CO5. Analyze basic protocols in wireless sensor network

CO6. Design IoT applications in different domain and be able to analyze their performance

CO7. Implement basic IoT applications on embedded platform

Topics and Learning Points

Unit-1: Introduction to Internet of Things **[8L]**

Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols

Unit-2: IOT Concepts and introduction **[8L]**

Technologies that led to evolution of IOT, IOT and SCADA, IOT and M2M, IOT and Big Data Requirement of international standard (case study), IOT standards in practice, Operating platforms /systems

Unit-3: IOT Applications (case study) **[6L]**

Lighting as a service, Intelligent Traffic systems, Smart Parking, Smart water management, IOT in Indian Scenario

Unit 4: Security and Future of IoT ecosystem **[8L]**

Need of security in IoT - Why Security? Privacy for IoT enabled devices- IoT security for consumer devices Security levels, protecting IoT devices Future IoT eco system - Need of power full core for building secure algorithms, Examples for new trends - AI, ML penetration to IoT

List of Practicals:

Sr. No.	Title of Experiment	No. of Experiment
1.	Smart Agriculture System	1
2.	Weather Reporting System	1
3.	Home Automation System	1
4.	Smart Garage Door	1
5.	Air Pollution Monitoring System	1
6.	Smart Parking System	1
7.	Familiarization with Arduino Pi & Perform necessary software installation	1
8.	Internet of things enabled real time water quality monitoring system	1
9.	Implement smart home automation system. The system automates home appliances and control them over internet from anywhere	1

10.	Develop a Real time application like a smart home security	1
11.	Create a simple web interface for Raspberry-Pi/Beagle board to control the connected LED sremotely through the interface.	1
12.	Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe.	1

References:

1. Internet of Things – A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

3. The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World Paperback – 26 March 2015 by Michael Miller.

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc (Sem- I) **Subject**: Physics

Course: Applications of Internet of Things-I **Course Code**: PHY-104-SEC

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3		1	2	2	3	1	1	2
CO 2	3		1	2	2	3	1	1	2
CO 3	3		1	2	2	3	1	1	2
CO 4	3		1	2	2	3	1	1	2
CO 5			1	2	2	3	1	1	2
CO 6			1	2	2	3	1	1	2
CO7			1	2	2	3	1	1	2

Justification

PO1: Disciplinary Knowledge

CO1. Able to understand the application areas of IoT Weightage: 3

Understanding the application areas of IoT directly contributes to disciplinary knowledge in the field.

CO2. Able to realize the revolution of the Internet in Mobile Devices, Cloud & Sensor Networks Weightage: 3

Realizing the revolution of the Internet in various technological aspects aligns directly with disciplinary knowledge.

CO3. Able to understand building blocks of the Internet of Things and characteristics Weightage: 3

Understanding the building blocks and characteristics of IoT is fundamental to disciplinary knowledge in this field.

CO4. Understand the concepts of the Internet of Things Weightage: 3

Grasping the concepts of IoT is a core element of disciplinary knowledge.

PO3: Social Competence

All COs: CO1 to CO7 Weightage: 1

While IoT has societal implications, the direct connection to social competence is weak in the technical content areas covered.

PO4: Research-related Skills and Scientific Temper

All COs: CO1 to CO7 Weightage: 2

The course content involves understanding and applying IoT concepts, contributing to research-related skills and scientific temper to some extent.

PO5: Trans-disciplinary Knowledge

All COs: CO1 to CO7 Weightage: 2

IoT applications span various domains, contributing to trans-disciplinary knowledge to some extent.

PO6: Personal and Professional Competence

All COs: CO1 to CO7 Weightage: 3

The entire course contributes significantly to personal and professional competence by imparting knowledge and skills in IoT.

PO7: Effective Citizenship and Ethics

All COs: CO1 to CO7 Weightage: 1

The direct connection to effective citizenship and ethics is weak in the technical content areas covered.

PO8: Environment and Sustainability

All COs: CO1 to CO7 Weightage: 1

The course content does not explicitly emphasize environmental considerations or sustainability.

PO9: Self-directed and Life-long Learning

All COs: CO1 to CO7 Weightage: 2

The course contributes moderately to self-directed and life-long learning by providing knowledge and skills applicable beyond the classroom.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Physics (2024 Pattern)

Name of the Programme : B.Sc. Physics

Programme Code : USPH

Class : F.Y.B.Sc.

Semester : II

Course Type : General (Theory)

Course Code : PHY-151-GEN

Course Title : Heat and Thermodynamics

No. of Credits : 02

No. of Teaching Hours : 30

Course Objectives:

The student will learn:

1. To describe the thermodynamic properties of a material.
2. To understand the ideal gas equation and its limitations.
3. To understand the real gas equation.
4. To apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process.
5. To understand principle of heat engines and calculate thermal efficiency.
6. To understand the principle of the refrigerators to calculate coefficient of performance.
7. To understand phenomenon of ‘entropy’.

Course Outcomes:

On successful completion of this course students will be able to do the following:

CO1. Describe the thermodynamic properties of a material.

CO2. Understand the ideal gas equation and its limitations.

CO3. Understand the real gas equation.

CO4. Apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process.

CO5. Understand principle of heat engines and calculate thermal efficiency.

CO6. Understand the principle of the refrigerators to calculate coefficient of performance.

CO7. Understand phenomenon of ‘entropy’. & Understand the types of thermometers and their uses.

Topics and Learning Points

UNIT 1: Equation of state (7L)

1.1.Introduction (Equation of state, ideal and real gas).

1.2 Andrew's Experiment on CO_2 gas (Liquefaction of CO_2 gas)

1.3 Van der Waals 'equation of state

1.4 Critical constants

1.5 Reduced equation of state

1.6 Joule-Thomson porous plug experiment (Throttling process)

1.7 Problem Solving

UNIT 2: Concepts of Thermodynamics (8L)

2.1. Introduction (Thermodynamic state of a system, Zeroth law of thermodynamics, Thermodynamic equilibrium, reversible and irreversible processes)

2.2. Thermodynamic Processes: isothermal, adiabatic, isochoric, and isobaric

2.3. Work done during isothermal change.

2.4. Adiabatic relations for perfect gas

2.5. Work done during adiabatic change.

2.6. First law of thermodynamics and its applications

2.7. Problem Solving

UNIT 3: Applied Thermodynamics (9L)

3.1. Introduction (Joules law of heating)

3.2. Heat and work

3.3. Carnot's cycle and Carnot's heat engine and its efficiency

3.4. Second law of thermodynamics

3.5. Concept of entropy

3.6. T-dS Equation

3.7. Clausius-Clapeyron Latent heat equations (I and II)

3.8. Problem solving

Unit 4: Heat Transfer Mechanism (6L)

4.1. Introduction (Kinematics of heat)

4.2. Heat Engines: Otto cycle and Diesel cycle and its efficiency

4.3. Refrigerators: Principle, working and its applications

4.4. Air conditioning: Principle, working and its applications

4.5. Problem Solving

References:

1. Physics: 4th Edition, Volume I, Resnick/Halliday/Krane JOHN WILEY & SON (SEA) Pvt. Ltd.
2. Concept of Physics: H.C. Verma, Bharati Bhavan Publishers
3. Heat and Thermodynamics: Brijlal, N. Subrahmanyam, S. Chand & Company Ltd, New Delhi
4. Heat and Thermodynamics: Mark. W. Zemansky, Richard H. Dittman, Seventh Edition, McGraw-Hill International Editions
5. Thermodynamics and Statistical Physics: J.K. Sharma, K.K. Sarkar, Him

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc (Semester-II) **Subject**: Physics
Course: Heat and Thermodynamics **Course Code**: PHY-151-GEN

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3	3	1	2	2	3	1	1	2
CO 2	3	3	1	2	2	3	1	1	2
CO 3	3	3	1	2	2	3	1	1	2
CO 4	3	3	1	2	2	3	1	1	2
CO 5	3	3	1	2	2	3	1	1	2
CO 6	3	3	1	2	2	3	1	1	2
CO7	3	3	1	2	2	3	1	1	2

Justification

PO1: Disciplinary Knowledge

CO1. Describe the thermodynamic properties of a material. Weightage: 3

Describing thermodynamic properties is fundamental to disciplinary knowledge in thermodynamics.

CO2. Understand the ideal gas equation and its limitations. Weightage: 3

Understanding the ideal gas equation is a key concept in thermodynamics, contributing directly to disciplinary knowledge.

CO3. Understand the real gas equation. Weightage: 3

Understanding the real gas equation is crucial to disciplinary knowledge, providing a more accurate representation of gases.

CO4. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process. Weightage: 3

Applying the laws of thermodynamics is a core aspect of disciplinary knowledge in thermodynamics.

CO5. Understand the principle of heat engines and calculate thermal efficiency. Weightage: 3

Understanding heat engines and calculating thermal efficiency directly contributes to disciplinary knowledge in thermodynamics.

CO6. Understand the principle of refrigerators to calculate the coefficient of performance. Weightage: 3

Understanding refrigerators and calculating the coefficient of performance is integral to disciplinary knowledge in thermodynamics.

CO7. Understand the phenomenon of 'entropy'. Weightage: 3

Understanding entropy is a fundamental concept in thermodynamics and contributes directly to disciplinary knowledge.

PO2: Critical Thinking and Problem Solving

All COs: CO1 to CO7 Weightage: 3

Each competency involves critical thinking and problem-solving skills in the context of thermodynamics.

PO3: Social Competence

All COs: CO1 to CO7 Weightage: 1

While thermodynamics has societal applications, the direct connection to social competence is weak in the technical content areas covered.

PO4: Research-related Skills and Scientific Temper

All COs: CO1 to CO7 Weightage: 2

Understanding and applying thermodynamic principles contribute to research-related skills and scientific temper to some extent.

PO5: Trans-disciplinary Knowledge

All COs: CO1 to CO7 Weightage: 2

While thermodynamics itself is a specific discipline, some aspects may have trans-disciplinary applications, contributing to trans-disciplinary knowledge to some extent.

PO6: Personal and Professional Competence

All COs: CO1 to CO7 Weightage: 3

The entire course contributes significantly to personal and professional competence by imparting knowledge and skills in thermodynamics.

PO7: Effective Citizenship and Ethics

All COs: CO1 to CO7 Weightage: 1

The direct connection to effective citizenship and ethics is weak in the technical content areas covered.

PO8: Environment and Sustainability

All COs: CO1 to CO7 Weightage: 1

The course content does not explicitly emphasize environmental considerations or sustainability.

PO9: Self-directed and Life-long Learning

All COs: CO1 to CO7 Weightage: 2

The course contributes moderately to self-directed and life-long learning by providing knowledge and skills applicable beyond the classroom in the field of thermodynamics.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Physics (2024 Pattern)

Name of the Programme : B.Sc. Physics

Programme Code : USPH

Class : F.Y.B.Sc.

Semester : II

Course Type : General (Practical)

Course Code : PHY-152-GEN

Course Title : Physics Practical-II

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To help develop habit of practice in the experimental skill developments.
2. To develop experimental skills in due course of time.
3. To introduce students to different apparatus & instruments, and demonstrate the skill based experiments.
4. To explain association between theoretical ideas and experimental skills.
5. To emphasize the need of practice in the skill developments.
6. To develop experimental skills in due course of time.
7. To help grow confidence while performing the practical individually.

Course Outcome:

After successfully completing this laboratory course, the students will be able to do the following:

CO 1. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials.
CO 2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data.
CO 3. Demonstrate an understanding of laboratory procedures including safety and scientific methods.
CO 4. Demonstrate a deeper understanding of abstract concepts and theories gained by experiencing and visualizing them as authentic phenomena.
CO 5. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings.
CO 6. Problem solving ability
CO 7. Critical Analysis

List of Practicals

A. Heat and Thermodynamics

1. Interpretation of isothermal and adiabatic curves on PV diagrams (Theoretical). Theoretical study of Carnot's cycle by drawing graphs of isothermal and adiabatic curves.
2. Temperature coefficient of resistance
3. Study of a thermocouple
4. Thermal conductivity by Lee's disc method
5. Specific heat of graphite
6. Study of Peltier effect
7. Determination of frequency of AC mains using sonometer.
8. Characteristics of thermistor.
9. Newton's law of cooling
10. Study of spectrometer and determination of angle of prism

B. Additional Activities

I. Demonstrations (Any two demonstrations equivalent to two experiments)

1. Biprism
2. LASER
3. Goniometer
4. Centre of Mass and Centre of gravity

II. Computer aided demonstrations using computer simulations or animations (Any one demonstrations equivalent to two experiments) / Virtual lab

1. Carnot engine, diesel engine
2. Graphs and their slopes, and Kinematics graphs (using computer simulations)
3. Mini projects/Hands on activities

III. Student Involvement (Any one equivalent to two experiments)

1. Mini Projects

Group of 4 students should carry out mini project with the report.

Students have to perform at least one additional activity out of three activities in addition to eight experiments mentioned above. Total Laboratory work with additional activities should be equivalent to ten experiments.

OR

2. Industrial Visit /Study Tour / Field Visit

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc, (Semester-II) **Subject**: Physics
Course: Physics Practical-II **Course Code**: PHY-152-GEN

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3			2	1	3	2	1	2
CO 2	3			2	1	3	2	1	2
CO 3	3			2	1	3	2	1	2
CO 4				2	1	3	2	1	2
CO 5			3	2	1	3	2	1	2
CO 6		3		2	1	3	2	1	2
CO7		3		2	1	3	2	1	2

Justification

PO1: Disciplinary Knowledge

CO1. Acquire technical and manipulative skills in using laboratory equipment, tools, and materials. Weightage: 3

Acquiring technical and manipulative skills is a fundamental aspect of disciplinary knowledge in any scientific field, particularly in a laboratory setting.

CO2. Demonstrate an ability to collect data through observation and/or experimentation and interpreting data. Weightage: 3

Data collection and interpretation are core components of disciplinary knowledge, and this directly aligns with the skill set required in a laboratory setting.

CO3. Demonstrate an understanding of laboratory procedures, including safety and scientific methods. Weightage: 3

Understanding laboratory procedures, safety measures, and scientific methods is integral to disciplinary knowledge in any scientific discipline.

PO2: Critical Thinking and Problem Solving

CO6. Problem-solving ability Weightage: 3

Problem-solving ability is a key element of critical thinking, and it is directly related to the development of critical thinking skills in a laboratory environment.

CO7. Critical Analysis Weightage: 3

Critical analysis involves evaluating information and making judgments, which is a crucial aspect of critical thinking in laboratory settings.

PO3: Social Competence

CO5. Acquire the complementary skills of collaborative learning and teamwork in laboratory settings. Weightage: 3

Collaborative learning and teamwork contribute to social competence, fostering effective communication and collaboration in a laboratory environment.

PO4: Research-related Skills and Scientific Temper

All COs: CO1 to CO7 Weightage: 2

While the primary focus is on developing practical skills, there is a moderate relation to research-related skills and scientific temper, especially in the context of experimental design and data interpretation.

PO5: Trans-disciplinary Knowledge

All COs: CO1 to CO7 Weightage: 1

The direct connection to trans-disciplinary knowledge is weak, as the focus is primarily on laboratory skills within a specific scientific discipline.

PO6: Personal and Professional Competence

All COs: CO1 to CO7 Weightage: 3

The acquisition of laboratory skills and the development of critical thinking contribute significantly to personal and professional competence.

PO7: Effective Citizenship and Ethics

All COs: CO1 to CO7 Weightage: 2

While laboratory skills contribute to effective citizenship and ethics to some extent, the direct connection is moderate.

PO8: Environment and Sustainability

All COs: CO1 to CO7 Weightage: 1

The course content does not explicitly emphasize environmental considerations or sustainability.

PO9: Self-directed and Life-long Learning

All COs: CO1 to CO7 Weightage: 2

While laboratory skills contribute to self-directed learning, the direct connection to life-long learning is moderate.

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Physics (2024 Pattern)

Name of the Programme	**:** B.Sc. Physics
Programme Code	**:** USPH
Class	**:** F.Y.B.Sc.
Semester	**:** II
Course Type	**:** OE (Practical)
Course Code	**:** PHY-153-OE
Course Title	**:** Indian Astronomy-II [आकाशाशी जडले नाते – भाग-2]
No. of Credits	**:** 02
No. of Teaching Hours	**:** 60

Course Objectives:

A) अभ्यासक्रमाची उद्दिष्टे

१.विद्यार्थी ta¹yaacyaa jalvanagaaqaca va saya ka pkaSata yaaca वर्णन करतील.

२. विद्यार्थी AakaSagagacal vyaaPtI samajana GatIla.

३. विद्यार्थी riDAa lahrI va %yaaca s~at tsaca @vasaar yaacal maaihtI GatIla.

४. विद्यार्थी ताऱ्याचे जीवनचक्र samajana GatIla.

५. विद्यार्थी विश्वाची रचना आणि इतिहासाचे विश्लेषण करतील.

६. विद्यार्थीnava gah, gahmaalaa, ga$%valya lahrI yaabaddla maaihtI GaNyaasa sa$vaat krtIla.

७. विद्यार्थी pqval plalkDIla jalvasaYTI tsaca #agaalaSaas~ AaiNa flajyaaitYa yaacal maaihtI GaNyaasa sa$vaat krtIla.

Course Outcomes:

B) अभ्यासक्रमाची फलिते

CO1. खगोलशास्त्र म्हणजे काय? याचा अभ्यास कसा केला जातो? खगोलशास्त्राचा अभ्यास करण्याचे परिणाम काय आहेत आशा सर्व प्रश्नाची उत्तरे विद्यार्थी स्वत शोधू शकतील.

CO2. खगोलशास्त्रातील घटकांची माहिती सांगता येईल

CO3. खगोलशास्त्रामध्ये टेलेस्कोप (दुर्बीण) जरी महत्त्वाची वस्तू असली तरी दुर्बीणीचा वापर न करता

विद्यार्थी सुरवातीला नुसत्या डोळ्यांनी दिसणाऱ्या ताऱ्यांचा अभ्यास करून तारका समूह ओळखणे, विशिष्ट ताऱ्यांचे नाव सांगु शकतील.

CO4. ताऱ्यांचा रंग पाहून, त्याची दीप्ती (Magnitude) किती आहे हे सांगु शकतील

CO5. ताऱ्यांचे वर्गीकरण करता येईल

CO6. सौर मंडळात तसेच दूरच्या ताराभोवती भ्रमण करणार्या जगात (ग्रह, चंद्र, रिंग, लघुग्रह आणि धूमकेतू) याबद्दल माहिती सांगता येईल.

CO7. तारे व आकाशगंगा यांच्या दृष्टीकोनातून हे सांगता येईल की आपल्या विश्वाचे अस्तित्व कसे आले आणि कसे कार्य करते.

Topics and Learning Points

विद्यार्थ्यांना खाली दिलेल्या यादीमधील कोणतेही (आठ) प्रयोग करायचे आहेत.

प्रयोगांची यादी

१) आकाशाची ओळख (ग्रह, तारे, नक्षत्र)

२) प्रकाशाचे विवर्तन कसे होते याचा अभ्यास करणे.

३) दोन ताऱ्यांतील अंतर काढणे.

४) पृथ्वीवरील गुरुत्वाकर्षण मोजणे

५) मूलद्रव्यांची ओळख करून घेणे.

६) रेडिओ लहरींचा अभ्यास करणे.

७) गुरुत्वीय लहरींचा अभ्यास करणे.

८) ताऱ्यांच्या गुणधर्माचा अभ्यास करणे.

९) सूर्यग्रहण व चंद्रग्रहण म्हणजे काय ? याचा अभ्यास करणे.

१०) प्रकाशाचे लोलकाच्या साहाय्याने केलेले पृथक्करण याचा अभ्यास करणे.

संदर्भ साहित्य

१. आकाशाशी जडले नाते - डॉ . जयंत नारळीकर

२. वेध अंतराळाचा - लीना दामले

३. अंतराळातील गंमत जंमत - रमेश के महाले

४. ओळख नभांगणाची - हेमंत माने

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc (Semester-II) **Subject**: Physics
Course: Indian Astronomy-II [आकाशाशी जडले नाते – भाग २] **Course Code**: PHY-153-OE

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3			3	1	2	1		
CO 2	3			3	1	2	1		
CO 3	3			3	1	2	1		
CO 4		3		3	1	2	1		
CO 5		3		3	1	2	1		
CO 6			2	3	1	2	1		
CO7			1	3	1	2	1		

Justification

PO1: Disciplinary Knowledge

CO1. खगोलशास्त्र म्हणजे काय? याचा अभ्यास कसा केला जातो? खगोलशास्त्राचा अभ्यास करण्याचे परिणाम काय आहेत आशा सर्व प्रश्नाची उत्तरे विद्यार्थी स्वत शोधू शकतील.

Weightage: 3

The question emphasizes understanding the essence of astronomy, directly contributing to disciplinary knowledge.

CO2. खगोलशास्त्रातील घटकांची माहिती सांगता येईल Weightage: 3

Understanding the components of astronomy is crucial for disciplinary knowledge.

CO3. खगोलशास्त्रामध्ये टेलेस्कोप (दुर्बीण) जरी महत्त्वाची वस्तू असली तरी दुर्बीणीचा वापर न करता विद्यार्थी सुरवातीला नुसत्या डोळ्यांनी दिसणार्या तार्यांचा अभ्यास करून तारकासमूह ओळखणे, विशिष्ट तार्यांचे नाव सांगु शकतील. Weightage: 3

The use of telescopes is directly related to observational skills in astronomy, contributing to disciplinary knowledge.

PO2: Critical Thinking and Problem Solving

CO4. तार्यांचा रंग पाहून त्याची दीप्ती (Magnitude) किती आहे हे सांगु शकतील Weightage: 3

Analyzing the color and magnitude of stars involves critical thinking in astronomy.

CO5. ताऱ्यांचे वर्गीकरण करता येईल Weightage: 3

Performing classification tasks involves critical analysis and problem-solving skills in astronomy.

PO3: Social Competence

CO6. सौरमंडळात तसेच दूरच्या ताराभोवती भ्रमण करणार्या जगात (ग्रह, चंद्र, रिंग, लघु ग्रह आणि धूमकेतू) याबद्दल माहिती सांगता येईल. Weightage: 2

Sharing knowledge about solar system exploration has a moderate social relevance.

CO7. तारे व आकाशगंगा यांच्या दृष्टीकोनातून हे सांगता येईल की आपल्या विश्वाचे अस्तित्व कसे आले आणि कसे कार्य करते. Weightage: 1

While understanding the universe is important, the direct link to social competence is weak.

PO4: Research-related Skills and Scientific Temper

All COs: CO1 to CO7 Weightage: 3

The entire set of learning outcomes contributes significantly to research-related skills and scientific temper.

PO5: Trans-disciplinary Knowledge

All COs: CO1 to CO7

CBCS Syllabus as per NEP 2020 for F.Y.B.Sc. Physics (2024 Pattern)

Name of the Programme : B.Sc. Physics

Programme Code : USPH

Class : F.Y.B.Sc.

Semester : II

Course Type : SEC (Practical)

Course Code : PHY-154-SEC

Course Title : Applications of Internet of Things-II

No. of Credits : 02

No. of Teaching Hours : 60

Course Objectives:

1. To learn and understand the basics of embedded systems.
2. To be acquainted with interfacing of sensors and actuators with microprocessor.
3. To design embedded systems applications.
4. To understand Internet of Things and its usefulness for society.
5. To understand the fundamentals and functionality of various embedded board platforms.
6. To design and implement interconnection and integration of sensors to embedded board platform
7. To design and implement application of IoT using various sensors.

Course Outcomes:

Student will be able to

CO 1. Identify and understand the unique characteristics and components of embedded systems

CO 2. Compare various development boards Arduino, Raspberry pi, Beagle bone

CO 3. Implement interfacing of various sensors, actuators to the development boards

CO 4. Design, implement and test an embedded system application

CO 5. Configure U-Boot, Understand IoT building blocks

CO 6. Compare various IoT communication technologies and Design various IoT applications

CO 7. Apply the knowledge to interface various sensors with IoT development board

List of Practicals:

Sr. No.	Title of Experiment
1	Embedded Systems of Object Detection
2	Embedded Systems of Traffic Signal,
3	Embedded Systems of Digital Clock
4	Embedded Systems of Robotics Arm Movement
5	Embedded Systems of Fire Alarm
6	Embedded Systems of Automated Disinfection Tent
7	Embedded Systems of Tyre Pressure Monitoring System
8	Embedded Systems of Smart energy home management
9	Communication Technologies for Smart Homes
10	Smart Irrigation System using Arduino uno
11	Crop Water Management System using Arduino uno
12	Transport And Traffic Management System using Arduino uno
13	Interface IR sensor to Arduino. Write a program to detect obstacle using IR sensor and notify it using led.
14	Interface stepper motor and seven segment display with Arduino and write a program to control the motion of motor and display number of rotation made by motor on 7 segment display.
15	Write an application using Arduino for streetlight control system. System consists of smart street lights that have external light sensing that automatically turns on at desired intensity based on amount of lighting needed.
16	Write an application using Arduino for traffic signal monitoring and control system.
17	Implement smart home automation system. The system automates home appliances and control them over internet from anywhere
18	Develop a real time application like a smart home security. Description: when anyone comes at door the camera module automatically captures his image and sends a notification to the owner of the house on his mobile phone using gsm modem

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10. Data and Computer Communications; By: Stallings, William; Pearson Education Pvt.Ltd., Delhi, 6th Edition

Mapping of Program Outcomes with Course Outcomes

Class: F.Y.B.Sc (Semester-II) **Subject**: Physics
Course: Applications of Internet of Things-II **Course Code**: PHY-154-SEC

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

	Programme Outcomes (POs)								
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9
CO 1	3								
CO 2		3							
CO 3							1		2
CO 4		3							
CO 5								1	
CO 6				3	2				
CO7			2			3			2

Justification

PO1: Disciplinary Knowledge

CO1: Identify and understand the unique characteristics and components of embedded systems Weightage: 3

Understanding the unique characteristics and components of embedded systems is fundamental to disciplinary knowledge in this field.

PO2: Critical Thinking and Problem Solving

CO2: Compare various development boards Arduino, Raspberry Pi, Beagle Bone Weightage: 3

Comparing development boards requires critical thinking to assess their features and choose the most suitable one for a given application.

CO4: Design, implement and test an embedded system application Weightage: 3

Designing and implementing embedded system applications involve critical thinking and problem-solving skills.

PO3: Social Competence

CO7: Design and implement IoT system for real-time applications Weightage: 2

Real-time IoT systems may have social implications, and designing them requires some consideration of social factors.

PO4: Research-related Skills and Scientific Temper

CO6: Model Internet of Things using various protocols of standard communication layers Weightage: 3

Modelling IoT using standard communication protocols involves research-related skills and a scientific temper.

PO5: Trans-disciplinary Knowledge

CO6: Compare various IoT communication technologies and design various IoT applications Weightage: 2

Considering various IoT communication technologies involves elements from different disciplines.

PO6: Personal and Professional Competence

CO7: Understand essentials of IoT Security Weightage: 3

Understanding IoT security is crucial for personal and professional competence in the field.

PO7: Effective Citizenship and Ethics

CO3: Choose an appropriate communication model for given design criteria Weightage: 1

While ethical considerations are important, directly choosing a communication model may have a weak connection with effective citizenship.

PO8: Environment and Sustainability

CO5: Configure U-Boot, Understand IoT building blocks Weightage: 1

U-Boot configuration and understanding IoT building blocks may have a weak connection to environmental and sustainability concerns.

PO9: Self-directed and Life-long Learning

CO3: Implement interfacing of various sensors, actuators to the development boards Weightage: 2

Implementing interfaces involves practical application and promotes self-directed learning.

CO7: Apply the knowledge to interface various sensors with IoT development board Weightage: 2

Applying knowledge to interface sensors fosters self-directed learning in practical scenarios.