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 central force.				

BOOKS FOR STUDY:

1. Physics for scientists and engineers with Modern Physics, 7th Edition, Serway & Jewett,
2. College Physics 2e, OpenStax
3. University Physics, 13 th Edition, Hugh D. Young, Roger A. Freedmann, A. Lewis Ford, Pearson 2012.
4. An Introduction to Mechanics, D. Kleppner & R. Kolenkow, 2/e, Cambridge University Press.

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

WEB RESOURCES:

1. https://archive.org/details/basicph_current/mode/2up (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; Book : 2- Chapter: 2,3,4; Book : 3; Chapter: 1-5)**	**9**	
	1	Vectors, Properties of vectors - cross product and dot product, scalar product and Vector product, Divergence and Curl	3	1
	2	Motion in One Dimension - Position, Velocity and speed, acceleration, freely falling objects	2	2
	3	Motion in two Dimension - position, velocity and acceleration vectors, projectile motion, circular motion	2	2
	4	Newton's laws of motion, Application of Newton's laws - Particles in equilibrium, Dynamics of particles, Frictional Force	2	2
II		**Linear Momentum, Impulse and Collisions (Book :1 - Chapter: 9; Book : 2- Chapter: 8)**	**9**	
	5	Linear momentum, Conservation of linear momentum	2	3
	6	Impulse - momentum theorem	2	3
	7	Collisions, Collisions in one dimension and two dimensions,	2	3
	8	Elastic and inelastic collisions, concept of centre of mass, rocket propulsion	3	3
III		**Circular Motion (Book 1, Chapter 4, Chapter 6)**	**9**	
	9	The Particle in Uniform Circular Motion	2	4

	10	Tangential and Radial Acceleration	1	4
	11	Newton's Second Law for Particle in Uniform Circular Motion	3	4
	12	Non Uniform Circular Motion	3	4
IV	**Angular Momentum (Book :1 - Chapter: 8, 11; Book : 2- Chapter: 10, Book:3 - Chapter 9,10)**		**9**	
	13	Work done by a constant force and varying force, work–kinetic energy theorem, potential energy	2	4
	14	Conservative and non-conservative forces, conservative forces and potential energy	2	4
	15	Angular Momentum, Conservation of Angular Momentum, Torque	2	4
	16	Angular momentum of rotating rigid object	1	4
	17	Gyroscopic Effects: Vector Aspects of Angular Momentum	2	4
V*	**Central Force (Book 4, Chapter 10)**		**9**	
	18	Central Force Motion as a One- body Problem	2	5
	19	Consequences of Conservation of Angular Momentum	2	5
	20	Consequences of Conservation of Energy	1	5
	21	The Effective Potential	1	5
	22	The Formal Solution for Central Force Motion	3	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.	6
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 trolly/roller	6
14	Surface Tension - To find the surface tension of water by capillary rise method	6

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Identify the basics of vectors and their properties	R	PSO-1
CO-2	Compare the motions in one and two dimensions and explain the newton's laws of motion and its applications	R, U	PSO-1
CO-3	Learn the physical and mathematical concepts of linear momentum, Impulse and Collisions	R, U	PSO-1
CO-4	Review the fundamental idea of work energy and force and recognize the concept of angular momentum	R, U	PSO-1

CO-5	Discuss the elementary ideas of central force	R, U	PSO-1
CO-6	Identify the methods to measure the radius of various objects and interpret the nature of various forces	U, Ap	PSO-2

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

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	Identify the basics of vectors and their properties	PSO-1 PO-1	R	F	L	-
CO-2	Compare the motions in one and two dimensions and explain the newton's laws of motion and its applications	PSO-1 PO-1, 2	R, U	F, C	L	-
CO-3	Learn the physical and mathematical concepts of linear momentum, Impulse and Collisions	PSO-1 PO-1, 2	R, U	F, C	L	-
CO-4	Review the fundamental idea of work energy and force and recognize the concept of angular momentum	PSO-1 PO-1, 2	R, U	F, C	L	-
CO-5	Discuss the elementary ideas of central force	PSO-1 PO-1	R, U	F, C	L	-
CO-6	Identify the methods to measure the radius of	PSO-2 PO-1	U, Ap	C, P		P

	various objects and interpret the nature of various forces					

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	✓	-	-	-