HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)
Re - Accredited with A++ Grade by NAAC (3rd Cycle)
Uthamapalayam - 625 533.

DEPARTMENT OF PHYSICS

BACHELOR OF SCIENCE - PHYSICS

SYLLABUS

Choice Based Credit System - CBCS

(As per TANSCHE/MKU Guidelines)

with

Outcome Based Education (OBE)

(with effect from Academic Year 2023 - 2024 onwards)

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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College Vision and Mission

Vision

Our vision is to provide the best type of higher education to all, especially to students hailing from minority Muslim community, rural agricultural families and other deprived, under privileged sections of the society, inculcating the sense of social responsibility in them. Our college is committed to produce talented, duty - bound citizens to take up the challenges of the changing times.

Mission

Our mission is to impart and inculcate social values, spirit of service and religious tolerance as envisioned by our beloved Founder President Hajee Karutha Rowther.

The Vision beckons ..... the Mission continues forever.

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Department Vision and Mission

Vision

- To provide an ambient environment for learning and research in physical science with a focus on academic excellence.

Mission

- To apply conventional and non - conventional tools in physics in tune with emerging trends of science.
- To bridge the gap between curriculum based learning and carrier readiness, employability through competitive physics in the competitive world
- Ignite the students to pursue higher studies and research programs.
- To create a meticulous awareness among students about issues pertaining to welfare of society and environment

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE, UTHAMAPALAYAM

(Reaccredited with "A++" grade by NAAC)

B.Sc., PHYSICS (SEMESTER)

Choice Based Credit System Regulations and Syllabus

(This will come into effect from the academic year 2023 - 24 onwards)

1. INTRODUCTION OF THE PROGRAMME:

Physics is often considered to be the most fundamental science. It is the basis of all other science subjects. It explains natural phenomena in the Universe. A bachelor degree in Physics is a great foundation for career in government jobs, industries, educational institutions, labs etc., Physics brings a broad perspective to any problem. This intensive thinking makes the Physicist desirable in any field. That's why Physics graduates can expect career salaries similar to those of computer science and engineering major.

2. OBJECTIVE OF THE PROGRAMME:

The UG course in Physics helps the students to understand the world around us, the world inside us and the world beyond us. Physics encompasses the study of the universe from the smallest sub atomic particles to the largest galaxies. Moreover it is the basis if many sciences like chemistry, oceanography, seismology and can be applied to a bachelor's degree in physics.

Physics challenges our imagination with concepts like relativity and string theory. It leads to great discoveries like computers and lasers that lead to technologies which change our lives – from healing joints to curing cancer and to develop sustainable energy solutions.

3. OUTCOME OF THE PROGRAMME:

The syllabus for B.Sc., Physics degree under semester system has been designed on the basis of Choice Based Credit System, (CBCS) which would focus on job oriented program and values added education. It will effect from June 2023 onwards. Duration of the course is three years. The students who are joining the B.Sc., (Physics) degree shall undergo a study period of three academic years - Six semesters.

4. OUTCOME OF THE PROGRAMME:

The Syllabus for B.Sc., Physics degree under semester system has been designed on the basis of Choice Based Credit System, (CBCS) which would focus on job oriented program and values added education. It will effect from June 2023 onwards. Duration of the course is three years. The students who are joining the B.Sc., (Physics) degree shall undergo a study period of three academic years – Six Semesters.

While preparing the syllabus, care is taken to provide the requirements of students who opt physics, for developing their skill and competence in their career. Hence after completion of the course, the student will be enriched with recent trends in Physics and be motivated towards higher studies and research activities. During the preparation of the syllabus and curriculum, the UGC model curriculum and syllabi of world best universities were considered.

B.Sc., PHYSICS SYLLABUS

Preamble

Physics is one of the basic and fundamental sciences. The curriculum for the undergraduate programme in Physics is revised as per the UGC guidelines on Learning Outcome based Course Framework. The learner-centric courses let the student progressively develop a deeper understanding of various aspects of physics.

The new curriculum offers courses in the core areas of mechanics, acoustics, optics and spectroscopy, electricity and magnetism, atomic and nuclear physics, solid state, electronics and other fields. The courses will train students with sound theoretical and experimental knowledge that suits the need of academics and industry. In addition to the theoretical course work, the students also learn physics laboratory methods for different branches of physics, specialized measurement techniques, analysis of observational data, including error estimation and etc. The students will have deeper understanding of laws of nature through the subjects like classical mechanics, quantum mechanics, statistical physics etc. The problem solving ability of students will be enhanced. The students can apply principles in physics to real life problems. The courses like integrated electronics and microprocessors will enhance the logical skills as well as employability skills. The numerical methods and mathematical physics provide analytical thinking and provides a better platform for higher level physics for research.

The restructured courses with well-defined objectives and learning outcomes, provide guidance to prospective students in choosing the elective courses to broaden their skills not only in the field of physics but also in interdisciplinary areas. The elective modules of the framework offer students choice to gain knowledge and expertise in specialized domains of physics like astrophysics, medical physics, etc.

TANSCHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR UNDERGRADUATE EDUCATION	
Programme	**B.Sc., Physics**
Programme Code	
Duration	**3 years [UG]**
Programme Outcomes: (These are mere guidelines. Faculty can create POs based on their curriculum or adopt from UGC or the University for their Programme)	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully; read and write analytically and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply the analytic thought to a body of knowledge; analyse and evaluate the proofs, arguments, claims, beliefs on the basis of empirical evidences; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach. **PO4: Problem solving:**

	Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right

	destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn", that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	**PSO1:** Students will have successful professional careers in academics as well as in the public/ private sectors in the field of physics, mathematics and environmental sciences **PSO2:** The students will be capable enough to acquire basic and specialist science skills, their use and incorporation to boost their confident and faith, for effective personal and professional development **PSO3:** Student will be able to gain holistic knowledge about the environment, that is essential for being responsible citizen to protect nature **PSO4:** Students will be equipped with lifelong learning process for self - sustainability, employability and leadership roles in our dynamic society **PSO5:** Students will be provided with value based ethical leadership in professional and social life

Programme SchemeEligibility

A pass in +2 examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu or equivalent, with Physics, Mathematics and Chemistry.

For Programme Completion

A Candidate shall complete:

- Part I - Language papers – Tamil/Arabic in semesters I, II, III and IV respectively
- Part II - Language papers - English in semesters I, II, III, IV respectively
- Part III - Core papers in semesters I, II, III, IV, V and VI respectively
- Part III - Elective papers (Discipline / Generic) in semesters I, II, III, IV, V and VI respectively
- Part IV – Skill Enhancement Course (NME) papers in semesters I and II respective
- Part IV - Skill Enhancement Course papers in semesters I, II, III, and IV respectively
- Part IV - Skill Enhancement Course (Foundation Course) paper in semester I respectively
- Part IV - Skill Enhancement Course (Professional Competency Skill) in semester VI respect
- Part IV - Value Education paper in semester V respectively
- Part IV - Environmental Studies paper in semesters III and IV respectively
- Part IV – Summer Internship/Industrial Training paper in semester V respective
- Part V - Extension activity in semester VI respectively

Scheme of Examinations under Choice Based Credit System

Term End Examinations (TEE)	-	75 Marks
Continuous Internal Assessment Examinations (CIAE)	-	25 Marks
Total	-	100 Marks

Pattern of Continuous Internal Assessment Examinations (CIAE)

Average of Two Internal Tests (each 20 marks)	-	20 Marks
Assignment	-	05 Marks
Total	-	25 Marks

Pattern of Term End Examinations(Max. Marks: 75 / Time: 3 Hours)

External Examinations Question Paper Pattern for Part I & III and Part IV (Elective & Skill Enhancement Course Subject)

Section – A (10 X 1 = 10 Marks) Answer ALL questions.

- Questions 1 - 10
- Two questions from each UNIT
- Multiple choice questions and each question carries Four choices

Section – B (5 X 7 = 35 Marks)
Answer ALL questions choosing either A or B.

- Questions 11 - 15
- Two questions from each UNIT (either…. or…. type)
- Descriptive Type

Section – C (3 X 10 = 30 Marks)
Answer any THREE out of five questions.

- Questions 16 - 20
- One question from each UNIT
- Descriptive Type

External Examinations Question Paper Pattern for Environmental Studies and Value Education

Section – A: (5 X 6 = 30 Marks)
Answer ALL questions choosing either A or B.

- Questions 1 - 5
- Two questions from each UNIT (either…. or…. type)
- Descriptive Type

Section – B (3 X 15 = 45 Marks)
Answer any THREE out of five questions.

- Questions 6 – 10
- One question from each UNIT

- Descriptive Type

Part V (Extension Activities)

- Internal Evaluation

Passing Marks

Minimum 27 for External Exam
Eligibility for the degree - passing minimum is 40%

Practical Examination

Internal – 40 marks

External – 60 marks

Total – 100 marks

Passing minimum is **40%**

Semester-I

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part I	23UTALL11	பொதுத்தமிழ் - 1 தமிழ் இலக்கிய வரலாறு - 1	6	25	75	100	3
	23UARLL11	Paper I : Prose					
	23UMMLL11	Prose, Composition and Translation					
Part II	23UENLL11	General English - I	6	25	75	100	3
Part – III	23UPHCC11	Core Theory 1 – Properties of Matter and Acoustics	5	25	75	100	5
	23UPHCC1P	Core Practical 1 – Physics Practical 1	3	40	60	100	3
	23UMAGE11	Numerical Methods with Applications (Allied Mathematics)	6	25	75	100	4
Part IV	23UPHSE11	Physics for Everyday Life (SEC-1) (NME)	2	25	75	100	2
	23UPHFN11	Foundation Course - Introductory Physics	2	25	75	100	2
Total			**30**				**22**

Semester-II

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max Marks	Credits
Part I	23UTALL21	பொதுத்தமிழ் - 2 தமிழ் இலக்கிய வரலாறு - 2	6	25	75	100	3
	23UARLL21	Paper II : Grammar					
	23UMMLL21	Office Communication Malayalam					
Part II	23UENLL21	General English - II	6	25	75	100	3
Part – III	23UPHCC21	Core Theory 2 – Heat, Thermodynamics and Statistical Physics	5	25	75	100	5
	23UPHCC2P	Core Practical 2 – Physics Practical - 2	3	40	60	100	3
	23UMAGE21	Mathematical Statistics(Allied Mathematics)	6	25	75	100	4
Part IV	23UPHSE21	Astrophysics (SEC-2) (NME)	2	25	75	100	2
	23UPHSE22	Digital Photography (SEC-3) (Discipline/Subject Specific)	2	25	75	100	2
Total			**30**				**22**

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UPHCC11	**Properties of Matter and Acoustics**	**Core**	**5**	**5**	**25**	**75**	**100**

Learning Objectives		
L1	Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers.	
L2	It gives us information about the internal forces which act between the constituent parts of the substance.	
L3	Students who undergo this course are successfully bound to get a better insight and understanding of the subject.	
UNIT	**Contents**	**No. of Hours**
I	**ELASTICITY:** Hooke's law – stress-strain diagram – elastic constants –Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses).	15
II	**BENDING OF BEAMS:** Cantilever– expression for Bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope	15
III	**FLUID DYNAMICS:** *Surface tension*: definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar's method– variation of surface tension with temperature *Viscosity*: definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille's formula – correction – terminal velocity and Stoke's formula– variation of viscosity with temperature.	15
IV	**WAVES AND OSCILLATIONS:** Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and Sharpness of resonance.	15

	Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer– determination of frequency using Melde's string apparatus	
V	**ACOUSTICS OF BUILDINGS AND ULTRASONICS:** Intensity of sound – decibel – loudness of sound – reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings. *Ultrasonic waves*: production of ultrasonic waves – Piezoelectric crystal method –magnetostriction effect – application of ultrasonic waves	10
VI	**PROFESSIONAL COMPONENTS:** Expert lectures – seminars –webinars – industry inputs – social accountability – patriotism	5
	Total	**75**
Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Relate elastic behavior in terms of three moduli of elasticity and working of torsion pendulum.	K1,K2,K3,K4
2	Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials.	K1,K2,K3,K4, K5,K6
3	Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems.	K1,K2,K3,K4, K5,K6
4	Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains	K1,K2,K3,K4, K5,K6
5	Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves	K1,K2,K3,K4, K5
Textbooks		
1	D.S.Mathur, 2010, ***Elements of Properties of Matter***, S.Chand and Co.	
2	Brijlaland N. Subrahmanyam, 2003, ***Properties of Matter***, S.Chand and Co.	
3	D.R.Khanna andR.S.Bedi, 1969, ***Textbook of Sound***, AtmaRam and sons.	
4	Brijlal and N.Subrahmanyam, 1995, ***A Text Book of Sound***, second revised edition Vikas Publishing House.	
5	R.Murugesan,2012, ***Properties of Matter***, S.Chand and Co.	
Reference Books		
1	C.J. Smith, 1960, ***General Properties of Matter***, Orient Longman Publishers.	
2	H.R. Gulati, 1977, ***Fundamental of General Properties of Matter***, Fifth edition.S. Chand and Co.	
3	A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-	

	Heinmann India.
Web Resources	
1	https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
2	http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html
3	https://www.youtube.com/watch?v=gT8Nth9NWPM
4	https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s
5	https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work
6	https://learningtechnologyofficial.com/category/fluid-mechanics-lab/
7	http://www.sound-physics.com/
8	http://nptel.ac.in/courses/112104026/

Mapping with Programme Outcomes:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	2	2	3	2	2	3	2	3
CO 2	2	3	3	3	2	2	3	2	3	3
CO 3	3	2	3	2	3	3	2	3	3	3
CO 4	3	3	3	3	3	2	3	2	2	2
CO 5	2	2	3	3	2	3	3	3	3	2

Strong-3 Medium-2 Low-1

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	2	3
CO2	2	3	2	3	3
CO3	3	2	3	3	3
CO4	2	3	2	2	2
CO5	3	3	3	3	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UPHCC1P	Physics Practical - 1	Core	3	3	40	60	100

Learning Objectives	
L1	Apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

EXPERIMENTS

Minimum of Eight Experiments from the list:

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of moment of inertia of an irregular body.
4. Verification of parallel axes theorem on moment of inertia.
5. Verification of perpendicular axes theorem on moment of inertia.
6. Determination of moment of inertia and g using Bifilar pendulum.
7. Determination of Young's modulus by stretching of wire with known masses.
8. Verification of Hook's law by stretching of wire method.
9. Determination of Young's modulus by uniform bending – load depression graph.
10. Determination of Young's modulus by non-uniform bending – scale and telescope.
11. Determination of Young's modulus by cantilever – load depression graph.
12. Determination of Young's modulus by cantilever – oscillation method
13. Determination of Young's modulus by Koenig's method – (or unknown load)
14. Determination of rigidity modulus by static torsion.
15. Determination of Y, n and K by Searle's double bar method.
16. Determination of surface tension and interfacial surface tension by drop weight method.
17. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
18. Determination of critical pressure for streamline flow.
19. Determination of Poisson's ratio of rubber tube.
20. Determination of viscosity by Poiseullie's flow method.
21. Determination radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

Textbooks

C.L.Arora, 2010, B.Sc Practical Physics, S.Chand and Co.

Brijlaland N. Subrahmanyam, 2003, ***Properties of Matter***, S.Chand and Co.

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Determine the properties of matter like rigidity modulus and to understand the elastic property.	K1,K2,K3,K4
2	Determine the properties of matter like young's modulus and to understand the elastic property.	K1,K2,K3,K4, K5,K6
3	Determine the properties of matter like surface tension and viscosity.	K1,K2,K3,K4, K5,K6
4	Determine the radius of capillary tube by unique method	K1,K2,K3,K4, K5,K6
5	Determine the acceleration due to gravity	K1,K2,K3,K4, K5

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	3	3	3	3	2	3	3	2	3	3
CO2	3	3	3	2	3	3	3	3	3	3
CO3	3	2	3	3	3	3	3	3	2	3
CO4	2	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	2	3	3	3	3
CO5	3	3	3	3	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UMAGE11	Numerical Methods with Applications (Allied Mathematics)	ELECTIVE	4	6	25	75	100

Learning Objectives		
L1	To explore the fundamental concepts of Numerical Methods.	
L2	To acquire knowledge about finding approximate roots of the transcendental and algebraic equations.	
L3	To improve students' ability to solve Problems in interpolation.	
L4	Students are exposed to understanding the concept of derivatives and Integrations.	
L5	To expose to find Numerical Solutions and their applications.	
UNIT	**Contents**	**No. of Hours**
I	Solutions of Transcendental and Algebraic Equations: Iteration method, Bisection method, Newton's method –Regula Falsi method, Horner's method(without proof) (Simple problems only).	**18**
II	Solutions of Simultaneous Equations: Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method - Gauss Jacobi method (Restricted to three variables only) (Simple problems only).	**18**
III	Interpolation for Equal Intervals: Introduction - Gregory Newton's forward and backward formulae –Central difference interpolation Formula: Central differences and central difference table – Gauss forward and backward formulae – Stirling's formula. Interpolation for Unequal Intervals: Introduction Divided Difference –Properties of Divided Difference- Theorem (Statement Only) Lagrange's interpolation formula and inverse interpolation.	**18**
IV	Numerical Differentiation: Newton's forward Difference and backward difference formulae to compute the derivatives. Numerical Integration: Newton – Cote's formula – Trapezoidal rule – Simpson's 1/3 rd and 3/8 th rules.	**18**
V	Applications: Ohm's Law – Kirchoff's Law-Related Problems-Problems using Elimination Method and Iteration method, - Industrial Problems - Finding Eigen values, Resistance Using Newton Raphson Methods-Find Area and Volume using Trapezoid Rule and Simpson's Rule - (Related Solved Problems).	**18**
	Total	**90**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Find out the approximate roots of transcendental and	K1,K2,K3,K4,K5,K6

	algebraic equations.	
2	Develop the skills of finding roots of simultaneous equations	K1,K2,K3,K4,K5,K6
3	Demonstrate knowledge about interpolation	K1,K2,K3,K4,K5,K6
4	Carry out calculations of problems related to derivatives and Integrations.	K1,K2,K3,K4,K5,K6
5	Evaluate Numerical Methods to find Numerical Solutions and their applications in real-life situations.	K1,K2,K3,K4,K5,K6
Textbooks		
1	P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences &Numerical Analysis, S.Chand & Company Ltd., New Delhi-55. **Unit I**: Chapter3 **Unit II:**Chapter4 **Unit III:**Chapter6(Sections: 6.1,6.2,6.3,) Chapter7(Sections: 7.1-7.5) Chapter 8 (Sections:8.1-8.3,8.5 8.7) **Unit IV:** Chapter 9 (Sections: 9.2,9.3 ,9.7-9.9 ,9.13,9.14)	
2	K. Subramani and A. Santha (2017) Numerical Methods Scitech Publications (India) Pvt Ltd. **Unit V:**Chapter 6	
Reference Books		
1	Numerical Methods, T.Veerarajan & T. Ramachandran ,second edition, Tata Mc Graw Hill,2006.	
2	Computer- Oriented Numerical Methods, P.Thangaraj, Prentice Hall of India,pvt.Ltd,NewDelhi,2008.	
3	Numerical Methods, A. Singaravelu, Meenakshi Publications.	
Web Resources		
1	https://nptel.ac.in	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	3	-	-	-	-	-
CO 2	3	2	3	-	-	-	-	-
CO 3	3	2	3	-	-	-	-	-
CO 4	3	2	3	-	-	-	-	-
CO 5	3	2	3	-	-	-	-	-

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	-	-
CO2	3	2	1	-	-
CO3	3	2	1	-	-
CO4	3	2	1	-	-
CO5	3	2	1	-	-

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UPHSE11	PHYSICS FOR EVERYDAY LIFE	NME	2	2	25	75	100

Learning Objectives		
L1	To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics	
UNIT	**Contents**	**No. of Hours**
I	**MECHANICAL OBJECTS: s**pring scales – bouncing balls –roller coasters – bicycles –rockets and space travel.	6
II	**OPTICAL INSTRUMENTS AND LASER:** vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – color photography – holography and laser.	6
III	**PHYSICS OF HOME APPLIANCES:** bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners	6
IV	**SOLAR ENERGY:** Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells.	6
V	**INDIAN PHYSICIST AND THEIR CONTRIBUTIONS:** C.V. Raman, HomiJehangir Bhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology.	6
	Total	**30**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Recognize and apply physics principles used in mechanical objects encountered daily.	K1,K2,K3,K4
2	Explain the physics behind optical instruments and laser applications in everyday items.	K1,K2,K3,K4, K5,K6
3	Understand the functioning and physical principles of household appliances.	K1,K2,K3,K4, K5,K6
4	Describe the fundamentals and applications of solar energy.	K1,K2,K3,K4, K5,K6
5	Appreciate the contributions of Indian physicists to the field of physics and technology.	K1,K2,K3,K4, K5

Textbooks	
1	The Physics in our Daily Lives, Umme Ammara, Gugu cool Publishing, Hyderabad, 2019.
2	For the love of physics, Walter Lawin, Free Press, New York, 2011.
3	
Reference Books	

1.	*Physics of Everyday Phenomena* by W. Thomas Griffith and Juliet Brosing, McGraw-Hill Education, 2014.
2.	*How Things Work: The Physics of Everyday Life* by Louis A. Bloomfield, Wiley, 2021.
3.	*Everyday Physics: Modern Classical Physics Made Simple* by Jo Hermans, Leiden University Press, 2012.
Web Resources	
1.	https://www.physicsclassroom.com/class/circles
2.	https://www.optics4kids.org/
3.	https://www.howstuffworks.com/
4.	https://www.youtube.com/watch?v=zY7QKI1HjaY

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10
CO 1	3	2	2	1	3	2	2	3	2	1
CO 2	2	3	3	3	2	1	3	2	3	2
CO 3	3	2	2	1	3	2	3	3	3	1
CO 4	2	3	3	3	1	3	2	2	3	2
CO 5	3	2	1	3	3	3	2	3	3	1

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	3	2	1
CO2	1	3	2	3	2
CO3	2	3	3	3	1
CO4	3	2	2	3	2
CO5	3	2	3	3	1

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UPHFN11	**Introductory Physics**	**Foundation Course**	**2**	**2**	**25**	**75**	**100**

Learning Objectives		
L1	To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.	
UNIT	**Contents**	**No. of Hours**
I	vectors, scalars –examples for scalars and vectors from physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions– standard physics constants	6
II	different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces	6
III	different forms of energy– conservation laws of momentum, energy – types of collisions –angular momentum– alternate energy sources–real life examples	6
IV	types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion – comparison of light and sound waves – free, forced, damped oscillations	6
V	surface tension – shape of liquid drop – angle of contact – viscosity –lubricants – capillary flow – diffusion – real life examples– properties and types of materials in daily use-conductors, insulators – thermal and electric	6
VI	**PROFESSIONAL COMPONENTS:** expert lectures –seminars –webinars – industry inputs – social accountability – patriotism	
	Total	**30**
Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Apply concept of vectors to understand concepts of Physics and solve problems.	K1,K2,K3,K4
2	Appreciate different forces present in Nature while learning about phenomena related to these different	K1,K2,K3,K4, K5,K6

	forces.	
3	Quantify energy in different process and relate momentum, velocity and energy.	K1,K2,K3,K4, K5,K6
4	Differentiate different types of motions they would encounter in various courses and understand their basis.	K1,K2,K3,K4, K5,K6
5	Relate various properties of matter with their behavior and connect them with different physical parameters involved.	K1,K2,K3,K4, K5
Textbooks		
1	D.S. Mathur, 2010, ***Elements of Properties of Matter***, S.Chand and Co	
2	Brijlal and N. Subrahmanyam, 2003, ***Properties of Matter***, S.Chand and Co.	
Reference Books		
1	H.R. Gulati, 1977, ***Fundamental of General Properties of Matter***, Fifth edition, S.Chand and Co.	
Web Resources		
1	http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/	
2	https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	3	3	3	3	3	2	3	2
CO 2	2	3	3	3	2	3	3	2	2	2
CO 3	3	3	3	2	3	3	3	2	3	2
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	2	3	3	3	3	3	2	2	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	2	2	2
CO3	3	3	2	3	2
CO4	3	3	2	2	2
CO5	3	3	2	2	3

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UPHCC21	**Heat, Thermodynamics and Statistical Physics**	**Core**	**5**	**5**	**25**	**75**	**100**

Learning Objectives		
L1	The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales	
L2	Practical exhibition and explanation of transmission of heat in good and bad conductor	
L3	Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation	
UNIT	**Contents**	**No. of Hours**
I	**CALORIMETRY:** specific heat capacity – specific heat capacity of gases C_P and C_V– Meyer's relation – Joly's method for determination of C_V – Regnault's method for determination of C_P **LOW TEMPERATURE PHYSICS:** Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetization.	15
II	**THERMODYNAMICS-I:** zeroth law and first law of thermodynamics – P-V diagram – heat engine –efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.	15
III	**THERMODYNAMICS-II:** second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram –thermos dynamical scale of temperature – Maxwell's thermos dynamical relations –Clasius - Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.	15
IV	**HEAT TRANSFER:** modes of heat transfer: conduction, convection and radiation. *Conduction*: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad conductor by Lee's disc method.	15

	Radiation: black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law –Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.	
V	**STATISTICALMECHANICS:** definition of phase-space – micro and macro states – ensembles –different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics – expression for distribution function – comparison of three statistics.	10
VI	**PROFESSIONAL COMPONENTS:** Expert lectures – seminars – webinars – industry inputs – social accountability – patriotism	5
	Total	**75**

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Acquires knowledge on how to distinguish between temperature and heat. Introduce him/her to the field of thermometry and explain practical measurements of high temperature as well as low temperature physics. Student identifies the relationship between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand cryogenics, superconductivity, super fluidity and Condensed Matter Physics.	K1,K2,K3,K4
2	Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines.	K1,K2,K3,K4, K5,K6
3	Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy.	K1,K2,K3,K4, K5,K6
4	Study the process of thermal conductivity and apply it to good and bad conductors. Quantify different parameters related to heat, relate them with various physical parameters and analyse them.	K1,K2,K3,K4, K5,K6
5	Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac. Apply to quantum particles such as photon and electron.	K1,K2,K3,K4, K5

Textbooks	
1	Brijlaland N. Subramaniam, 2000, ***Heat and Thermodynamics***, S.Chand and Co.
2	Narayanamoorthy and Krishna Rao, 1969. ***Heat***, Triveni Publishers, Chennai.
3	V.R.Khannaand R.S.Bedi, 1998 1st Edition, ***Text book of Sound***, Kedharnaath Publish and Co, Meerut.
4	Brijlal and N. Subramanyam, 2001, ***Waves and Oscillations,*** Vikas Publishing House, New Delhi.
5	Ghosh, 1996, ***Text Book of Sound***, S.Chand and Co.
6	R.Murugesan and Kiruthiga Siva prasath, ***Thermal Physics***, S.Chand and Co.
Reference Books	
1	J.B.Rajamand C.L.Arora, 1976, ***Heat and Thermodynamics***, 8th edition, S.Chandand Co. Ltd.
2	D.S.Mathur, ***Heat and Thermodynamics***, Sultan Chand and Sons
3	Gupta, Kumar, Sharma, 2013, ***Statistical Mechanics***, 26th Edition, S. Chand and Co.
4	Resnick, HallidayandWalker,2010, ***Fundamentals of Physics***, 6th Edition.
5	Sears, Zemansky, Hugh D. Young, Roger A. Freedman, 2021 ***University Physics with Modern Physics***, 15th Edition, Pearson.
Web Resources	
1	https://youtu.be/M_5KYncYNyc
2	https://www.youtube.com/watch?v=4M72kQulGKkandvl=en
3	Lecture 1: Thermodynamics Part 1 | Video Lectures | Statistical Mechanics I: Statistical Mechanics of Particles | Physics | MIT OpenCourseWare
4	http://www.freebookcentre.net/Physics/Physics-Books-Online.html

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	3	3	3	3	3	2	3	2
CO 2	2	3	3	3	2	3	3	2	2	2
CO 3	3	3	3	2	3	3	3	2	3	2
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	3	2	3	3	3	2	2	3	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	2	2	2
CO3	3	3	2	3	2
CO4	3	3	2	2	2
CO5	3	2	2	3	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UPHCC2P	Physics Practical - 2	Core	3	3	40	60	100

Learning Objectives	
L1	Apply their knowledge gained about the concept of heat and sound waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results.

HEAT, OSCILLATIONS, WAVES AND SOUND

EXPERIMENTS

Minimum of Eight Experiments from the list:

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of good conductor by Searle's method.
3. Determination of thermal conductivity of bad conductor by Lee's disc method.
4. Determination of thermal conductivity of bad conductor by Charlaton's method.
5. Determination of specific heat capacity of solid.
6. Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction/graphical method),
7. Determination of Latent heat of a vaporization of a liquid.
8. Determination of Stefan's constant for Black body radiation.
9. Verification of Stefan's-Boltzmann's law.
10. Determination of thermal conductivity of rubber tube.
11. Helmholtz resonator.
12. Velocity of sound through a wire using Sonometer.
13. Determination of velocity of sound using Kunds tube.
14. Determination of frequency of an electrically maintained tuning fork.
15. To verify the laws of transverse vibration using sonometer.
16. To verify the laws of transverse vibration using Melde's apparatus.
17. To compare the mass per unit length of two strings using Melde's apparatus.
18. Frequency of AC by using sonometer.

Total Hours: 45

Textbooks
C.L.Arora, 2010, B.Sc Practical Physics, S.Chand and Co.
Brijlaland N. Subrahmanyam, 2003, ***Properties of Matter***, S.Chand and Co.

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Determine thermal conducting property of a bad conductor	K1,K2,K3,K4
2	Determine the specific heat and latent heat capacity by various method	K1,K2,K3,K4, K5,K6
3	Determine the velocity sound.	K1,K2,K3,K4, K5,K6
4	Determine the radius of capillary tube by unique method.	K1,K2,K3,K4, K5,K6
5	Determine the frequency of alternating current source.	K1,K2,K3,K4, K5

MAPPING WITH PROGRAM OUT COMES:

Map course outcomes **(CO)** for each course with program outcomes **(PO)** in the 3-point scale of STRONG(**S**), MEDIUM (**M**) and LOW (**L**).

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	3	3	2	3	3
CO2	3	3	3	2	3	3	3	3	3	3
CO3	3	2	3	3	3	3	3	3	2	3
CO4	2	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	3	3	3	3	3	2

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	2	3
CO4	2	3	3	3	3
CO5	3	3	3	3	2

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UMAGE21	Mathematical Statistics (Allied mathematics)	ELECTIVE	4	6	25	75	100

Learning Objectives		
L1	To expose the topics such as Collection of Data , classification and Tabulation.	
L2	To gain knowledge of Measures of central Tendency.	
L3	To acquire the knowledge of solving Mean, Median, Mode, Index Numbers and concepts of probability.	
UNIT	**Contents**	**No. of Hours**
I	Collection of Data Techniques: Primary and secondary data - Primary methods of data collection –Drafting Questions and questionnaires - Sources of secondary data -Editing primary data- Editing secondary data. Classification and Tabulation: Introduction, Classification, Organizing Quantitative Data, Selecting Class Intervals Two way Frequency Distribution, Cumulative Frequencies, Types of Tables.	18
II	Measures of Central Tendency: The arithmetic Mean-Properties-Shortcut Method-Weighted arithmetic Mean-Quartile -Deciles and Percentile-Median-Mode.	18
III	Measures of Dispersion: The Range, Quartile Deviation-–Mean Deviation-Standard Deviation- Calculation of standard deviation by short cut method- Variance and coefficient of variation.	18
IV	Index Numbers: Introduction, Weighted Average of Actual Prices-Price Relative Method-Quantity Index Numbers-Mathematical Test of consistency-Fixed and Chain Base Index Numbers-Consumer Price Index Numbers.	18
V	Probability: Introduction - Addition Rule o Probability-Conditional Probability-Baye's Theorem-Inverse Probability - Permutations and Combinations, Random Variable and Probability Distribution.	18
	Total	**90**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Find out the Classification data and Table.	K1,K2,K3,K4,K5,K6

2	Provide a basic knowledge of measures of central tendency.	K1,K2,K3,K4,K5,K6
3	Demonstrate knowledge of solving problems Mean, Standard Deviation and variance.	K1,K2,K3,K4,K5,K6
4	Carry out calculations of problems related to Index Numbers.	K1,K2,K3,K4,K5,K6
5	Evaluate problems using Probability.	K1,K2,K3,K4,K5,K6
Textbooks		
1	Introduction to Statistical Methods, C.B. Gupta,Vijay Gupta 23rd Revised Edition, Vikas Publishing House PVT LTD,2004,Reprint 2013 **Unit-I:** Chapter 5, 6. **Unit-II:** Chapter 9. **Unit-III:** Chapter 10. **Unit - IV**: Chapter 13. **Unit-V:** Chapter 16.	
Reference Books		
1	Statistics, S. Arumugam & Isaac , New Gamma Publishing House, July 2016.	
2	Fundamental of Mathematics, S.C.Gupta & V.K. Kapoor. Eleventh Edition, Sultan Chand &Sons publication.	
3	Introduction to mathematical Statistics, Robert .V. Hogg &Allen T.Craig, Collier Macmillan Global Editions.	
Web Resources		
1	https://nptel.ac.in	

Mapping with Programme Outcomes:

CO /PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	2	3	2	2	3	-	-
CO 2	3	2	3	2	2	3	-	-
CO 3	3	2	3	2	2	3	-	-
CO 4	3	2	3	2	2	2	-	-
CO 5	3	2	3	2	2	3	-	-

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	-	-
CO2	3	2	2	-	-
CO3	3	2	2	-	-
CO4	3	2	2	-	-
CO5	3	2	2	-	-

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Hours	Marks		
					CIAE	TEE	Total
23UPHSE21	ASTROPHYSICS	NME	2	2	25	75	100

Learning Objectives		
L1	This course intends to introduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena and provide an understanding of the physical nature of celestial bodies along with the instrumentation and techniques used in astronomical research	
UNIT	**Contents**	**No. of Hours**
I	**TELESCOPES:** Optical telescopes – magnifying power, brightness, resolving power and f/a ratio – types of reflecting and refracting telescopes – detectors and image processing – radio telescopes – Hubble space telescope.	6
II	**SOLAR SYSTEM:** Bode's law of planetary distances – meteors, meteorites, comets, asteroids – Kuiper belt – Oort cloud – detection of gravitational waves – recent advances in astrophysics.	6
III	**ECLIPSES:** types of eclipses – solar eclipse – total and partial solar eclipse – lunar eclipse – total and partial lunar eclipse – transits. **THE SUN:** physical and orbital data – solar atmosphere – photosphere – chromosphere – solar corona – prominences – sunspots – 11year solar cycle – solar flares.	6
IV	**STELLAR EVOLUTION:** H-R diagram – birth and death of low mass, intermediate mass and massive stars – Chandrasekar limit – white dwarfs – neutron stars – pulsars – black holes – supernovae. **GALAXIES:** classification of galaxies – galaxy clusters –interactions of galaxies, dark matter and super clusters – evolving universe.	6
V	**ACTIVITIES IN ASTROPHYSICS:** (i) Basic construction of telescope (ii) Develop models to demonstrate eclipses/planetary motion (iii) Night sky observation (iv) Conduct case study pertaining to any topic in this paper (v) Visit to any one of the National Observatories Any three activities to be done compulsorily.	6
	Total	**30**

Course Outcomes		Knowledge Level
CO	**On completion of this course, students will**	
1	Identify and understand various types of telescopes and their functions.	K1,K2,K3,K4
2	Describe the structure and components of the solar system and recent advances in detecting celestial phenomena.	K1,K2,K3,K4, K5,K6
3	Explain eclipse phenomena and the physical features of the	K1,K2,K3,K4,

	Sun.	K5,K6
4	Analyze star evolution, galaxy types, and the concept of dark matter.	K1,K2,K3,K4, K5,K6
5	Engage in practical activities related to astrophysical concepts.	K1,K2,K3,K4, K5
Textbooks		
1	Baidyanath Basu, (2001). An introduction to Astrophysics, Second printing, Prentice – Hall of India (P) Ltd, New Delhi	
2	K.S. Krishnaswamy, (2002), Astrophysics – a modern perspective, New Age International (P) Ltd, New Delhi.	
3	Shylaja, B.S. and Madhusudan, H.R.,(1999), Eclipse: A Celestial Shadow Play, Orient BlackSwan,	
Reference Books		
1.	Dr.A.Mujiber Rahman,(2018) Introduction to Astrophyics, KAMS Publications,Theni	
2.	Carroll, B. W., & Ostlie, D. A. (2017). *Introduction to Modern Astrophysics.* Pearson, Boston.	
3.	Choudhuri, A. R. (2010). *Astrophysics for Physicists*. Cambridge University Press, Cambridge.	
Web Resources		
1.	https://science.nasa.gov/astrophysics/technology/ground-based-telescopes	
2.	https://www.nasa.gov/mission_pages/hubble/main/index.html	
3.	https://solarsystem.nasa.gov/	
4.	https://eclipse.gsfc.nasa.gov/	
5.	https://astro.unl.edu/naap/hr/animations/hr.html	
6.	https://www.esa.int/Science_Exploration/Space_Science/ Hubble_classifies_galaxies	
7.	https://www.skyandtelescope.com/astronomy-equipment/how-to-build-your-own-telescope/	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	**3**	**2**	**3**	**2**	**1**	**3**	**2**	**3**
CO 2	**2**	**3**	**3**	**3**	**2**	**1**	**3**	**2**
CO 3	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**3**
CO 4	**2**	**3**	**3**	**2**	**1**	**3**	**2**	**3**
CO 5	**3**	**1**	**2**	**3**	**2**	**3**	**3**	**2**

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**3**	**2**	**3**
CO2	**1**	**3**	**2**	**3**	**2**
CO3	**2**	**3**	**3**	**2**	**3**
CO4	**3**	**2**	**3**	**3**	**2**
CO5	**3**	**3**	**2**	**3**	**1**

Strong-3 Medium-2 Low-1

Course Code	Course Title	Category	Credits	Inst. Hours	Marks		
					CIAE	External	Total
23UPHSE22	**Digital Photography**	**Discipline/subject specific (sec-3)**	**2**	**2**	**25**	**75**	**100**

Learning Objectives		
L1	To understand the principles of photography and image formation and the science and arts behind it. To understand the essential components of conventional and digital cameras and also the different image processing techniques.	
UNIT	**Contents**	**No. of Hours**
I	**PHOTOGRAPHY AND BASIC PRINCIPLE OF IMAGE FORMATION:** principle –chemical route and digital route –light, wavelengths, colors – shadows – light intensity and distance – making light form images –pin-hole images – practical limitations to pin-hole images – lens instead of pin-hole – focal length and image size – imaging of closer subjects.	6
II	**LENSES – CONTROLLING THE IMAGES:** photographic lens – focal length and angle of view **(***problems***)** – focusing movement – aperture and f-numbers **(***problems***)** – depth of field– depth of focus – image stabilization – lenses for digital cameras – lens and camera care.	6
III	**CAMERA USING FILMS AND ITS TYPES:** camera and its essential components– shutter – aperture – light measurement – film housing – camera types: view camera– view finder camera – Reflex camera– single lens reflex (SLR) camera.	6
IV	**DIGITAL CAMERAS PRINCIPLE AND TYPES:** principle of digital image capturing –comparison of digital and analog picture information – megapixel – grain, noise and pixel density – optical and digital zooming – image stabilizer – bit depth – white balance – color modes – file formats (TIFF, RAW and JPEG) – storage cards and types – digital cameras: camera phones – compact camera – hybrid camera – digital SLR.	6
V	**THE DIGITAL IMAGE – POSTPRODUCTION:** hardware: computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history – crop – rotate – brightness and contrast – color balance – hue/saturation – dodge/burn – cloning and retouching –	6

	removing an element in an image – advanced editing: histogram/levels – curves – selection tools: magic wand – printing digital images: inkjet printer – laser printer – dye sub printer – lambda/light jet printers.	
	Total	**30**
Textbooks		
1	Michel J. Langford, Anna Fox and Richard Sawdon Smith, ***Basic photography***, 9th Edn 2010-NL, Focal press, London.	
2	Henry Carroll, Read this if you want to take great photographs of people, Laurence King Publishing.	
Reference Books		
1	Mark Galer, ***Digital Photography in Available Light essential skills***, 2006, Focal press, London.	
2	Paul Harcourt Davies, ***The Photographer's practical handbook***, 2005, UK PRESS.	

Course Outcomes		**Knowledge Level**
CO	**On completion of this course, students will**	
1	Learn in depth about types of lenses, their practical usages and other accessories used in photography	K1,K2,K3,K4
2	Describe and predict how images are formed and magnified	K1,K2,K3,K4, K5,K6
3	Appraise types of photographic components like shutter, aperture and its types.	K1,K2,K3,K4, K5,K6
4	Learn in depth about types of picture quality and types of storage devices	K1,K2,K3,K4, K5,K6
5	study the image enhancement techniques, image restoration procedures and the image compression procedures.	K1,K2,K3,K4, K5

Mapping with Programme Outcomes:

CO /PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**
CO 1	3	3	3	3	3	3	3	2	3	2
CO 2	2	3	3	3	2	3	3	2	2	2
CO 3	3	3	3	2	3	3	3	2	3	2
CO 4	3	3	3	3	3	3	3	2	2	2
CO 5	3	2	3	3	3	3	3	2	2	3

Strong-3 Medium-2 Low-1

Level of Correlation between PSO's and CO's

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	2
CO2	3	3	2	2	2
CO3	3	3	2	3	2
CO4	3	3	2	2	2
CO5	3	3	2	2	3

Strong-3 Medium-2 Low-1