University of Kerala

Discipline	**PHYSICS**				
Course Code	**UK2DSCPHY103**				
Course Title	**MODERN PHYSICS**				
Type of Course	**DSC**				
Semester	**II**				
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 quantum mechanics, number systems, logic gates, atom models nuclear properties, radioactivity and crystallography.				

BOOKS FOR STUDY:

1. Modern Physics – R.Murugeshan, S.Chand & Co. Ltd.
2. Principles of Electronics – V.K.Mehta

DETAILED SYLLABUS: THEORY

Module	Unit	Content	Hrs	CO No
I		**Quantum Mechanics (Book 1)**	**9**	
	1	Inadequacies of classical physics, experimental evidences	2	1
	2	Quantum theory Planck's hypothesis, foundation of quantum mechanics	2	1
	3	Wave function and probability density	1	1
	4	Schrödinger equation-time dependent and time independent	2	1
	5	Particle in a potential box	2	1

II	**Digital electronics (Book 2)**		**9**	
	6	Number systems – binary, octal and hexadecimal and their interconversions	3	2
	7	Binary arithmetic, 1's compliment and 2's compliment arithmetic	3	2
	8	Basic logic gates	2	2
	9	Universal logic gates	1	2
III	**Atom models (Book 1)**		**9**	
	10	Bohr atom model	1	3
	11	Space quantization and spin of electrons	2	3
	12	Vector atom model	3	3
	13	Pauli's exclusion principle	1	3
	14	Periodic table	2	3
IV	**Atomic nucleus (Book 1)**		**9**	
	15	Basic properties of nuclei	1	4
	16	Nuclear force	1	4
	17	Mass defect and binding energy	2	4
	18	Radioactivity and law of radioactive decay	2	4
	19	Half-life and mean life	1	4
	20	Measurement of radioactivity, radiocarbon dating	2	4
V*	**Crystallography (Book 1)**		**9**	
	21	Crystalline and amorphous solids, Crystal structure-crystal lattice and translation vectors	2	5
	22	Unit cell, symmetry operations	2	5
	23	Types of lattices, lattice directions and planes	2	5
	24	X-ray crystallography-diffraction of x -rays, Bragg's law, x-ray crystallography, powder diffraction method.	3	5

DETAILED SYLLABUS: PRACTICALS

Part A – At least 5 Experiments to be performed		CO No
Sl No	**Name of Experiment**	
1	Carey Foster's bridge - Resistivity	6
2	Potentiometer- Resistivity	6
3	Diode Characteristics (for Ge and Si diodes)	6
4	Half wave rectifier-Measurement of ripple factor with and without filter capacitor	6
5	Full wave rectifier- Measurement of ripple factor with and without filter capacitor	6
6	Logic gates- OR and AND-To verify the truth tables of OR and AND gates using diodes.	6
7	Logic gate- NOT-To verify the truth tables of NOT gate using a transistor	6
8	Conversion of galvanometer into ammeter and calibration using digital Multimeter	6
9	Conversion of galvanometer into voltmeter and calibration using digital Voltmeter.	6
10	Potentiometer-Calibration of ammeter	6
Part B* – At least One Experiment to be performed		
11	Program to convert hexadecimal to decimal number, decimal to hexadecimal number, binary to hexadecimal numbers and hexadecimal to binary numbers	6
12	Program to find the result of binary addition and subtraction.	6

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Outline the evolution of quantum mechanics and explain the basic concepts of quantum mechanics	R, U	PSO-1,2
CO-2	Practise the conversion binary numbers to octal and hexadecimal, solve problems using binary arithmetic and define and compare logic gates	R, U, Ap	PSO-1,2

CO-3	Describe and summarize vector atom model	R, U	PSO-1,2
CO-4	State properties of a nucleus and explain radioactivity	R, U	PSO-1,2
CO-5	Identify types of crystal lattices and explain principle and applications of X-ray diffraction	R, U	PSO-1,2
CO-6	Describe and demonstrate simple experiments	U, Ap	PSO-7

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

Name of the Course: MODERN PHYSICS

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

CO No.	CO	PO / PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Outline the evolution of quantum mechanics and explain the basic concepts of quantum mechanics	PO-1/ PSO-1,2	R, U	F,C	L	-
CO-2	Practise the conversion binary numbers to octal and hexadecimal, solve problems using binary arithmetic and define and compare logic gates	PO-1, 2, 3/ PSO-1,2	R, U, Ap	F,C	L	-
CO-3	Describe and summarize vector atom model	PO-1/ PSO-1,2	R, U	F,C	L	-
CO-4	State properties of a nucleus and explain radioactivity	PO-1, 2/ PSO-1,2	R, U	F,C	L	-
CO-5	Identify types of crystal lattices and explain principle and	PO-1, 2/ PSO-1,2	R, U	F,C	L	-

	applications of X-ray diffraction					
CO-6	Describe and demonstrate simple experiments	PO-1, 2, 3/ PSO-7	U, 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	-	-	-	-	-	1	-	-	-	-	-	-	-
CO-2	2	2	-	-	-	-	-	2	3	2	-	-	-	-	-
CO-3	2	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO-4	2	1	-	-	-	-	-	2	2	-	-	-	-	-	-
CO-5	2	2	-	-	-	-	-	2	1	-	-	-	-	-	-
CO-6	-	-	-	-	-	-	3	2	2	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	✓	-	-	-
CO-6	✓	-	-	-