



UNIVERSITY OF KERALA

Four Year Under Graduate Programme (UoK FYUGP)

First Semester – Modified Syllabus

Major Discipline: PHYSICS

University of Kerala
Senate House Campus, Palayam, Thiruvananthapuram- 34, Kerala, India

June 2025



University of Kerala

Discipline	PHYSICS				
Course Code	UK1DSCPHY100				
Course Title	FOUNDATION COURSE IN PHYSICS-I				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 Hrs	-	2 Hrs	5 Hrs
Pre-requisites	-				
Course Summary	This course discusses basic foundation concepts in Physics. Simple mathematical tools required for understanding Physical concepts are discussed in the first module. Motion of objects is explained on the basis of Newton's laws followed by the discussion on work and energy. Study on rotational dynamics reveals the concept of angular momentum and its significance in rigid bodies. The discussion on oscillations will help to understand simple harmonic motion and its applications in pendulum.				

BOOKS FOR STUDY:

1. Introduction to Electrodynamics, David J Griffiths, Prentice Hall
2. Sear and Zemansky's University Physics With Modern Physics, Hugh D Young, Roger A Freedman, Addison -Wesley, 13TH EDITION, 2012.
3. Mechanics, J C Upadhyaya, Ramprasad Publications

BOOKS FOR REFERENCE:

1. Introduction to Mechanics, Daniel Kleppner and Robert Kolenkow Second Edition, Mc Graw Hill Education, 2017.
2. Principles Of Physics 10th Edition, Robert Resnick Jearl Walker, David Halliday, Wiley, 2014.
3. Mechanics: H. S. Hans and S. P. Puri, TMH, 2ndEdn.
4. Properties of matter: Brijlal and Subramaniam, S. Chand & Co., 2004
5. Principles of Physics: P.V. Naik, PHI,

DETAILED SYLLABUS: THEORY

Total 45 Hrs

1Hr/week = 15 Hrs

Module	Unit	Content	Hrs	CO No
I	LANGUAGE OF PHYSICS (Book 1: Chapter 1)		9	
	1	Vector algebra - vector operations, component form, triple products,	3	1
	2	Gradient, the operator ∇ , the divergence, the curl, product rules	3	1
	3	Integral calculus: line, surface and volume integrals	1	1
	4	Gauss's divergence theorem and Stokes's theorem	2	1
II	DYNAMICS OF MOTION- WORK AND ENERGY (Book 2: Chapter 6 & 7)		8	
	5	Work, Kinetic energy and work - energy theorem	1	2
	6	Work and energy with varying forces- Straight line motion, Motion along a curve, Power	2	2
	7	Gravitational Potential energy, elastic Potential energy	2	2
	8	Conservative and non-conservative forces, Law of Conservation of energy	2	2
	9	Force and potential energy	1	2
III	DYNAMICS OF ROTATION AND ANGULAR MOMENTUM (Book 2 and Book 3)		10	
	10	Torque, Angular acceleration, Rigid body rotation about a moving axis (Book 2:Chapter 10)	3	4
	11	Combined translation and rotation-energy relations, rolling without slipping. Rolling friction, work and power in rotational motion (Book 2: Chapter 10)	3	4
	12	Equation of motion of a rotating rigid body: Angular momentum and moment of inertia, Parallel axes theorem, perpendicular axes theorem, Calculation of moment of inertia of uniform rod, thin circular ring, circular disc, sphere. (Book 3 : Chapter 8)	4	4
IV	UNDERSTANDING OSCILLATIONS (Book 2, Book 3)		9	
	13	Simple Harmonic motion, Energy in Simple Harmonic motion (Book 2: Chapter 14)	3	5

	14	mass on a spring - oscillation of two particles connected by a spring (Book 3 : Chapter 9)	2	5
	15	compound pendulum - interchange ability of suspension and oscillation points-collinear points-conditions for maximum and minimum periods (Book 3 : Chapter 9)	4	5
V*	LAWS OF MOTION (Book 2: Chapter 4 & 8)		9	
	16	Newton's first law, law of inertia - Inertial frame of reference	2	3
	17	Newton's second law- Mass and Force	1	3
	18	Mass and weight- Variation of g with location, measuring mass and weight	2	3
	19	Newton's third law	1	3
	20	Momentum and impulse - Newton's second law in terms of Momentum, The impulse-momentum theorem	3	3

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		CO No
Sl No	Name of Experiment	
1	Compound Bar Pendulum – Symmetric	5
2	Compound Bar Pendulum – Asymmetric.	5
3	Determination of moment of inertia of fly wheel	4
4	Helical spring- Spring constant	2, 5
5	Show that the period of oscillation of a simple pendulum is independent of the mass of the bob used.	5
6	Kater's Pendulum - Determine the value of g	5
Part B* – At least One Experiment to be performed		
7	Inclined plane - determine the downward force, along an inclined plane	1
8	Concurrent forces - determination of unknown mass	1
9	Concurrent forces - parallelogram law verification	1
10	Establish the relationship between length and period of a simple pendulum.	5

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Use basic mathematical tools to solve problems involving vectors and their applications.	Ap	1, 2, 4
CO-2	Evaluate the concepts of work, energy and power in different physical situations.	E	1, 2
CO-3	Apply the basic ideas of Newtonian mechanics to evaluate dynamics of objects in detail.	Ap	1, 2
CO-4	Develop the concepts of torque, angular momentum and moment of inertia to study rigid bodies.	C	1, 2, 7
CO-5	Analyse the periodic movement of objects in relation to the simple harmonic motion.	An	1, 2, 7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: FOUNDATION COURSE IN PHYSICS-I

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PSO / PO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Use basic mathematical tools to solve problems involving vectors and their applications.	PSO 1, 2, 4/ PO 1, 2	Ap	F, C	L	P
CO-2	Evaluate the concepts of work, energy and power in different physical situations.	PSO 1, 2/ PO 1, 2	E	F, C	L	-
CO-3	Apply the basic ideas of Newtonian mechanics to evaluate dynamics of objects in detail.	PSO 1, 2/ PO 1, 2	Ap	F, C	L	-
CO-4	Develop the concepts of torque, angular momentum	PSO 1, 2/	C	F, C, P	L	P

	and moment of inertia to study rigid bodies.	PO 1, 2				
CO-5	Analyse the periodic movement of objects in relation to the simple harmonic motion.	PSO 1, 2, 7/ PO 1, 2, 3, 6	An	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	-	-	✓
CO-3	✓	-	-	✓
CO-4	✓	✓	-	✓
CO-5	✓	-	-	✓



University of Kerala

Discipline	PHYSICS				
Course Code	UK1DSCPHY101				
Course Title	PRINCIPLES OF DYNAMICS				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 Hrs	-	2 Hrs	5 Hrs
Pre-requisites	1. The students should have undergone a course in physics during their higher secondary curriculum 2. The students should have a basics understanding of motion 3. The students should have basic ideas physical quantities and units				
Course Summary	This course aims to present the basics of mechanics in an easily understandable way. The course begins with an introduction to kinematics which includes the properties of vectors, motions and Newton's laws. The second module comprises the basic ideas of momentum and collisions and discusses the concept of conservation. The basic ideas of circular motion is explained with a few examples in the third module. The work, energy, force and the concept of angular momentum are introduced in the fourth module. The last module includes the elementary ideas of equilibrium and stability.				

BOOKS FOR STUDY:

1. Physics for scientists and engineers with Modern Physics, 7th Edition, Serway & Jewett,
2. College Physics 2e, OpenStax
3. Sear and Zemansky's University Physics With Modern Physics, Hugh D Young, Roger A Freedman, Addison -Wesley, 13TH EDITION, 2012.
4. Mechanics, J C Upadhyaya, Ramprasad Publications

BOOKS FOR REFERENCE:

1. Principles of Physics, 10/e, Walker, Halliday & Resnick, International Student Version, Wiley

2. Basic Physics, Kenneth W Ford, World Scientific Publishing Co. Pvt. Ltd., 2016
3. An Introduction to Mechanics, D. Kleppner & R. Kolenkow, 2/e, Cambridge University Press.
4. University Physics, 13 th Edition, Hugh D. Young, Roger A. Freedmann, A. Lewis Ford, Pearson 2012.
5. Basic Physics: Principles and Concepts, Avijit Lahiri

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	INTRODUCTION TO KINEMATICS (Book: 1 - Chapter 2, 3,4,5, 7,11)		9	
	1	Vectors, Properties of vectors - scalar product and Vector product	2	1
	2	Motion in One Dimension - Position, Velocity and speed, acceleration, freely falling objects	2	1
	3	Motion in two Dimension - position, velocity and acceleration vectors, projectile motion, particle in uniform circular motion	2	1
	4	Newton's First law and inertial Frames, Mass, Newton's Second Law, Newton's Third Law	3	1
II	Circular Motion (Book: 2 - Chapter 6)		8	
	5	Rotation angle and angular velocity	1	2
	6	Centripetal acceleration (discuss centrifuge as an example)	2	2
	7	Centripetal force: Coefficient of friction on a car tyre, ideal speed and angle of a car on a turn	3	2
	9	Fictitious Forces and Non-inertial Frames, The Coriolis Force	2	2
III	Linear Momentum, Impulse and Collisions (Book: 1, Book: 2)		9	
	10	Linear momentum, Conservation of linear momentum (Book: 1 - Chapter 9)	2	3

	11	Impulse - momentum theorem (Book: 1 - Chapter 9)	2	3
	12	Collisions, Collisions in one dimension and two dimensions (Book: 1 - Chapter 9)	2	3
	13	Elastic collisions in one dimension, inelastic collisions in one dimension (Book: 2 - Chapter 8)	3	3
IV	Angular Momentum (Book: 3, Book: 4)		10	
	14	Torque, Angular acceleration, Rigid body rotation about a moving axis (Book 3: Chapter 10)	4	4
	15	Equation of motion of a rotating rigid body: Angular momentum and moment of inertia, Parallel axes theorem, perpendicular axes theorem, Calculation of moment of inertia of uniform rod, thin circular ring, circular disc, sphere, solid cylinder. (Book 4 : Chapter 8)	6	4
V*	Equilibrium and stability (Book: 2 - Chapter 9)		9	
	18	Definition for equilibrium, first and second conditions for equilibrium	2	5
	19	Ideas of stability of a system	1	5
	20	Mechanical advantage and its determination	2	5
	21	Simple Machines: Nail puller and Wheel barrow	2	5
	22	Forces and torque in muscles and joints	2	5

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		CO No
Sl No	Name of Experiment	
1	Least Count of instruments - Screw Gauge, Vernier Callipers, Spectrometer, traveling microscope	6
2	Screw Gauge - To find the thickness of a scale and radius of wire	6
3	Vernier Callipers - To find the breadth of a scale and the diameter of a small spherical/cylindrical body	6
4	The moment bar - To determine the weight of a bar/scale	6
5	Concurrent Forces - To find the weight of a body using parallelogram law of vectors	6

6	Viscosity - To find the Coefficient of viscosity- Continuous flow method using constant pressure head.	6
7	Viscosity- To find the Coefficient of viscosity- using Variable pressure head arrangement	6
8	To locate the points to given coordinates in space, measure the distance between two points in space and then to verify the distance using distance formula	
9	To find the distance of given point (in space) from a plane (passing through three non-collinear points) by actual measurement and also analytically	6
10	To study the third law of motion using two spring balances	6
Part B* – At least One Experiment to be performed		
11	Surface Tension - To find the surface tension of water by capillary rise method	6
12	The force of Friction - To determine the relationship between force of limiting friction and normal reaction and to find the coefficient of friction between a block and a horizontal surface	6
13	The inclined plane - To determine the downward force along the inclined plane acting on a trolley/roller	6
14	Fly Wheel - To determine the moment of inertia about its axle	6

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Apply mathematical and physical principles of vectors and motion to solve problems involving objects moving in one, two, and three dimensions, and analyze the forces acting on these objects using Newton's laws of motion.	Ap	PSO-1
CO-2	Analyze the relationships between centripetal acceleration, centripetal force, friction, and motion in circular paths, and apply these concepts to determine ideal speeds, angles of turn, and forces involved, as well as examine the effects of frames of reference, fictitious forces, and Coriolis force on physical phenomena.	An	PSO-1
CO-3	Evaluate the principles of linear momentum, impulse-momentum theory, and collisions in one and two dimensions, and apply these concepts to analyze and solve problems	E	PSO-1

	involving elastic and inelastic collisions, demonstrating an understanding of the relationships between momentum, impulse, and energy transfer.		
CO-4	Develop the concepts of torque, angular momentum and moment of inertia to study rigid bodies.	C	PSO-1
CO-5	Apply the principles of equilibrium, stability, and mechanical advantage to analyze and solve problems involving simple machines, and extend these concepts to understand the forces and torques involved in human movement, muscles, and joints.	Ap	PSO-1
CO-6	Apply measurement techniques and fundamental principles to accurately measure physical quantities, analyze the behavior of concurrent forces, and determine the properties of liquids, including surface tension and viscosity.	Ap	PSO-2

Name of the Course: PRINCIPLES OF DYNAMICS

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Apply mathematical and physical principles of vectors and motion to solve problems involving objects moving in one, two, and three dimensions, and analyze the forces acting on these objects using Newton's laws of motion.	PSO-1 PO-1,2	Ap	F	L	-
CO-2	Analyze the relationships between centripetal acceleration, centripetal force, friction, and motion in circular paths, and apply these concepts to determine ideal speeds, angles of turn, and forces involved, as well as	PSO-1,2 PO-1, 2,3	An	F, C	L	-

	examine the effects of frames of reference, fictitious forces, and Coriolis force on physical phenomena.					
CO-3	Evaluate the principles of linear momentum, impulse-momentum theory, and collisions in one and two dimensions, and apply these concepts to analyze and solve problems involving elastic and inelastic collisions, demonstrating an understanding of the relationships between momentum, impulse, and energy transfer.	PSO-1,2 PO-1, 2,4	E	F, C	L	-
CO-4	Develop the concepts of torque, angular momentum and moment of inertia to study rigid bodies.	PSO-1,2 PO-1, 2,3	C	F, C	L	-
CO-5	Apply the principles of equilibrium, stability, and mechanical advantage to analyze and solve problems involving simple machines, and extend these concepts to understand the forces and torques involved in human movement, muscles, and joints	PSO-1 PO-1,2	Ap	F, C	L	-
CO-6	Apply measurement techniques and fundamental principles to accurately measure physical quantities,	PSO-7 PO-1,2	Ap	C, P	-	P

	analyze the behavior of concurrent forces, and determine the properties of liquids, including surface tension and viscosity.					
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F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	-	-	✓
CO-3	✓	-	-	✓
CO-4	✓	✓	-	✓
CO-5	✓	✓	-	-
CO-6	✓	-	-	-



University of Kerala

Discipline	PHYSICS				
Course Code	UK1DSCPHY102				
Course Title	PROPERTIES OF SOLIDS				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 Hrs	-	2 Hrs	5 Hrs
Pre-requisites	1. Students should have a basic understanding of classification of materials based on the electrical properties. 2. Students should be aware of basics of diamagnetic, paramagnetic, and ferro magnetic substances. 3. Students should know the fundamentals of heat, temperature, thermal expansion and heat transfer by conduction, convection and radiation.				
Course Summary	This course explores the fundamental properties of solids and their applications. Topics covered include magnetic properties, superconductivity, thermal properties and dielectric properties. Emphasis is placed on understanding the underlying concepts of physics governing these properties and their technological significance.				

BOOKS FOR STUDY:

1. A textbook of Engineering Physics, Dr. M.N. Avadhanulu and Dr. P.G. Kshirsagar
2. Engineering Physics, G Aruldas, PHI Learning Private Limited, New Delhi(2012).
3. Heat and Thermodynamics: Brijlal and Subramaniam, S. Chand &Co.

BOOKS FOR REFERENCE:

1. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan, S Rai Choudhury, McGraw Hill Education (India) Private Limited (2017).
2. Solid State physics and Electronics, R K Puri, V K Babbar, S Chand & Company Ltd, (2008).

3. Solid State Physics, Dr R Asokamani, Eswar Press, Chennai, (2015).
4. Applied Solid State Physics, Rajnikant, Wiley India Pvt. Ltd. 92011)
5. Heat and Thermodynamics: M. Zeemansky, McGraw Hill, New Delhi (2007).
6. Heat and Thermodynamics: Rose C. McCarthy, The Rosen Publishing Group, Inc. NY, (2005)
7. Thermodynamics Kinetic Theory and Statistical Thermodynamics: F. W. Sears and G. L. Salinger, Addison-Wesley Publishing Company, 3rd Edn. (1975).

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	SOLIDS Book 1 (28.2,28.3, 28.5, 28.6, 28.7, 28.8,28.9, 28.14)		8	
	1	Electrical conduction, Classification of materials	2	1
	2	Classical Free electron model of solids	2	1
	3	Drift velocity, Electrical conductivity, Mobility, Relaxation time	3	1
	4	Drawbacks of classical free electron theory	1	1
II	MAGNETIC PROPERTIES Book 2 (14.1, 14.2, 14.3, 14.6, 14.7, 14.8)		8	
	5	Permeability and Susceptibility	1	1
	6	Origin of Magnetic Moment	1	1
	7	Classification of magnetic materials	2	1
	8	Curie Temperature, Weiss theory of Ferromagnetism	2	1
	9	Hysteresis loop	2	1
III	SUPERCONDUCTIVITY Book 2 (7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.9, 7.10)		8	
	10	Introduction, Magnetic Properties, Meissner Effect	2	1
	11	Type I and type II superconductors – London Penetration depth	2	1
	12	Isotope Effect, BCS Theory, Cooper Pairs	2	1
	13	High temperature superconductivity, Applications	2	1
IV	THERMAL PROPERTIES Book 3 (15.1, 15.13, 15.14, 15.19, 16.2, 16.3, 16.4, 16.5, 16.6, 13.17, 13.18, 13.19, 13.20, 13.21)		12	
	14	Coefficient of Thermal Conductivity, Thermal Diffusivity	1	2

	15	Thermal conductivity – Radial flow of heat, cylindrical flow	2	2
	16	Wiedemann – Franz Law	1	2
	17	Latent Heat of Fusion	1	2
	18	Laws of Fusion - Practical Applications	1	2
	19	Effect of Pressure and impurities on Freezing point,	1	2
	20	Thermoelectric effects – Seebeck, Peltier, Peltier Coefficient, Thomson effect and Thomson Coefficient	5	2
V*	DIELECTRIC PROPERTIES Book 2 (13.1, 13.2, 13.7, 13.8, 13.9)		9	
	21	Electric Dipole, Polarizability, Polarisation vector, Dielectric constant, Dielectric Susceptibility	2	3
	22	Dielectric polarisation- Electronic Polarisation, Ionic Polarisation, Orientation Polarisation, Space Charge Polarization, Total Polarisation	4	3
	23	Ferroelectric Crystals, Piezoelectric Crystals- Applications	2	3
	24	Applications of dielectric materials	1	3

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		CO No
Sl No	Name of Experiment	
1	Diode Characteristics (for Ge and Si diodes)	4
2	Zener diode characteristics: To (i) trace and construct the circuit (ii) to plot the V-I characteristic under reverse biased condition and (iii) to calculate the dynamic resistance of the diode under reverse bias when conducting	4
3	Phase transition-determination of M.P of wax	4
4	Determination of thermal conductivity of rubber	4
5	Lee's disc-determination of thermal conductivity of a bad conductor	4
6	Circular coil- magnetization of a magnet	4
7	Absolute determination of m and Bh using box type and Searle's type vibration magnetometers	4
8	Searle's vibration magnetometer-comparison of magnetic moments	4
9	Potentiometer – Resistivity	4
Part B* – At least One Experiment to be performed		
10	Thermo emf-measurement of emf using digital multimeter	4

11	Determination of dielectric constant of a given material	4
12	Carey Foster's Bridge-Resistivity	4

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Assess the conducting properties of solids using the free electron model, evaluate the impact of mobility and relaxation time, interpret the magnetic behavior of materials, and critically examine the principles, properties, and diverse applications of superconductivity.	An	PSO-1,2
CO-2	Design experiments to explore the thermal conductivity of solids, utilizing latent heat of fusion, and create practical applications based on the thermoelectric properties of solids.	C	PSO-1,2
CO-3	Apply the concepts of electric dipole, polarizability, polarization vector, dielectric constant, and susceptibility to explain various types of polarization, and utilize the properties of dielectric, ferroelectric, and piezoelectric crystals in practical applications.	Ap	PSO-1,2
CO-4	Experiment and infer conductivity and magnetic property measurements as well as semiconductor device characterization.	Ap	PSO-1,2, 7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: PROPERTIES OF SOLIDS

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Assess the conducting properties of solids using the free electron model, evaluate the impact of mobility and relaxation time,	PO 1, 2, 3, 4, 5, 8/ PSO – 1,2	An	C	L	-

	interpret the magnetic behavior of materials, and critically examine the principles, properties, and diverse applications of superconductivity.					
CO-2	Design experiments to explore the thermal conductivity of solids, utilizing latent heat of fusion, and create practical applications based on the thermoelectric properties of solids.	PO 1, 2, 3, 4, 6, 8/ PSO – 1,2	C	C	L	-
CO-3	Apply the concepts of electric dipole, polarizability, polarization vector, dielectric constant, and susceptibility to explain various types of polarization, and utilize the properties of dielectric, ferroelectric, and piezoelectric crystals in practical applications.	PO 1, 2, 3, 4, 8/ PSO – 1,2	Ap	C	L	-
CO-4	Experiment and infer conductivity and magnetic property measurements as well as semiconductor device characterization.	PO 1, 2, 3, 4, 5, 6, 8/ PSO – 1,2,7	Ap	P	-	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	✓	-	✓
CO-3	✓	✓	✓	-
CO-4	✓	-	-	✓



University of Kerala

Discipline	PHYSICS				
Course Code	UK1DSCPHY103				
Course Title	INTRODUCTION TO MECHANICS AND ENERGY RESOURCES				
Type of Course	DSC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 Hrs	-	2 Hrs	5 Hrs
Pre-requisites					
Course Summary	Knowledge about basic ideas of physical quantities, vectors, gravitation, rotational motion, energy resources and sound waves.				

BOOKS FOR STUDY:

1. Principles of physics: Halliday and Resnick, tenth edition
2. Non-conventional energy sources: G D Rai, Khanna publishers 2008

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	Physical quantities and vectors (Book 1)		9	
	1	Measuring things, the international system of units	1	1
	2	Significant figures	1	1
	3	Vectors and scalars, components of a vector	1	1
	4	Unit vectors	1	1
	5	Addition of vectors	1	1

	6	Multiplication of vectors	2	1
	7	Vectors and the laws of physics	2	1
II	Gravitation (Book 1)		9	
	8	Newton's law of gravitation, gravitation and principle of superposition	2	2
	9	Gravitation near earth's surface, gravitation inside earth	2	2
	10	Gravitational potential energy	1	2
	11	Planets and satellites, Kepler's laws	2	2
	12	Satellite orbits and energy	2	2
III	Energy resources (Book 2)		9	
	13	Various forms of energy, renewable and conventional energy systems	2	3
	14	Solar energy, applications, merits and demerits	2	3
	15	Wind energy, applications, merits and demerits	2	3
	16	Biomass energy, merits and demerits	1	3
	17	Nuclear energy, fission and fusion and nuclear reactors	2	3
IV	Rotational motion (Book1)		9	
	18	Rotational variables, rotation with constant angular acceleration	2	4
	19	Relating the linear and angular variables	2	4
	20	Kinetic energy of rotation	1	4
	21	Calculating the rotational inertia	2	4
	22	Torque	1	4
	23	Newton's second law of rotation	1	4
V*	Sound waves (Book 1)		9	
	24	Sound waves, speed of sound waves, travelling sound waves	2	5
	25	Interference	2	5
	26	Intensity and sound level, sources of musical sound	2	5
	27	Beats, Doppler effect, supersonic speeds, shock waves	3	5

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		CO No
Sl No	Name of Experiment	
1	Melde's string- frequency of tuning fork	6
2	Kater's pendulum-Acceleration due to gravity	6
63 ✓	Fly Wheel	6
4	Sonometer-frequency of A.C	6
5	Kundt's tube-determination of velocity of sound.	6
3 6 ✓	Symmetric bar pendulum – g	6
4 7 ✓	Compound Bar Pendulum – Asymmetric – g	6
1 8 ✓	Comparison of least counts of measuring instruments.	6
2 9 ✓	Evaluation of errors in any one experiment.	6
Part B* – At least One Experiment to be performed		
10	Program to find the dot product and cross product of vectors	6
11	Program to find the moment of inertia of regular bodies about various axes of rotation.	6
5 12 ✓	Symmetric bar pendulum- to calculate moment of inertia about an axis through its centre of gravity and perpendicular to its length	6
13	Asymmetric bar pendulum- to calculate moment of inertia about an axis through its centre of gravity and perpendicular to its length	6
2 14 ✓	Simple pendulum – acceleration due to gravity	6

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Formulating a physical quantity as a vector or scalar, identify number of significant figures in a value and solving problems involving vectors.	C	PSO-1,2

CO-2	Accessing Newton's law of gravitation and Kepler's laws and hypothesising the principles behind the orbiting of planets and satellites.	E	PSO-1,2
CO-3	Differentiating conventional and renewable energy sources and classify an energy source as conventional or renewable	An	PSO-1,2,3
CO-4	Evaluating variables in linear motion and rotational motion	E	PSO-1,2
CO-5	Classifying types and properties of sound waves and outlining characteristics of sound waves	An	PSO-1,2
CO-6	Demonstrating simple experiments	Ap	PSO-7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: INTRODUCTION TO MECHANICS AND ENERGY

RESOURCES

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Formulating a physical quantity as a vector or scalar, identify number of significant figures in a value and solving problems involving vectors.	PO 1,3,4, 5,6,8 / PSO-1,2	C	F, C	L	-
CO-2	Accessing Newton's law of gravitation and Kepler's laws and hypothesising the principles behind the orbiting of planets and satellites.	PO 1,3,4, 5,6,8 / PSO-1,2	E	F, C	L	-
CO-3	Differentiating conventional and renewable energy sources and classify an energy source as conventional or renewable	PO 1,2, 3,4,5,6,8 / PSO-1,2,3	An	F, C	L	-
CO-4	Evaluating variables in linear	PO 1,3,4,	E	F, C	L	-

	motion and rotational motion	5,6,8 / PSO-1,2				
CO-5	Classifying types and properties of sound waves and outlining characteristics of sound waves	PO 1,3,5,6,8 / PSO-1,2	An	F, C	L	-
CO-6	Demonstrating simple experiments	PO 1,2, 4,5,8 / PSO-7	Ap	F, C		P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	✓	-	✓
CO-3	✓	✓	-	✓
CO-4	✓	✓	-	✓
CO-5	✓	-	-	-
CO-6	✓	-	-	-



University of Kerala

Discipline	PHYSICS				
Course Code	UK1MDCPHY100				
Course Title	ELEMENTARY DATA ANALYSIS				
Type of Course	MDC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 Hrs	-	-	3 Hrs
Pre-requisites					
Course Summary	By the end of the course, students will have gained proficiency in collecting, analysing, and interpreting experimental data in Physics, preparing them for further studies or careers in scientific research or related fields. The course emphasizes hands-on experience with real-world datasets and practical applications, aiming to equip students with the ability to extract meaningful insights from experimental measurements.				

BOOKS FOR STUDY:

1. Hooda, R.P. (2002): Introduction to Statistics, Macmillan
2. Gupta S.C, Kapoor V.K. (2000): Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi
3. Hogg, R.V., Tanis, E. A. and Rao J. M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.
4. Mood, A. M. Graybill, F. A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
5. Curtis Frye, Microsoft Excel 2019 Step by Step- 250 Ways to a Calmer You ,2019, Microsoft.

BOOKS FOR REFERENCE:

1. K. F. Riley, M. P. Hobson and S. J. Bence, 2006, Mathematical Methods for Physics and Engineering Third Edition, Cambridge University Press.

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	Presentation of Data (Book:1)		10	
	1	Data: Quantitative and Qualitative, Attributes, Variables, Scales of Measurement- Nominal, Ordinal, Interval and Ratio.	2	1
	2	Presentation of Data by Tables and Diagrams- Tabular and Graphical, Including Bar Diagram, Histogram, Pie Chart, Frequency Polygon and Ogives.	3	1
	3	Bivariate data: Definition, Scatter Diagram	2	1
	4	Frequency Distributions for Discrete and Continuous Variables, Graphical Representation of a Frequency Distribution by Histogram and Frequency Polygon, Cumulative Frequency Distributions.	3	1
II	Probability (Book:2, 3, 4)		10	
	5	Introduction, Random Experiments, Sample Space, Events and Algebra of Events	3	2
	6	Definitions of Probability – Classical, Statistical, and Axiomatic.	2	2
	7	Conditional Probability, Laws of Addition and Multiplication, Independent Events	2	2
	8	Theorem of Total Probability, Bayes' Theorem and its Applications.	3	2
III	Statistical Methods (Book: 2)		10	
	9	Statistical Methods: Definition and Scope of Statistics, Concepts of Statistical Population and Sample.	2	3
	10	Central Tendency and its Measures: Arithmetic Mean, Median, Mode, Geometric Mean and Harmonic Mean (<i>Proof/Derivation not needed</i>)	4	3
	11	Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation, Root Mean square	4	3

		deviation, Variance, Coefficient of Variation, Skewness and Kurtosis (Proof/Derivation not needed)		
IV	Introduction to Spreadsheet (Book: 5)		6	
	12	Cell Reference – Entering Data, Formatting, Editing Data	1	4
	13	Using Formulas – Filters, Sorting, Data Analysis, Pivot Tables	2	4
	14	Mathematical and Statistical Functions, Creating Charts (Pie Chart, Column Chart and Line Chart)	3	4
V*	Hands On Training (Book: 5) Any Five.		09	
	15	Using Spreadsheet, calculate the mean, median, and mode.	9	5
	16	Using Spreadsheet, calculate the range and standard deviation.		5
	17	Using Spreadsheet, compute standard deviation, range and skewness of the data.		5
	18	Using Spreadsheet, organize data in a list alphabetically, numerically or chronologically.		5
	19	Using Spreadsheet, plot Ohm's law.		5
	20	Using Spreadsheet, create a formula to find the Income tax of an individual that contains nested functions.		5
	21	A worksheet contains names and marks in 3 subjects. Calculate total marks and construct 3D Pie chart for total marks.		5
	22	Using Spreadsheet, Construct 2D line chart for a given set of data.		5
	23	Using Spreadsheet, Construct 2D column chart for a given set of data.		5
	24	From the data given, using the most appropriate formulas and functions, (i). Calculate the total rainfall for the week and the year respectively. (ii). Find the lowest rainfall for the week and the year respectively. (iii). Find the highest rainfall for the week and the year respectively. (iv). Find the mean rainfall for the week and the year respectively.		5

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Create concise and visually appealing graphical representations using various quantitative techniques involved in complex data handling.	C	2, 4
CO-2	Apply theorems of probability to analyse and to make decisions in uncertain situations, and solve problems in diverse contexts.	Ap	2, 4
CO-3	Assess the statistical methods of handling data and evaluate the characteristics of the data sets.	E	4
CO-4	Develop the proficiency in utilizing formulas to conduct calculations and streamline tasks through automation.	C	2, 4
CO-5	Interpret, apply and visualize data using Spreadsheet software, enabling them to make informed decisions and solve real-world problems efficiently.	Ap	2, 4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: ELEMENTARY DATA ANALYSIS

Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Create concise and visually appealing graphical representations using various quantitative techniques involved in complex data handling.	PO 1, 3, 4, 6/ PSO 2,4	C	F, C, P	L	-
CO-2	Apply theorems of probability to analyse and to make decisions in uncertain situations, and solve problems in diverse contexts.	PO 1,2, 3/ PSO 2, 4	Ap	F, C	L	-

CO-3	Assess the statistical methods of handling data and evaluate the characteristics of the data sets.	PO 1,2,4,6/ PSO 4	E	F, C, P	L	-
CO-4	Develop the proficiency in utilizing formulas to conduct calculations and streamline tasks through automation.	PO 1,2,6,7/ PSO 2,4	C	F, C, P	L	-
CO-5	Interpret, apply and visualize data using Spreadsheet software, enabling them to make informed decisions and solve real-world problems efficiently.	PO 1,2,6,7/ PSO 2,4	Ap	F, C, P	L/T	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	-	-	-	✓
CO-2	✓	-	-	✓
CO-3	✓	-	-	✓
CO-4	✓	✓	-	✓
CO-5	✓	✓	-	-



University of Kerala

Discipline	PHYSICS				
Course Code	UK1MDCPHY101				
Course Title	ENVIRONMENTAL PHYSICS				
Type of Course	MDC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 Hrs	-	-	3 Hrs
Pre-requisites					
Course Summary	Foster environmental consciousness among students by fostering an understanding of environmental issues and the interconnectedness of humanity and the environment, advocating for nature preservation and conservation, and promoting awareness of environmental laws and policies.				

BOOKS FOR STUDY:

1. Handbook of Electronic Waste Management: International Best Practices and Case Studies: Edited by Majeti Narasimha Vara Prasad, Sri Jayewardenepura, and Anwesha Borthakur, Butterworth-Heinemann 2020
2. Climate Change: What The Science Tells Us: C. Fletcher; Wiley 1st edition
3. A textbook of Environmental Studies- E Bharucha - University Grants Commission, 2004

BOOKS FOR REFERENCE:

1. Environmental Science: Principles and Practice- R.C. Das and D.K. Behera - PHI Learning Pvt. Ltd (2008)
2. A textbook of Environmental Studies- S.Satyanarayan, S.Zade, S.Sitre and P.Meshram - Allied Publishers, New Delhi, 2009
3. The Physics of Monsoon: R. N. Kesavamoorthy and N. Sankar Rao, Allied Publications (1992)
4. The Physics of Atmosphere: J. T. Houghton, Cambridge University, 3rd Edition (2002)

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	AN INTRODUCTION TO ENVIRONMENTAL STUDIES (Book 3, Chapters 3, 5, Book 1, Chapter 1)		9	
	1	Environmental Studies: Definition, Scope and Importance	1	1
	2	Concept of Ecosystem, Ecosystem degradation, Energy flow in an ecosystem	3	2
	3	Solid Waste Management: Causes, Effects and Control measures of urban and industrial waste - Incineration- Vermi - Composting, Hazardous waste and characteristics , Radioactive Waste, Types of Contaminants in Electronic Waste, Treatment Strategies of E-waste – Recycling - Landfill Disposal - Biological Treatment - Advanced Methods	5	4, 5
II	PHYSICS OF CLIMATE CHANGE (Book 2, Chapter 1; Book 3 Chapter 6;)		9	
	4	Weather and Climate- Layers of the Atmosphere	1	1
	5	Global Circulation of the Atmosphere-Ocean Currents	2	1
	6	Global Warming and the Ocean- Warming Oceans- Phytoplankton- Acidifying Oceans	2	4
	7	Climate change: global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust	4	2
III	ENVIRONMENTAL POLLUTION (Book 3 Unit 5)		9	
	10	Pollution	1	1
	11	Air Pollution-Types and Sources of Air Pollution- Pollutants in the Atmosphere-Effects of Air Pollution on Living Organisms-Effects of Air Pollution on the Stratosphere-Ozone Depletion and its Effects-Control measures for air pollution	2	2, 3
	12	Air Pollution in India-Air Quality Monitoring	1	1
	13	Water Pollution-Water Availability on the Planet-Point Sources of Pollution-Causes of Water Pollution- Groundwater Pollution- Control measures for preventing water pollution	3	2, 3

	14	Noise Pollution-Effects of Noise Pollution on Physical Health-Effects of Noise Pollution on Mental Health-Noise Control Techniques	2	2, 3
IV	ENVIRONMENTAL DEGRADATION (Book 3 Unit 4, 5)		9	
	15	Soil Pollution-Causes of Soil Degradation-Problems with Pesticide Use-Excess Salts and Water	2	1, 2,
	16	Thermal Pollution-Sources-Effects	1	1, 2
	17	Biodiversity-Genetic Diversity-Species Diversity-Ecosystem Diversity-Biogeographic Classification of India	3	1
	18	Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts	1	4
	19	Conservation of Biodiversity	2	4
V*	ENVIRONMENT AND ENVIRONMENT ACTS (Book 3,Chapter 5,6,7)		9	
	20	Environment and Human Health, Role of Information Technology in Environment and Human Health	2	1
	21	Pollution case studies (Groundwater, Pesticide, River) in India	3	2
	22	Role of an Individual in Prevention of Pollution	1	1
	23	The Environment (Protection) Act- The Air (Prevention and Control of Pollution) act- The Water (Prevention and Control of Pollution) Act- The Wildlife Protection Act- The Forest Conservation Act	3	1

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the importance of environmental studies, how the environment affects human health and policies related to environment protection, and to study the effect of climate change.	U	PSO-4
CO-2	Analyse the concept of ecosystem, different types of pollution and the impact of climate change due to global variation in temperature	An	PSO-3,4

CO-3	Develop various strategies for preventing pollution.	C	PSO-1,2,3,4
CO-4	Understand biodiversity and examine major threats to biodiversity and its conservation	Ap	PSO-4
CO-5	Evaluate various waste management strategies to preserve environment	E	PSO-2,4,7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: ENVIRONMENTAL PHYSICS

Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Understand the importance of environmental studies, how the environment affects human health and policies related to environment protection, and to study the effect of climate change.	PO-1,8/ PSO-2,4	U	F, C	L	-
CO-2	Analyse the concept of ecosystem, different types of pollution and the impact of climate change due to global variation in temperature	PO-1,8/ PSO-3,4	An	F	L	-
CO-3	Develop various strategies for preventing pollution.	PO-1,2,8/ PSO-1,2,3, 4	C	F,C	L	-
CO-4	Understand biodiversity and examine major threats to biodiversity and its conservation	PO-1,8/ PSO-1,2,4,7	Ap	F,C	L	-

CO-5	Evaluate various waste management strategies to preserve environment	PO-1,2,3,6, 8/ PSO-2,4,7	E	F	L	-
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F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	✓	-	✓
CO-2	✓	-	-	✓
CO-3	✓	-	-	✓
CO-4	✓	-	-	✓
CO-5	✓	✓	-	✓



University of Kerala

Discipline	PHYSICS				
Course Code	UK1MDCPHY102				
Course Title	GREEN ENERGY				
Type of Course	MDC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 Hrs	-	-	3 Hrs
Pre-requisites					
Course Summary	The course provides a comprehensive understanding of the concept of energy fundamentals. It includes various forms of energy such as renewable and conventional systems. It explores the impact of non-conventional energy sources on global warming and examines approaches to energy conservation and governmental policies. Moreover, this course also covers specific renewable energy sources like solar, wind, hydro, tidal, and wave energy. The course touches upon Energy Conservation Policies of Different Governmental Bodies in India and help students embrace sustainable energy.				

BOOKS FOR STUDY:

1. Non-Conventional Energy Resources: G. D. Rai, Khanna Publishers, 2008.
2. Non-Conventional Energy Resources: G.S. Sawhney, PHI Learning Private Limited, 2012.
3. Energy Technology: S. Rao and Dr. B.B. Parulekar, Third edition, 2009.
4. Non-Conventional Energy Sources, Sri. Shali Habibulla, State Institute of Vocational Education Directorate of Intermediate Education Govt. of Andhra Pradesh, Hyderabad, 2005.
5. Fundamentals of Renewable Energy Systems, By D. Mukherjee, S.. Chakrabarti, New Age International (P) Ltd., Publishers, 2014.

BOOKS FOR REFERENCE:

1. Power Plant Technology: A. K. Wahil. 1993.
2. Solar energy: S. P. Sukhatme, Tata McGraw- Hill Publishing company Ltd.,1997.

3. Renewable Energy, Power for a sustainable future, Godfrey Boyle, 2004, Oxford University Press, in association with The Open University.
4. Solar Energy: Resource Assessment Handbook, Dr. P Jayakumar, 2009.
5. Solar Energy Fundamentals and application: H.P. Garg and J. Prakash, Tata McGraw - Hill Publishing company Ltd., 1997.
6. Wave and Tidal Energy Editor(s): Deborah Greaves, Gregorio Iglesias, First published: 23 March 2018, DOI:10.1002/9781119014492, 2018 John Wiley & Sons Ltd.
7. Renewable Energy Resources: John Twidell and Tony Weir, Routledge Publishers ISBN: 978-1138782841.
8. Solar energy: G.D. Rai, Fifth edition, 1995.
9. Renewable Energy: Sources and Methods, Anne Elizabeth Maczulak, 2010.

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	INTRODUCTION (Book 1 Chapter 1; Book 2 Chapter 1; Book 3 Chapter 1; Book 4 Chapter 1; Book 5 Chapter 1)		9	
	1	Introduction to Energy - Different forms of energy	1	1
	2	Renewable and Non-renewable energy sources – Comparison, Availability, Applications, Merits and demerits of Renewable and Non-renewable energy sources	2	1
	3	Impact Due to Non-Conventional Energy Sources – Global Warming, Energy consumption from various resources in India	3	1
	4	Approaches to Energy Conservation - Energy Conservation Policies of Different Governmental Bodies in India	3	1
II	SOLAR ENERGY (Book 1 Chapter 2, 3 & 5; Book 4 Chapter 2; Book 5 Chapter 2, 3, 4 & 5)		9	
	5	Solar Radiation Measurements-Instruments (qualitative only), Principles of the Conversion of Solar Radiation into Heat	3	2
	6	Classification of Different Types of Solar Energy Collectors -Qualitative ideas of non-concentrating (flat plate collectors) and Concentrating collectors - Merits and Demerits	3	2
	7	Applications of solar energy-Solar Heaters, Solar Cookers, Solar Green Houses	1	2

	8	Merits and Demerits of Solar Energy, Electricity from Solar Energy- Solar Photovoltaics (basic principle only)	2	2
III	WIND ENERGY (Book 1 Chapter 9; Book 4 Chapter 3; Book 5 Chapter 7)		9	
	9	Basic Principles of Wind Energy Conversion, Merits and Demerits	3	3
	10	Classification of wind mills- Basic Components of Wind Energy Conversion System	3	3
	11	Policies Related to Wind Energy in India, Applications of Wind Energy.	3	3
IV	HYDRO, TIDAL AND WAVE ENERGY (Book 1 Chapter 18; Book 4 Chapter 5; Book 5 Chapter 8 & 9)		9	
	12	Hydro-Resources, Hydro-Project- Types and Hydro-Conversion Technologies	2	4
	13	Tidal Resource, Tidal Power Conversion	3	4
	14	Wave Resource, Wave Energy Conversion	3	4
	15	Challenges to Sustainability	1	4
V*	EMBRACE SUSTAINABLE ENERGY & PRACTICE ECO-FRIENDLY LIFE STYLE (Complete any 2 or 3 activities from this module)		9	
	16	Study tour to any of the following sites: Hydroelectricity, Solar Electricity and Wind Energy Generation, or Organise a walk to an Ecotourism destination	2	5
	17	Conduct a debate or discussion about the threat of global warming and importance of Green Energy Sources,	2	5
	18	Prepare a list of Green practices at home and how can we improve our life style	2	5
	19	Conduct a model making competition on renewable electricity generation using waste materials	3	5

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Identifying various forms of energy and the impacts of Non-Conventional Energy Sources	U	PSO-3,4,7

CO-2	Analyse the principles for conversion of solar energy into heat and classify various types of solar energy collectors	An	PSO-3,4.7
CO-3	Evaluate the principles of wind energy conversion and Analyse the policies related to wind energy in India	E	PSO-3,4.7
CO-4	Develop the fundamental principles hydro resources and challenges to sustainability	C	PSO-3,4.7
CO-5	Apply knowledge of sustainable energy solutions to adopt eco-friendly practices and mitigate global warming impacts through informed debates, discussions, and experiential learning via study tours.	Ap	PSO-3Appl,4.7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: GREEN ENERGY
Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Identifying various forms of energy and the impacts of Non-Conventional Energy Sources	PO-1,2 /PSO-3,4.7	U	F, C	L	-
CO-2	Analyse the principles for conversion of solar energy into heat and classify various types of solar energy collectors	PO-1,2 /PSO-3,4.7	An	C, P	L	-
CO-3	Evaluate the principles of wind energy conversion and Analyse the policies related to wind energy in India	PO-1,2 /PSO-3,4.7	E	C, P	L	-
CO-4	Develop the fundamental principles hydro resources and challenges to sustainability	PO-1,2 /PSO-3,4.7	C	P, M	L	-

CO-5	Apply knowledge of sustainable energy solutions to adopt eco-friendly practices and mitigate global warming impacts through informed debates, discussions, and experiential learning via study tours.	PO-1,2 / PSO-3,4.7	Ap	P, M	L	-
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F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	✓	-	✓
CO-2	✓	-	-	✓
CO-3	✓	✓	-	✓
CO-4	✓	-	-	✓
CO-5	✓	✓	-	-



University of Kerala

Discipline	PHYSICS				
Course Code	UK1MDCPHY103				
Course Title	PHYSICS IN ARTS AND SPORTS				
Type of Course	MDC				
Semester	I				
Academic Level	100- 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 Hrs	-	-	3 Hrs
Pre-requisites					
Course Summary	Focuses on the physical principles behind arts and sports, with the purpose of enabling the student to develop and optimize ideas on arts/music/photography and sports				

BOOKS FOR STUDY:

1. Physics in the Arts – Third Edition, P. U. P. A. Gilbert
2. The Physics of Sports A Textbook by David R. Heskett
3. Concepts in physics by H C Verma

WEB REFERENCES

1. <https://www.mathnasium.com/blog/14-interesting-examples-of-the-golden-ratio-in-nature> (Golden Ratio)
2. <https://www.mathsisfun.com/numbers/fibonacci-sequence.html> (Fibonacci Series)
3. <https://fractal.foundation.org/fractivities/FractalPacks-EducatorsGuide.pdf> (Fractals)

BOOK FOR REFERENCE:

1. Phyllotaxis, anthotaxis and semataxis Acta Biotheoretica Vol 14, 1961, pages 1-28. (Fibonacci series)

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	INTRODUCTION (Book 1 Chapter 1, 2, 4, 20, web 1, 2 & 3)		9	
	1	Electromagnetic wave - Basic concepts - Frequency, wavelength, speed of light	1	1
	2	Electromagnetic Spectrum, Refraction and Total Internal Reflection in Diamonds, Polarization	2	2
	3	Fibonacci Series, Golden Ratio and Symmetry in Nature. Fractals: Introduction, Natural Fractals, Geometric Fractals and Algebraic Fractals.	4	1
	4	Human Visual System, Human Auditory Perception	2	2
II	PHYSICS OF PAINTING & PHOTOGRAPHY (Book 1 Chapter 5, 6, 7 & 8)		9	
	5	Primary Colours, Colour Triangle, Colour Sensitivity of the Eye	3	2
	6	Colour: Saturation, Brightness in Painting and Photography. Additive Color Mixing in Painting, Subtractive Primary Colors	3	2
	7	Camera - Focusing the Camera	1	2
	8	Parameters Affecting Quality of Photos: Exposure Time, Aperture, Depth of Field, f Number, Rule of Third	2	2
III	PHYSICS OF MUSIC (Book 1 Chapter 10, 11, 12, 15, & 19)		9	
	9	Periodic Oscillations, Simple Harmonic Motion, Damped Oscillations (qualitative) and Resonance.	3	3
	10	Build-up and Decay of Musical Tones, Resonators in Musical Instruments.	2	3
	11	Principle of Superposition, Beats and Harmony, Sound Perception: Pitch, Loudness and Timbre, Loudness and Amplitude, Loudness and Frequency.	4	3
IV	PHYSICS IN SPORTS – I (Book 2 Chapter 1 - 7)		9	
	12	Role of Physics in Sports- Fundamental concepts- Motion, Distance, Displacement, Speed, Velocity, Acceleration,	4	4

		Free Fall, Newton's Laws of Motion, Force, Mass and Weight, Friction, Kinetic Energy, Potential Energy, Work		
	13	Impulse and Momentum, Conservation of Momentum, Coefficient of Restitution, Uniform and Non-Uniform Circular Motion, Torque, Rotational Mass, Angular Momentum	3	4
	14	Two-Dimensional Motion, Projectile, Range of Projectile Catches, Throws.	2	4
V*	PHYSICS IN SPORTS - II (Book 2 Chapter 8, 9 & 10)		9	
	15	Science Behind Various Sports -Basketball, Football, Javelin, Discus, Cricket Batting, Kicking of Football, Badminton, Swimming	3	4
	16	Science Behind the Design of Bats - Table Tennis, Cricket, Tennis	1	4
	17	Cricket Bowling- Magnus Effect, Spin Motion, Reverse Swing	2	4
	18	Athletics - Physics of Running, Long jump, High Jump & Gymnastics	3	4

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Illustrate the beauty and interconnectedness of the natural world and human understanding.	Ap	PSO-2,4
CO-2	Evaluate the fundamental principles of light and color, for creative expression through photography and painting.	E	PSO-1, 2,4
CO-3	Design models to study the phenomena of oscillation and its relevance to the production, transmission, and perception of sound.	C	PSO-1, 2,4
CO-4	Apply the physics principles to sports and athletics, to understand and enhance performance, design better equipment, and make informed decisions in coaching, training, and sports medicine.	Ap	PSO-1, 2,4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: PHYSICS IN ARTS AND SPORTS**Credits: 3:0:0 (Lecture: Tutorial: Practical)**

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Illustrate the beauty and interconnectedness of the natural world and human understanding.	PO-3,6/ PSO-2,4	Ap	F, C	L	-
CO-2	Evaluate the fundamental principles of light and color, for creative expression through photography and painting.	PO-3,6/ PSO-1, 2,4	E	F, C	L	-
CO-3	Design models to study the phenomena of oscillation and its relevance to the production, transmission, and perception of sound.	PO-3,6/ PSO-1, 2,4	C	F, C	L	-
CO-4	Apply the physics principles to sports and athletics, to understand and enhance performance, design better equipment, and make informed decisions in coaching, training, and sports medicine.	PO-3,6/ PSO-1, 2,4	Ap	F, C	L, T	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	-	-	✓
CO-3	✓	✓	-	✓
CO-4	✓	✓	-	✓



University of Kerala

Discipline	PHYSICS				
Course Code	UK1MDCPHY104				
Course Title	PHYSICS OF EVERYDAY APPLIANCES				
Type of Course	MDC				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 Hrs	-	-	3 Hrs
Pre-requisites					
Course Summary	“This course provides a basic exploration of the physical principles underlying everyday appliances and technologies. From the basics of electronics and electricity to modern communication technology, students will gain a comprehensive understanding of how various devices work, their impact on energy consumption and efficiency.”				

BOOKS FOR STUDY:

1. Louis A Bloomfield – “How things works – The physics of everyday life” - 5-th Edition - Willy Publications (2013)
2. Eric Kleinert - “Trouble shooting and repairing major appliances” Third Edition - McGraw Hills companies (2013)
3. Disseminating Star Labelling in Household Appliance (DISHA) Operational Manual, Bureau of Energy Efficiency

BOOKS FOR REFERENCE:

1. Edison's Electric Light: The Art of Invention (Johns Hopkins Introductory Studies in the History of Technology)
2. LED Lighting: A Primer to Lighting the Future, Sal Cangeloso
3. "The Physics of Everyday Things: The Extraordinary Science Behind an Ordinary Day" by James Kakalios
4. "Optics" by Eugene Hecht

WEB REFERENCES

1. <https://www.energy.gov/articles/history-light-bulb>
2. Energy_efficient_Ceiling_fans_using_BLDC_motors-A_practical_implementation - Dr Mahesh Rao (https://www.researchgate.net/profile/Mahesh-Rao-8/publication/325922681_Energy_efficient_Ceiling_fans_using_BLDC_motors-A_practical_implementation/links/5b2c7dcfa6fdcc8506bc8680/Energy-efficient-Ceiling-fans-using-BLDC-motors-A-practical-implementation.pdf)
3. Induction stoves: An option for clean and efficient cooking in Indonesia – Tiandho, Yuant etal 2020 (doi:10.1088/1757-899X/1034/1/012068)
4. Prospects for LED lighting <https://doi.org/10.1038/nphoton.2009.32>
5. Evaluating the Impacts of Mandatory Policies and Labeling program for Appliances in India <https://energy-evaluation.org/wp-content/uploads/2019/11/eeap2019-kishorekumar-paper.pdf>

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	Lighting Devices (Ref Web Link -1,4,5 Book-1 section 13.2-13.3, Book 3)		9	
	1	History of light bulbs	1	1
	2	Discharge lamps-Gas Discharges, fluorescent lamps - mercury, metal-halide, and sodium lamps	3	1
	3	Light-emitting diodes- working of led	2	1
	4	LED performance parameter- luminous efficacy- Comparison of luminous efficacy-Advantages of LED	1	1,5
	5	Need for saving energy - bee standards & labelling - Impact of labelling programme on energy savings and emission programme	2	1,5
II	Mirrors, Lenses, and Camera (Book-1, section 14.1)		7	
	6	Introduction to mirrors and lenses, real images - focusing and lens diameter	2	2
	7	Focal lengths and f-numbers	1	2
	8	Improving the quality of a camera lens - the viewfinder and virtual images Image sensors - limit of resolution	3	2,5
	9	Eyes and eye glasses	1	2

III	Heat Transfer and Cooling Systems (Book-1, section 7.1, 8.2, 8.1, Web Link-3)		11	
	10	Woodstoves -thermal conductivity, conduction, convection, radiation, heat capacity	2	3
	11	Microwave ovens – speed, frequency, and wavelength in electromagnetic waves - polar and nonpolar molecules - working of ovens	2	3
	12	Induction stoves - basic principles	2	3
	13	Automobiles - using thermal energy: heat engines – the internal combustion engine, efficiency, Improving Engine Efficiency	3	3,5
	14	Air conditioners - pumping heat against its natural flow (qualitative only- how an air conditioner cools the indoor air- how an air conditioner warms the outdoor air)	2	3
IV	Other Domestic Appliances (Book-1, section 9.1, 9.2, Web Link-2)		9	
	15	Clocks- Time , natural resonance, Pendulums and Harmonic Oscillators , Electronic Clocks	3	1
	16	Musical Instruments: sound and music; vibrations in strings, air, surfaces, fundamental and higher-order modes; harmonic and nonharmonic overtones; sympathetic vibration; standing and traveling waves; transverse and longitudinal waves.	4	1
	17	BLDC Motors - features, applications (Fan, Pump)- BLDC and conventional fans comparison	2	1,5
V*	Hands on Training (Book-2, Chapter 6 & 7)		9	
	18	(Any five experiments to be done) 1. Soldering technique 2. Electric tester 3. Checking the continuity of electrical components in simple circuits using multimeter 4. Assembling/replacing of fuse wire in household devices 5. Familiarization of resistor, capacitor, diode, transformer 6. One lamp controlled by one switch - soldering 7. One lamp controlled by two switch - soldering 8. Led bulb/tube light making, and troubleshooting	9	4

		9. Finding the focal length of lens 10. Making of simple electrical extension boards 11. Electric earthing system 12. Energy auditing of devices		
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COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the basics of lighting technology, domestic appliances including proficiency in energy efficiency standards and labelling programs established by the Bureau of Energy Efficiency (BEE)	U	PSO-1, 4,6
CO-2	Formulate customized solutions to imaging problems through creative adjustments of optical components and sensor configurations.	C	PSO-1, 2,3,4
CO-3	Apply principles of heat transfer to explain the functioning of everyday appliances.	Ap	PSO-1, 4
CO-4	Construct electrical and optical systems using soldering, circuit testing, and component integration for practical applications.	C	PSO-3,6,7
CO-5	Evaluate and compare the performance, efficiency, and sustainability of modern technologies in lighting, imaging, thermal systems, and electromechanical applications.	E	PSO-1,2,3,4,6

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: PHYSICS OF EVERYDAY APPLIANCES**Credits: 3:0:0 (Lecture: Tutorial: Practical)**

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Summarize the basics of lighting technology, domestic appliances including proficiency in energy efficiency standards and labelling programs established by the Bureau of Energy Efficiency (BEE)	PO 4,7/ PSO-1, 4,6	U	F, C	L	P
CO-2	Formulate customized solutions to imaging problems through creative adjustments of optical components and sensor configurations.	PO 4,7/ PSO-1, 2,3,4	C	F, C, P	L/T	P
CO-3	Apply principles of heat transfer to explain the functioning of everyday appliances.	PO 4,7/ PSO-1,4	Ap	F, C, P	L	-
CO-4	Construct electrical and optical systems using soldering, circuit testing, and component integration for practical applications.	PO 3,4,7/ PSO-3,6,7	C	F,C,P	L	P
CO-5	Evaluate and compare the performance, efficiency, and sustainability of modern technologies in lighting, imaging, thermal systems, and electromechanical applications.	PO 1,6,7 PSO-1,2,3,4, 6	E	F, C, P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

CO No	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	-	-	✓
CO-2	✓	-	-	✓
CO-3	✓	✓	-	✓
CO-4	✓	✓	-	-



University of Kerala

Discipline	PHYSICS				
Course Code	UK1MDCPHY105				
Course Title	ASTRONOMY FROM ANCIENT SKIES TO ALIEN WORLDS				
Type of Course	MDC				
Semester	I				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 Hrs	-	-	3 Hrs
Pre-requisites					
Course Summary	This course provides a comprehensive exploration of astronomy, tracing its evolution from ancient observations to modern astrobiological inquiries. Spanning five modules, it covers the historical, observational, and theoretical foundations of astronomy, alongside contemporary topics in the search for extraterrestrial life.				

BOOKS FOR STUDY

1. The Story of Astronomy – Peter Aughton, Quercus
2. Minding the Heavens: The Story of Our Discovery of the Milky Way - L. Belkora
3. The Stars: A New Way to See Them - H. A. Rey
4. Astrobiology: A Very Short Introduction - David C Catling

BOOKS FOR REFERENCE

1. The Book of Constellations – Robin Kerrod
2. Astronomy: A Beginner's Guide to the Universe – Eric Chaisson & Steve McMillan
3. Measuring the Universe – Kitty Ferguson

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I	Ancient Skies and the Birth of Astronomy.		9	
	Book 1			
	1	Astronomy in the Ancient World: Babylon, Egypt, China. Chapter 1,2,3	3	1
	2	Greek Astronomy and the Birth of Models-Evaluating how early models shaped later scientific frameworks. Chapter 3	3	1
	3	Islamic Astronomy and the Renaissance. Chapter 4,5	3	1

II	Revolutions in Thought and Tools		9	
	Book 1			
	4	Copernican Revolution and Changing Worldviews. Chapter 5,6	3	2
	5	Telescopes and the Rise of Observational Astronomy. Chapter 7,8	3	2
	6	Newton and Celestial Mechanics- Simple scenarios to illustrate gravitational laws and orbital motion. Chapter 9	3	2
III	Mapping the Night Sky.		9	
	Book 2: Chapter 2			
	7	Stars, Constellations, The Milky Way	3	3
	8	The Celestial sphere and coordinates	3	3
	9	Zodiac and Ecliptic, Star clusters and Nebulae - Their role in navigation, calendars, and cosmic structure	3	3
IV	Time, Space, and Planetary Motions.		9	
	Book 3 Chapter 4			
	10	Pole star and latitude, Ecliptic and seasons	3	4
	11	Solar day and Sidereal day, Time and Time zones - Conceptual maps to visualise timekeeping systems	3	4
	12	Zodiac and Planets	3	4
V*	Life Beyond Earth		9	
	Book 4			
	13	Exoplanets and Habitable zone. Chapter 7	3	5
	14	Biosignatures, Search for Extra-terrestrial intelligence. Chapter 7	3	5
	15	Rare Earth Hypothesis and Prospects for Astrobiology. Chapter 8	3	5

COURSE OUTCOMES

CO No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand and evaluate the historical development of astronomical thought across ancient civilisations, Greek contributions, and the Islamic and Renaissance periods.	E	4,5,6
CO-2	Analyse the paradigm shifts in astronomy during the Scientific Revolution, and create illustrative scenarios based on Newtonian celestial mechanics.	C	1,2,4,5,6

CO-3	Demonstrate knowledge of stellar and galactic astronomy, and evaluate the relevance of sky structures in cultural and scientific contexts.	E	1,2,4,5
CO-4	Apply astronomical concepts to practical navigation and timekeeping, and create conceptual representations of time systems.	C	1,2,4,5
CO-5	Evaluate the principles and implications of astrobiology in the search for extraterrestrial life.	E	2,4,5,6

R – Remember, U – Understand, Ap – Apply, An – Analyse, E – Evaluate, C - Create

Name of the Course: ASTRONOMY FROM ANCIENT SKIES TO ALIEN WORLDS

Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Understand and evaluate the historical development of astronomical thought across ancient civilisations, Greek contributions, and the Islamic and Renaissance periods.	PO-1,7,8 PSO-4,5,6	E	F,C	L: 9	-
CO-2	Analyse the paradigm shifts in astronomy during the Scientific Revolution, and create illustrative scenarios based on Newtonian celestial mechanics.	PO-1,2,4,7,8 PSO-1,2,4,5,6	C	C,P	L: 9	-
CO-3	Demonstrate knowledge of stellar and galactic astronomy, and evaluate the relevance of sky structures in cultural and scientific contexts.	PO-1,2,7,8 PSO-1,2,4,5	E	F,C	L: 9	-
CO-4	Apply astronomical concepts to practical navigation and timekeeping, and create conceptual representations of time systems	PO-1,2,7,8 PSO-1,2,4,5	C	C,P	L: 9	-

CO-5	Evaluate the principles and implications of astrobiology in the search for extra terrestrial life.	PO-1,2,4,7,8 PSO-2,4,5,6	E	C,P	L: 6	-
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F-Factual, **C**-Conceptual, **P**-Procedural, **M**-Metacognitive

Mapping of COs with POs and PSOs

(Correlation Levels: 3 – High, 2 – Medium, 1 – Low, Blank – No correlation)

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

Correlation Levels:

Level	-	1	2	3
Correlation	Nil	Slightly / Low	Moderate / Medium	Substantial / High

Assessment Rubrics

- **Internal Exam**
- **Quiz / Objective Test:** Short assessments to test recall and understanding of historical and astronomical facts.
- **Reflective Assignment:** Written reflections on astronomy's influence in cultural or personal contexts.
- **Seminar/Presentation:** Student-led sessions on selected astronomical themes and their societal impacts.
- **Skywatch Logbook:** A written record of skywatching experiences, adapted as a reflective or assignment-based activity (e.g., observing constellations, navigation stars).
- **End Semester Examinations:** Comprehensive evaluation covering all units, including analytical questions.

Mapping of COs to Assessment Rubrics

CO No.	Internal Exam	Quiz/ Objective Test	Reflective Assignment	Seminar /Presentation	Skywatch Logbook	End Semester Examinations
CO-1	✓	✓	✓	✓	-	✓
CO-2	✓	-	-	✓	-	✓
CO-3	✓	✓	-	-	✓	✓
CO-4	✓	-	✓	-	✓	✓
CO-5	✓	-	-	✓	-	-