Teaching Plan

Department: Physics

Class: I B.Sc. Physics

Title of the Course: Heat, Thermodynamics and Statistical Physics

Semester: II

Course Code: PU232CC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232CC1	5	-	-	-	5	5	75	25	75	100

Learning Objectives:

1. To understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales.
2. To Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation

Course Outcomes

On the successful completion of the course, student will be able to**:**		
1.	acquires knowledge on how to distinguish between temperature and heat, and explain practical measurements of high temperature as well as low temperature physics.	**K1 & K2**
2.	derive the efficiency of Carnot's engine and discuss the implications of the laws of Thermodynamics in diesel and petrol engines	**K1 & K3**
3.	analyze performance of thermodynamic systems viz efficiency by problems and gets an insight into thermodynamic properties like enthalpy, entropy	**K2 & K3**
4.	study the process of thermal conductivity and apply it to good and bad conductors.	**K2 & K3**
5.	interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law, Bose-Einstein and Fermi-Dirac .	**K2 & K3**

Teaching Plan

Total Contact Hours: 75 (Including Lectures, Assignments and Tests)

Unit	Module	Topics	Teaching hours	Cognitive Level	Pedagogy	Assessment/ Evaluation
I	**Calorimetry and Low Temperature Physics**					
	1	Specific heat capacity – specific heat capacity of gases C_P & C_V– Meyer's relation	3	K1(R)	Lecture using chalk and talk, Discussion with Videos, mind mapping using	Evaluation through: Quiz using QUIZZIZ,

					TASKADE, Demonstration	Problem Solving
	2	Joly's method for determination of C_V – Regnault's method for determination of C_P	4	K2(U)	Lecture using STEVE.AI, Problem solving	short questions
	3	Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect	4	K2(U)	Demonstration, PPT using SLIDESPILOT, Problem solving, Review	Descriptive answers
	4	Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.	4	K2(U)	Demonstration, Peer tutoring, Problem solving, Review	
II	**Thermodynamics-I**					
	1	Zeroth law and first law of thermodynamics	3	K1(R)	Demonstration, Peer tutoring, Problem solving, Review Discussion with FLIP, mind mapping using TASKADE	Evaluation through: Quiz using GOOGLE FORM, short questions
	2	P-V diagram – heat engine – efficiency of heat engine	4	K3(Ap)	Demonstration, Peer tutoring, Problem solving, Review, Discussion with PPT using SLIDESPILOT, mind mapping using TASKADE	Descriptive answers Problem solving

	3	Carnot's engine, construction, working	3	K1(R)	Demonstration, Peer tutoring, Problem solving, Review, mind mapping using TASKADE	Formative assessment (II CIA)
	4	efficiency of petrol engine and diesel engines – comparison of engines	5	K3(Ap)	Demonstration, Peer tutoring, Problem solving, Review	
III	**Thermodynamics-II**					
	1	Second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes	4	K2(U)	Lecture using chalk and talk, Discussion with video, mind mapping using TASKADE	Evaluation through: MENTIMETER, short questions Descriptive answers Formative assessment (I & II CIA)
	2	T-S diagram –thermodynamical scale of temperature	3	K3(Ap)	Lecture using videos, Problem solving	
	3	Maxwell's thermodynamical relations – Clasius-Clapeyron's equation (first latent heat equation)	4	K2(U)	Lecture using videos, Demonstration, Peer tutoring, Problem solving, Review.	
	4	Third law of thermodynamics – unattainability of absolute zero – heat death.	4	K3(Ap)	Demonstration, Peer tutoring, Problem solving, Review	
IV	**Heat Transfer**					
	1	Modes of heat transfer: conduction, convection and radiation	2	K2(U)	Lecture using videos, mind mapping using TASKADE	Evaluation through: short test Class Test Multiple choice questions
	2	Thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad	5	K2(U)	Lecture using videos, Problem solving	

		conductor by Lee's disc method.				Quiz using SLIDO Formative assessment Short Summary or Overview (II CIA)
	3	Radiation: black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law	4	K3(Ap)	Demonstration, Peer tutoring, Problem solving, Review	
	4	Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.	4	K3(Ap)	Demonstration, Peer tutoring, Problem solving, Review	
V	**Statistical Mechanics**					
	1	Definition of phase-space – micro and macro states – ensembles –different types of ensembles	3	K2(U)	Lecture using chalk and talk, Discussion with PPT, mind mapping using TASKADE	Evaluation through: short test Class Test Multiple choice questions Quiz Formative assessment Short Summary or Overview (II CIA)
	2	Classical and quantum Statistics – Maxwell Boltzmann statistics – expression for distribution function	5	K3(Ap)	Demonstration, Problem solving	
	3	Bose-Einstein statistics – expression for distribution function	3	K3(Ap)	Demonstration, Peer tutoring, Problem solving, Review.	
	4	Fermi-Dirac statistics – expression for distribution function – comparison of three statistics.	4	K3(Ap)	Demonstration, Peer tutoring, Problem solving, Review.	

PO- Program outcome; LO – Learning outcome; Cognitive Level U – Understand; Ap- Apply, An- Analyze; K- Knowledge

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Skill Development
Activities (SD): Hands on training on modes of heat transfer.

Course Focussing on Cross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/

Gender Equity): -

Activities related to Cross Cutting Issues :-

Assignment : Heat engines.

Sample Questions

Part A

1. _____ is the unit of specific heat capacity. **(K1 - R, CO - 1)**
2. _____ law defines the term temperature. **(K1 - R, CO - 2)**
3. State True / False. Absolute zero temperature can be easily attained. **(K2 - U, CO - 3)**
4. Define temperature gradient. **(K2 - U, CO - 4)**
5. Ensembles are classified into _____ types. **(K1 - R, CO - 5)**

Part B

1. Write a short note on adiabatic demagnetisation. **(K1 - R, CO - 1)**
2. Calculate the efficiency of Carnot's engine working between the temperatures 227^{o}C and 15^{o}C. **(K3- Ap, CO -2)**
3. Derive Claussius latent heat equation. **(K3- Ap, CO -3)**
4. State and explain laws relating to black body radiation and bring out characteristics of black body radiations. **(K2- U, CO -4)**
5. Distinguish between Maxwell – Boltzmann, Fermi – Dirac and Bose – Einstein statistics. **(K2- U, CO -5)**

Part C

1. Derive Meyer's relation for the two specific capacity of a gas. **(K2- U, CO -1)**
2. Explain the construction and working of Otto engine. **(K2- U, CO -2)**
3. Derive Maxwell's thermodynamic relations. **(K2- U, CO -3)**
4. Explain Lee's method of determining the thermal conductivity of a bad conductor. **(K2- U, CO -4)**
5. Obtain the expression for Fermi – Dirac distribution law. Using it, derive expression for the Fermi energy of an electron in a metal. **(K3- Ap, CO -1)**

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Head of the Department: Dr. C. Nirmala Louis

Course Instructor : Dr. P. Aji Udhaya

Teaching Plan

Department : Physics
Class : I B.Sc Mathematics
Title of the Course : ELECTIVE COURSE–II:ALLIED PHYSICS FOR MATHEMATICS – II
Semester : II
Course Code : PU232EC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232EC1	4		-		3	4	60	25	75	100

Learning Objectives:

1. To impart basic principles of Physics
2. To incorporate concepts of Physics in day to day life

Course Outcomes

On the successful completion of the course, student will be able to**:**		
CO1	explain the concepts of interference, diffraction and rephrase the concept of polarization	**K1 & K2**
CO2	outline the basic foundation of different atom models and relate the importance of theoretical models	**K1 & K2**
CO3	understand the properties of nuclei, nuclear forces, structure of atomic nucleus and nuclear models and interpret nuclear processes like fission and fusion.	**K2& K3**
CO4	describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation.	**K3 & K4**
CO5	summarize the working of semiconductor devices like diodes, transistors, USB chargers and EV charging stations.	**K4& K5**

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	1.	Interference – interference in thin films –colors of thin films – air wedge – determination of diameter of a thin wire by air wedge	4	K1(R)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	Evaluation through: short test Class Test Quiz through Quizziz Formative assessment through Hot Potatoes
	2.	diffraction – diffraction of light vs sound – normal incidence	4	K1(R)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
	3.	experimental determination of wavelength using diffraction grating (no theory) – polarization	3	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	
	4.	polarization by double reflection – Brewster's law – optical activity – application in sugar industries	4	K2(U)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
II	5.	Atom models – Bohr atom model – mass number – atomic number – nucleons – vector atom model	4	K1(R)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping	Evaluation through: short test Class Test Multiple choice questions Quiz through Nearpod Formative assessment through
	6.	various quantum numbers – Pauli's exclusion principle – electronic configuration – periodic classification of elements – Bohr magneton	4	K1(R)	Peer tutoring, Lecture using videos, Problem solving, Derivation, PPT, Review	
	7.	Stark effect – Zeeman effect (elementary ideas only) – photo electric effect – Einstein's	3	K2(U)	Lecture using Chalk and talk ,Introductory session, Group	

		photoelectric equation			Discussion, Mind mapping,	Mentimetre
	8	applications of photoelectric effect: solar cells, solar panels, optoelectric devices	4	K2(U)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	
III	9	Nuclear models – liquid drop model – magic numbers – shell model – nuclear energy – mass defect – binding energy – radioactivity – uses – half life – mean life - radio isotopes and uses	3	K2(U)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	Evaluation through: short test Class Test
	10	controlled and uncontrolled chain reaction – nuclear fission – energy released in fission – chain reaction – critical reaction – critical size- atom bomb – nuclear reactor	4	K2(U)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	Match the following through Hot Potatoes
	11	breeder reactor – importance of commissioning PFBR in our country – heavy water disposal, safety of reactors: seismic and floods	4	K3(Ap)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	
	12	introduction to DAE, IAEA – nuclear fusion – thermonuclear reactions – differences between fission and fusion.	4	K3(Ap)	Peer tutoring, Lecture using videos, Problem solving, Demonstration, PPT, Review	Formative assessment through Quizziz
IV	13	Frame of reference – postulates of special theory of relativity – Galilean transformation equations	4	K3(Ap)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping	Evaluation through: short Class Test
	14	Lorentz	3	K3(Ap)	Peer tutoring,	

		transformation equations – derivation – length contraction – time dilation			Lecture using videos, Problem solving, Derivation, PPT	Multiple choice questions Quiz through Slido Formative assessment through Nearpod
	15	– twin paradox – mass-energy equivalence – introduction on gravitational waves	4	K4(An)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Mind mapping,	
	16	LIGO, ICTS opportunities at International Centre for Theoretical Sciences	4	K4(An)	Peer tutoring, Lecture using videos, Problem solving, Derivation, PPT, Review	
V	17	p-n junction diode – forward and reverse biasing – characteristic of diode – zener diode	4	K4(An)	Lecture using Chalk and talk ,Introductory session, Group Discussion, Derivation	Evaluation through: short Class Test Multiple choice questions Quiz Formative assessment through Hot Potatoes
	18	characteristic of zener diode – voltage regulator – full wave bridge rectifier	4	K4(An)	Peer tutoring, Lecture using videos, Problem solving, PPT,	
	19	construction and working – advantages (no mathematical treatment) – USB cell phone charger	3	K5(E)	Lecture using Chalk and talk ,Derivation, Group Discussion, Mind mapping,	
	20	introduction to e-vehicles and EV charging stations	4	K5(E)	Peer tutoring, Lecture using videos, Problem solving, PPT	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Skill Development**

Activities (Em/ En/SD): Display on IC collection

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Environment Sustainability

Activities related to Cross Cutting Issues : -

Assignment : introduction to e-vehicles and EV charging stations (IC 7483)

Seminar Topic: ICTS opportunities at International Centre for Theoretical Sciences

Sample questions

Part A

1. Double refraction does not take place. (**K1-R, CO-1)**
   a) in quartz b)in calcite c)in water d) none of the above

2. Atomic radius is the ---------- distance from the nucleus of an atom to the outermost orbit. **(K2-U, CO-2)**
   (a) half (b) mean (c) total d) None

3. Nuclei having same mass number are named as _____ **(K2- U, CO-3)**
   (a) isotopes (b) isobars (c) isotones (d) isomer

4. All the accelerated frames are inertial frames of reference. TRUE/FALSE **(K4- An, CO 4)**
5. The emitter current is the sum of the base current and the collector current. True / False.
   (K4- An, CO-5)

Part B

1. State and devise Bragg's law. **(K2- U, CO-1)**

2. Explain the significance of vector atom model. **(K2-U, CO-2).**

3. Distinguish between nuclear fission and nuclear fusion. **(K2-U, CO-3)**

4. Obtain the Lorentz transformation equations. **(K3-Ap, CO-4)**
5. How the zener diode acts as a voltage regulator? Explain. **(K4-An, CO-5)**

Part C

1. Derive the expression for the fringe width. Give the experimental procedure to measure the diameter of thin wire using Air wedge. **(K2-U, CO-1)**

2. Explain about atomic radius and calculate the radius and energy of the electron in the nth orbit in hydrogen atom. **(K2-U, CO-2)**

3. Give a detailed account on the properties of nucleus. **(K3- Ap, CO-3)**

4. Obtain the Galilean transformation equations. **(K4- An, CO -4)**

5. Construct the Bridge Rectifier and explain the working principle**.(K6-C,CO-5)**

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Head of the Department

Dr. S. Sonia
Course Instructor

TeachingPlan

Department : Physics
Title of the Course : NonMajorElective:Physicsof Music
Semester : II
CourseCode : PU232NM1

CourseCode	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
PU231NM1	2	-	-	2	2	30	25	75	100

Pre-requisite:
Students should know about the basic knowledge regarding sound, vibrating systems and musical instruments.

Learning Objectives:

1. To educate and instruct students on the significance of physics in music.
2. To gain understanding of musical notes and instruments.

Course Outcomes

On the successful completion of the course, student will be able to**:**		
1.	understand the principles and basic scientific concepts in sound waves	**K2**
2.	understand the various phenomena of simple vibrating systems.	**K1**
3.	comprehend the various musical notes and its production	**K2**
4.	apply the knowledge of recording music in day to day life activities.	**K3**
5.	know the scientific concepts of music	**K2**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Teachingplan

TotalContacthours:30(Includinglectures,assignmentsand tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/Evaluation
I	**SCIENTIFIC STUDY OF MUSIC**					
	1	vibrations of atoms of matter– vibrations coupling to air	**2**	K2(U)	Demonstration,	Evaluationthrough: Online quiz using Slido and Nearpod, short questions, , MCQ, True/False, Short essays
	2	propagation of sound waves in air, other media, fluids & solids	**2**	K2(U)	PPT, illustration, blended classroom	

	3	velocity, frequency, wavelength, time period, intensity: definition and unit fs – classification of sound on frequency and velocity	**1**	K2(U)	PPT, Illustration, flipped classroom	
	4	human & animal sound perception– mechanism of ear and hearing – psychoacoustics	**1**	K2(U)	PPT, blended classroom	
II	**SIMPLE VIBRATING SYSTEMS**					
	1	Simple harmonic motion – tuning fork	**2**	K2(U)	PPT, Group Discussion, blended classroom	Evaluation through:Online quiz through slido and nearpod, Shortquestions Descriptive answers Formative assessmentI
	2	amplitude, phase, energy, energy loss/damping/ dissipation – power – travelling waves and standing waves	**2**	K2(U)	PPT, Group discussion	
	3	laws of vibration in stretched strings– one-dimensional medium – open and closed organ pipes	**1**	K2(U)	Concept Explanation, Theoretical formulation	
	4	over tones, harmonics – quality of sound: pitch, timber, loudness – octaves, musical notes	**1**	K2(U)	Demonstration, Group Discussion, Flipped classroom	
III	**MUSICAL TONE**					

	1	pure/simple tones – sine/cosine waves– well-defined frequencies, wavelengths, amplitudes & phases	**2**	K2(U)	Lecture method, Concept Explanation, Peer group learning, PPT	Evaluation through:Online Quiz through slido and nearpod, short questions Descriptive answersMCQ, True/False, Concept explanations, Formative assessmentI/II
	2	partial tones – assembly of pure tones– mix of different frequencies & amplitudes– complex tone – superposition of simple tones	**2**	K2(U)	Illustration, flipped classroom Theoretical formulation Group Discussion	
	3	complex waveform– periodic complex waveform – formants – resonances– sound envelope	**2**	K2(U)	Group discussion, blended classroom, PPT	
IV	**PRODUCTION OF MUSICAL SOUNDS**					
	1	human voice,mechanism of vocal sound production – larynx (sound box)	**2**	K2(U)	Lecture method, Peergroup learning, PPT	Evaluation through:Online quiz through slido and nearpod, shortquestions Descriptive answers MCQ, True/False, Concept explanations,Short
	2	stringed Instruments:plucked&bowed, guitar,	**2**	K2(U)	Lecture method, group discussi	

		mandolin, violin, piano, etc. – wind instruments: whistles, flute, saxophone, pipe organ, bag pipes,etc			on, PPT	
	3	percussion instruments, electronic instruments, analog and digital sound synthesizers	**2**	K2(U)	Group discussion, PPT	Summary Formative assessmentII
V	**RECORDING OF MUSIC & SOUND**					
	1	Edison phonograph – cylinder & disk records – magnetic wire and tape recorders – digital recording	**2**	K1(R)	Lecture method, Peergroup learning, PPT	Evaluation through:Online quiz through slido and nearpod shortquestions Descriptive answers MCQ,True/False, Concept explanations, Formative assessmentII
	2	analog transducers, condenser, dynamic microphones, loudspeaker – complex sound fields	**2**	K1(R)	Lecture method, Peergroup learning, PPT	
	3	digital signal processing – digital filtering – specifications of recording studios	**2**	K1(R)	Lecture method, Peergroup learning, PPT	

CourseFocussingonEmployability/Entrepreneurship/Skill Development:

Employability

Activities(Em/En/SD):**GroupDiscussion**

CourseFocussingonCrossCuttingIssues(ProfessionalEthics/HumanValues/Environment Sustainability/

Gender Equity): **Professional Ethics**

ActivitiesrelatedtoCrossCutting Issues:**Albummaking-Types of musical instruments**

Assignment:(MentionTopicandType):**Mechanism of ear and hearing-descriptionsthroughGoogleClassroom**

SeminarTopic:(ifapplicable):-

Samplequestions(minimumone questionfromeachunit)

PartA(1mark)

1. Frequency and wavelength are inversely proportional. True / False**(K2-U,CO-1)**
2. The abbreviation for MIDI is _____**(K2-U,CO-2)**
3. Drums is an example of percussion instruments. SayTrue/ False. **(K2-U,CO-3)**
4. Which one of the following instrument is a wind instrument? **(K2- U, CO-4)**
   a) Whistles b)xylophone c)cymbals d)guitars
5. Which one of the following is an example for digital recording? **(K1-R, CO-5)**
   a) VCD b)CD
   c)Floppy d)film

PartB(4marks)

1. Write short notes on propagation of sound waves in air**(K2-U,CO-1)**
2. Write the difference between traveling waves and standing waves**(K2-U,CO-2)**
3. Explain the sine and cosine waves?**(K2-U,CO-3)**
4. Explainthemechanism of vocal sound production. **(K2-U,CO-4)**
5. HowdidEdison phonogram workst?**(K1-R,CO-5)**

PartC(8marks)

1. Give a detailed account on psychoacoustics. **(K2-U,CO-1)**
2. Discusstheconcept of simple harmonic motion.**(K2-U,CO-2)**
3. Describe the superposition of simple tones in detail.**(K2-U, CO-3)**
4. Discussthetypes of stringed instruments with example.**(K2-U,CO-4)**
5. Give a detailed account on digital signal processing.**(K1-R,CO-5)**

Head ofthe Department **CourseInstructor**

Dr.C.NirmalaLouis **Ms. S. Virgin Jeba**

TeachingPlan

Department : Physics
Title of the Course : Skill Enhancement Course – Digital Photography
Semester : II
CourseCode : PU232SE1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
PU232SE1	2	-	-	-	2	2	30	25	75	100

Prerequisites:

Basic Knowledge in optics and imaging.

Learning Objectives:

1. To understand the principles of photography and image formation and the science and arts behind it.
2. To understand the essential components of conventional and digital cameras and also the different image processing techniques.

Course Outcome

On the successful completion of the course, student will be able to**:**		
1	describe the principle of image formation in Photography	**K2**
2	apply the parameters for controlling the images	**K3**
3	identify different types of camera	**K4**
4	explain the image formation in Digital Photography	**K2**
5	illustrate the digital image – postproduction procedures	**K3**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6**– Create

Teachingplan

TotalContacthours:30(Includinglectures,assignmentsand tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/Evaluation
I	**PHOTOGRAPHY AND BASIC PRINCIPLE OF IMAGE FORMATION**					
	1	Principle – chemical route and digital route –light, wavelengths, colours – shadows	**2**	K2(U)	Demonstration,	Evaluationthrough: Online quiz using Slido and Nearpod, short questions, , MCQ, True/False, Short essays
	2	light intensity and distance – making light form images	**2**	K2(U)	PPT, illustration, blended classroom	
	3	pin-hole images – practical limitations to pin-hole images – lens instead of pin-hole	**1**	K2(U)	PPT, Illustration, flipped classroom	
	4	focal length and image size – imaging of closer subjects.	**1**	K2(U)	PPT, blended classroom	
II	**LENSES – CONTROLLING THE IMAGES**					
	1	Photographic lens – focal length and angle of view (problems)	**2**	K3(Ap)	PPT, Group Discussion, blended classroom	Evaluation through:Online quiz through slido and nearpod, Shortquestions Descriptive answers Formative assessmentI
	2	focusing movement – aperture and f-numbers (problems)	**2**	K3(Ap)	PPT, Group discussion	
	3	depth of field– depth of focus – image stabilization	**1**	K2(U)	Concept Explanation, Theoretical formulation	
	4	lenses for digital	**1**	K2(U)		

		cameras – lens and camera care			Demonstration, Group Discussion, Flipped classroom	
III	**CAMERA USING FILMS AND ITS TYPES**					
	1	Camera and its essential components– shutter – aperture – light measurement – film housing	**2**	K2(U)	Lecture method, Concept Explanation, Peer group learning, PPT	Evaluation through:Online Quiz through slido and nearpod, short questions Descriptive answersMCQ, True/False, Concept explanations, Formative assessmentI/II
	2	– camera types: view camera– view finder camera – camera types: view camera– view finder camera	**2**	K4(An)	Illustration, flipped classroom Theoretical formulation Group Discussion	
	3	Reflex camera– single lens reflex (SLR) camera	**2**	K2(U)	Group discussion, blended classroom, PPT	
IV	**DIGITAL CAMERAS PRINCIPLE AND TYPES**					
	1	Principle of digital image capturing – comparison of digital and analog picture information – megapixel – grain, noise and pixel density	**2**	K2(U)	Lecture method, Peergroup learning, PPT	Evaluation through:Online quiz through slido and nearpod, shortquestions Descriptive answers MCQ, True/False, Concept

	2	optical and digital zooming – image stabilizer – bit depth – white balance – colour modes – file formats (TIFF, RAW & JPEG) – storage cards and types	**2**	K2(U)	Lecture method, group discussi on, PPT	explanations,Short
	3	digital cameras: camera phones – compact camera – hybrid camera – digital SLR	**2**	K2(U)	Group discussion, PPT	Summary Formative assessmentII
V	**THE DIGITAL IMAGE – POSTPRODUCTION**					
	1	Hardware: computer and its peripherals – software: saving digital file – basic editing: navigating the image – undo/redo/history – crop – rotate – brightness & contrast – colour balance – hue/saturation – dodge/burn	**2**	K2(U)	Lecture method, Peergroup learning, PPT	Evaluation through:Online quiz through slido and nearpod shortquestions Descriptive answers MCQ,True/False, Concept explanations,
	2	cloning & amp; retouching – removing an element in an image – advanced editing: histogram/levels – curves	**2**	K2(U)	Lecture method, Peergroup learning, PPT	
	3	selection tools: magic wand – printing digital images: inkjet printer – laser printer – dye sub printer – lambda/ light jet printers.	**2**	K2(U)	Lecture method, Peergroup learning, PPT	Formative assessmentII

CourseFocussingonEmployability/Entrepreneurship/Skill Development:

Skill Development

Activities(Em/En/SD):**GroupDiscussion**

CourseFocussingonCrossCuttingIssues(ProfessionalEthics/HumanValues/Environment Sustainability/

Gender Equity): **Professional Ethics**

ActivitiesrelatedtoCrossCutting Issues:**Albummaking-Camera and is essential components**

Assignment:(MentionTopicandType):**Digital Cameras-descriptionsthroughGoogleClassroom**

SeminarTopic:(ifapplicable):-

Samplequestions(minimumone questionfromeachunit)

PartA(1mark)

1. The abbreviation for SLR is _____**(K2-U,CO-2)**
2. View finder camera is one of the types of camera. SayTrue/ False. **(K2-U,CO-3)**
3. Frequency and wavelength are inversely proportional. True / False **(K2-U,CO-1)**
4. Which one of the following is used to save the file as image document? **(K2- U, CO-4)**

   a) Adobe reader b)Notepad c)JPEG d)BIT
5. Which one of the following is an example for digital recording? **(K1-R, CO-5)**

   a) VCD b)CD

   c)Floppy d)film

PartB(4marks)

1. Write short notes on pin hole images.**(K2-U,CO-1)**
2. Write short note on lens and camera care**(K2-U,CO-2)**
3. Explain the essential components of camera.**(K2-U,CO-3)**
4. Explainthemechanism of digital image capturing. **(K2-U,CO-4)**
5. Write short notes on selection tools.**(K1-R,CO-5)**

PartC(8marks)

1. Give a detailed account on principle of chemical route and digital route. **(K2-U,CO-1)**
2. Discusstheconcept of photographic lenses.**(K2-U,CO-2)**
3. Describe the different types of camera.**(K2-U, CO-3)**
4. Discussthetypes of digital cameras.**(K4-An,CO-4)**
5. Give a detailed account on lambda / light jet printers.**(K1-R,CO-5)**

Head ofthe Department **CourseInstructor**

Dr.C.NirmalaLouis **Ms. S. Virgin Jeba**

Department : Physics

Class : II B.Sc. Physics

Course Name: Optics and Spectroscopy

Course Code : PC2041

Semester :IV

No. of hours per week	No. of credits	Total No. of hours	Marks
4	4	60	100

Learning Objectives

1. To provide knowledge on the concept of aberrations in lenses, prisms and Spectroscopy.
2. To understand the phenomenon like interference, diffraction, polarization through wave nature of light and its applications.

Course Outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO- 1	gain knowledge of geometric optics, helps in the practical design of many optical systems and instruments including aberrations in lens system.	**PSO - 2**	**K2(U)**
CO- 2	determine the behavior of a ray and wave at any optical surface.	**PSO - 1**	**K1(R)**
CO- 3	analyze the intensity variation of light due to polarization, interference and diffraction.	**PSO - 4**	**K4(An)**
CO- 4	study the phenomena: interference, diffraction, and polarization lays the foundation for an understanding of concepts such as as holograms, interferometers.	**PSO -5**	**K5(E)**
CO- 5	gain knowledge on spectroscopy helps to extract the dynamic information about the molecule.	**PSO - 3**	**K3(Ap)**

Modules

Total contact hours: 60 (Including lectures, assignments and Tests)

Unit	Module	Topics	Teaching hours	Cognitive Level	Pedagogy	Assessment/ Evaluation
I	**Geometrical optics**					
	1	Lens – Spherical aberration in lenses – Methods of minimizing spherical aberration	3	K1(R)	Illustration and lecture	Evaluation through: Quiz using Kahoot, short questions
	2	Dispersion – Angular and Chromatic dispersion – combination of prisms to produce i)dispersion without deviation ii) deviation without	3	K2(U)	Illustration and lecture	

		dispersion				
	3	Direct vision spectroscope – Eyepieces – Ramsden's and Huygens's eyepieces	2	K3(Ap)	Illustration and lecture	Multiple choice, questions, Formative assessment
	4	Simple microscope (magnifying glass)– compound microscope	1	K4(An)	Group discussion and lecture	
II	**Interference**					
	1	Conditions for interference – Theory of interference fringes – interference due to reflected light (thin films)	3	K1(R)	Illustration, demonstration and lecture	Evaluation through: quiz, Multiple choice, questions, Exhibiting Models, Formative assessment
	2	Colours of thin films – wedge shaped thin film – theory – determination of diameter of a thin wire by Air wedge	2	K2(U)	Demonstration and lecture	
	3	Test for optical flatness – Newton's rings by reflected light	2	K3(Ap)	Group discussion	
	4	Determination of wavelength of light - Michelson's Interferometer – theory and its Application (Measurement of wavelength)	2	K5(E)	lecture and Demonstration	
III	**Diffraction**					
	1	Fresnel's diffraction – Rectilinear propagation of light – zone plate – action of zone plate - Fraunhofer diffraction at single slit – Double slit	3	K1(R)	Lecture discussion, PPT	Evaluation through: quiz, Assignments, Multiple choice questions, Descriptive answers, Formative assessment
	2	Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength (Normal incidence method) –resolving power	3	K2(U)	Lecture discussion &Demonstration, PPT	
	3	Rayleigh's criterion for resolution – resolving power of a telescope – resolving power of a microscope – resolving power of a prism - resolving power ofgrating.	3	K3(Ap)	Lecture demonstration	

IV	**Polarisation**					
	1	Double refraction –Nicol Prism – Nicol Prism as polarizer and analyzer – Huygens's explanation of double refraction in uniaxial crystals	3	K1(R)	Lecture discussion, PPT	Evaluation through: quiz Assignments Short questions Descriptive answers Formative assessment
	2	Plane, elliptically and circularly polarized light– Quarter wave plates and Half wave plates – Production and detection of plane, circularly and elliptically polarized light	3	K2(U)	Lecture Illustration	
	3	Optical activity– Fresnel's explanation of optical activity	3	K4(An)	Lecture discussion PPT	
V	**Spectroscopy**					
	1	Infrared spectroscopy – sources and detector – uses – ultraviolet spectroscopy – sources – quartz spectrograph - applications -	4	K1(R)	Lecture discussion, PPT	Evaluation through: quiz, Assignments on applications Formative assessment
	2	Raman Spectroscopy Nuclear magnetic resonance –Nuclear quadrupole resonance	2	K3(Ap)	Lecture discussion, PPT	
	3	Electron spin resonance spectroscopies- (Qualitative study)	3	K4(An)	Group discussion, PPT	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Skill Development

Activities (SD): Hands on training on optics experiments.

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues :-

Assignment : Differentiate the types of diffraction.

Seminar Topic: -

Sample questions (minimum one question from each unit)

Part A

1.In a compound microscope, the intermediate image is: **(K2-U, CO-1)**

a)Virtual, erect and magnified b)Real, erect and magnified

c)Real, inverted and magnified d)Virtual, erect and reduced

2. If a 1 and a 2 are the amplitudes of the interfering waves, then the maximum amplitude of the resultant wave is……(**K4-An, CO-3)**

3. What happens with the Fraunhofer single slit diffraction pattern if the whole apparatus is immersed in water? (**K4-An, CO-3)**

a) The Wavelength of light increases b) Width of central maximum increases

c) Width of central maximum decreases d) Frequency of light decreases

4.The polarizing angle for glass surface is _____(**K1-R, CO-2)**

5.Infrared spectrum is obtained for a sample due to the change of **(K2-U, CO-1)**

a)Spin b) Orientation c) Configuration d) electron distribution

Part B

1 The dispersive powers for crown and flint glass are 0.015 and 0.030 respectively. Calculate the focal lengths of the lenses (made of crown and flint glass) which form an achromatic doublet of focal length 60 cm when placed in contact. **(K3-Ap, CO-5)**

2. Derive an expression for film appears bright due to interference by reflected light. **(K5-E, CO-4)**

3. Differentiate Fresnel diffraction from Fraunhofer diffraction. **(K4-An, CO-3)**

4.How a nicol prism can acts a polarizer? **(K4-An, CO-3)**

5.Explain about the Quantum theory of Raman effect **(K2-U, CO-1)**

Part – C

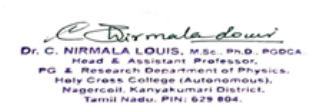
1. Explain with the help of a neat diagram the construction and working of a Huygens eyepiece and clearly indicate the positions of its cardinal points. Why is it referred to as a theoretically perfect but a negative eyepiece? **(K2-U, CO-1)**

2. Give the theory of Interference fringes and compare the position of bright and dark interference fringes. **(K4-An, CO-3)**

3. Show that the resultant intensity at a point is proportional to square of amplitude. **(K5-E, CO-4)**

4. Compare Quarter wave plate and Half wave plate. **(K4-An, CO-3)**

5. Write an essay on “Electron spin Resonance Spectroscopy”. **(K1-R, CO-2)**



Dr.C.Nirmala Louis

Head of the Department

Dr.M.Abila Jeba Queen & Dr. R. Krishna Priya

Course Instructors

Holy Cross College (Autonomous), Nagercoil-629004.

B.Sc. Physics

Semester IV

Name of the Course: Computer Programming in C++

Subject code: PC2042

No. of hours per week	No. of Credits	Total No. of hours	Marks
4	4	60	100

Objectives

1. To provide knowledge about the basics of Computer programming in C++ and to solve problems by writing programs.
2. To enable the students developing their own applications using C++.

Course Outcomes

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO-1	Understand the different types of operators and expressions in C++ language.	PSO - 4	U
CO-2	implement different operation an arrays and use function to solve the given problem	PSO - 4	Ap
CO-3	understand member functions and constructors	PSO - 4	U
CO-4	Analyze pointers, operator overloading and inheritance.	PSO - 4	An
CO-5	analyze input/output operations	PSO- 4	An

Modules

Credit: 5 **Total Hours: 60**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assesment/ Evaluation
I		**C++ An Introduction**				
	1	Introduction - tokens - keywords - identifiers and constants - declaration of variables - basic data types	2	K1(R)	Illustration and PPT	Evaluation through: quiz Quizzes

		- user defined data types- derived data types				
	2	Symbolic constants - operators in C++ - expressions and their type- hierarchy of arithmetic operators	3	K1(R)	Illustration, PPTusing gamma	Formative assessment Evaluation through short test using nearpod
	3	Scope resolution operator – declaring, initializing and modifying variables- special assignment operators -	2	K1(R)	Lecture Discussion	
	4	Control structures- Structure of a simple C ++ program	2	K1(R)	Writing simple programme	
II		**Arrays and Functions in C++**				
	1	Introduction - one dimensional and two dimensional arrays - initialization of arrays- array of strings -	1	K2(U)	Illustration using gamma	Evaluation through: quizzes, Mentimeter
	2	Functions-introduction- function with no argument and no return values - function with no argument but return value - function with argument and no return values	3	K3(Ap)	Lecture, Writing simple programmes	Evaluation through: quiz nearpod
	3	Function with argument and return values- call by reference return by reference	2	K3(Ap)	Lecture Illustration , Writing simple programmes	
	4	Function prototyping - inline functions - local, - global and static variables	2	K3(Ap)	Illustration , Writing simple programmes	
	5	Function overloading -	1	K2(U)	Illustration and PPT	

		virtual functions-main function-math library functions.				
III		**Classes and Objects**				
	3	Arrays within a class-array of objects-static class members-friend functions	2	K3(Ap)	Lecture Illustration , Writing simple program mes	Evaluation through: quizzes, Mentimeter Evaluation through: quiz nearpod
	4	Constructors - parameterized constructors-multiple constructors - constructors with default arguments - copy constructor.	3	K3(Ap)	Lecture Illustration , Writing simple program mes	
IV		**Operator Overloading, Inheritance and Pointers**				
	1	Introduction -defining operator overloading - overloading unary operators -binary operators	2	K1(R)	Lecture Illustration , Writing simple program mes using OLAB	Evaluation through: quiz using qizzes Problem solving Theoretical derivation Formative assessment
	2	Inheritance - single inheritance –	4	K2(U)	Lecture Illustration , Writing	

		multipleinheritance-multilevel inheritance-hybrid inheritance-hierarchial inheritance			simple programmes	
	3	virtual base class-abstract class	1	K2(U)	Lecture Illustration , Writing simple programmes	
	4	Pointers-definition-declaration- arithmetic operations	2	K1(R)	Lecture Illustration , Writing simple programmes	
V		Managing Console I/O Operations				
	1	Introduction - C++ stream - C++ stream classes -	2	K2(U)	Lecture Illustration , Writing simple programmes	Evaluation through: quizusing Mentimeter Problem solving Formative Assessment Assignment
	2	unformatted I/O Operations -formatted console I/O operations	2	K4(An)	Lecture Illustration , Writing simple programmes	
	3	Working with files - classes for file steam operations	2	K5(C)	Lecture Illustration , Writing simple programmes	
	4	Opening and closing a file - file pointers and their manipulations.	3	K5(C)	Lecture Illustration , Writing simple programmes	

Course Focussing on Employability/ Entrepreneurship/ Skill Development: **Employability**

Activities (Em / En /SD): **Problem solving and programming**

Course Focusing onCross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Environment Sustainabilityactivities related to Cross Cutting Issues:-

Assignment: (Mention Topic and Type): Program to solve problems

Seminar Topic: (if applicable):-

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. Define tokens.**(K1-U, CO-1)**
2. A variable declared inside a block is said to be _____ to the block **(K2-R, CO-2)**
3. **The operator used to return the reminder of a number is----K3 – Ap, CO3)**
4. Analyze main() and void main() function**(K4-An,CO3)**
5. Evaluate the expression 5%2(**K5-E, CO4)**

Part B (4 marks)

1. Briefly explain keywords, identifiers, and constants. **(K1-U, CO-1)**
2. Explain enumerated data type in C++ with examples.**(K1-U, CO-1)**
3. Define expressions. Explain different types of expressions in C++.**(K1-U, CO-1)**
4. Explain the syntax of friendly function and its special characteristics **(K1-U, CO-3)**
5. Determine parameterized constructor with a simple program in C++ **(K3-Ap, CO-4)**

Part C (8 marks)

1. How will you declare variables in C++? Explain dynamic initialization of variables and reference variables in C++. Also, enumerate the rules of naming variables in C++.**(K1-U, CO-1)**
2. With neat sketch, describe the control structures in C++.**(K2-R, CO-2)**
3. Apply the concept of operator overloading to swap 3 numbers. **(K3-Ap, CO-3)**
4. Analyze single dimensional and multi-dimensional array with a simple program**(K4-An, CO-4)**
5. Create a simple C++ program to implement multiple inheritance **(K5-, CO-5)**

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Dr.C.Nirmala Louis
Head of the Department

Dr.S.J.Jenepha Mary
Course Instructors

Teaching Plan

Department : Physics

Class : II B.Sc., Chemistry

Title of the Course: Allied Physics II for Chemistry

Semester : IV

Course Code : AP2041

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
AP2041	4			3	4	60	40	60	100

Learning Objectives

1. To understand the concepts of resistance of materials, capacity of conductors, effect of magnetic field due to passage of current, idea about the atom models and energy released in breaking of atom.
2. To make an awareness in physical concepts behind electricity , electronics, basic semiconductor diodes, transistor and basic logic gates.

Course Outcome

COs	Upon completion of this course students will be able to:	PSO addressed	CL
CO -1	Acquire knowledge on elementary ideas of electricity and magnetism, electronics, atomic and nuclear physics.	PSO-1	U
CO- 2	Analyze the concepts and study their applications in the field of electricity and magnetism, electronics and nuclear physics.	PSO -3	An
CO- 3	Apply their depth knowledge of Physics in day today life.	PSO -2	Ap
CO- 4	Develop their knowledge and carry out the practical by applying the concepts of a rectifier, amplifiers and oscillator, basic digital electronics principles through logic gates and the laws governing them.	PSO -4	R

Modules

Total Contact Hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive Level	Pedagogy	Assessment/ Evaluation
I	**Current Electricity**					
	1	Ohm's law – Law of resistance in series and parallel	**2**	**K2 (U)**	Derivation and group discussion	Evaluation through: Online quiz, Problem solving short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I
	2	capacitors in serial and parallel – Kirchoff's laws – Wheatstone's network	**3**	**K3-(Ap)**	PPT, Illustration and theoretical derivation, Circuit designing	
	3	condition for balance Carey-Foster's bridge – measurement of resistance – measurement of specific resistance	**4**	**K3-(Ap)**	PPT, Illustration and theoretical derivation, Circuit designing	
	4	determination of temperature coefficient of resistance – Potentiometer – calibration of Voltmeter	**3**	**K3-(Ap)**	Derivation and group discussion, Circuit designing	
II	**Electromagnetism**					
	1	Electromagnetic Induction – Faraday's laws – Lenz law	**3**	**K2-(U)**	Illustration, Theoretical formulation Circuit designing	Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment I
	2	Self Inductance – Mutual Inductance – Coefficient of Coupling A.C. Circuits	**4**	**K3-(Ap)**	PPT, Illustration and theoretical derivation, Circuit designing	
	3	Mean value – RMS value – Peak value – LCR in series circuit	**3**	**K4-(An)**	PPT, Illustration and theoretical derivation,	

					Circuit designing	
	4	Impedance – resonant frequency – sharpness of resonance	**2**	**K5-(E)**	Illustration, Theoretical formulation Circuit designing	
III	**Atomic and Nuclear Physics**					
	1	Bohr's atom model – radius energy – Atomic excitation	**2**	**K2 (U)**		Evaluation through: Online quiz, Problem solving short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment I/II
	2	Ionization potential – Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect	**3**	**K3-(Ap)**		
	3	Binding energy. Radio isotopes – Uses of radio isotopes – Nuclear fusion and Nuclear fission	**4**	**K3-(Ap)**		
	4	X-rays – Production – properties – Derivation of Bragg's law – uses in industrial and medical fields	**3**	**K3-(Ap)**		
IV	**Analog Electronics**					
	1	Semiconductor – PN junction diode	**2**	**K2-(U)**		Evaluation through: Online quiz, Problem solving short questions Descriptive answers Formative assessment II
	2	Bridge rectifier – Zener diode – Regulated power supply	**2**	**K3-(Ap)**		
	3	Transistor – Working of a transistor – CE Configuration – current gain – Transistor Characteristics	**4**	**K4-(An)**		

	4	CE Configurationβ and αrelationship between only – CE amplifier – feedback – Hartley oscillator	**4**	**K4-(An)**		
V	**Digital Electronics**					
	1	Number system – Decimal – Binary – Double Dabble method	**2**	**K2-(U)**		Evaluation through: Online quiz, Problem solving short questions Descriptive answers MCQ, True/False, Short essays, Concept explanations, Short summary or overview Formative assessment II
	2	Binary addition, subtraction and multiplication – conversion of one number system to another number system	**4**	**K3-(Ap)**		
	3	Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables	**3**	**K3-(Ap)**		
	4	Laws and theorems of Boolean's algebra – De Morgan's theorems	**3**	**K4-(An)**		

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Employability

Activities (Em/ En/SD): Project

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues :- Nil

Assignment : (Mention Topic and Type): Voltage to Time conversion – Circuit descriptions through Google Classroom

Seminar Topic: (if applicable): Exercise Problem solving and circuit designing

Sample questions (minimum one question from each unit)

Part A (1 mark)

1. The reciprocal of conductivity is called the ------- **(K2-U, CO-1)**

   (a) Resistivity (b) current density (c) specific resistance (d) capacitance

2. S.I unit of self-inductance is _____ **(K4-An, CO-2)**

   a) hertz b) ampere c) henry d) newton-meter

3. The empirical formula for the nuclear radius is **(K3-Ap, CO-3)**

   a) $R = r_oA^{1/3}$ b) $R = r_oA^{2/3}$ c) $R = r_oA$ d) $R = r_oA^{1/2}$

4. Bridge rectifiers are also called as average rectifiers. True / False **(K4-An, CO-4)**

5. The _____gate circuit is also called inequality comparator or detector. **(K3-Ap, CO-4)**

   (a) XOR (b) OR (c) AND (d) NAND

Part B (4 marks)

6. Regonise the capacitance of a capacitor connected in series. **(K2-U, CO-1)**

7. Explain the coefficient of coupling between coils. **(K4-An, CO-2)**

8. Demonstrate any five properties of X-rays. **(K3-Ap, CO-3)**

9. Write short note on Zener diode. **(K4-An, CO-4)**

10. (i) Convert the hexadecimal E8F6 to decimal. **(K3-Ap, CO-4)**

    (ii) Convert the octal 237 to binary

Part C (8 marks)

11. Apply Kirchhoff's laws to Wheatstone's network with neat sketch. **(K3-Ap, CO-1)**

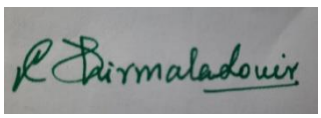
12. Elucidate the resonant frequency in a AC circuit containing Resistance, Inductance and Capacitance in series. **(K4-An, CO-2)**

13. State Bragg's law and derive Bragg's law with neat sketch. **(K3-Ap, CO-3)**

14. With neat circuit diagram explain the working of a Hartley oscillator. **(K3-Ap, CO-4)**

15. Give a detailed account on the logic symbol, truth table and Boolean expression of OR Gate. **(K4-An, CO-4)**

S. Sebastiammal



Sr. S. Sebastiammal

Head of the Department **Course Instructor**

Teaching Plan

Department : Physics
Class : III B.Sc. Physics
Title of the Course : Major Core VIII: Relativity and Quantum Mechanics
Semester : VI

Course Code : PC2061

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To acquire sufficient knowledge in the concept of Relativity, dual nature of matter waves,
2. To apply the Quantum mechanics principles, Operator formalisms and derive Schrodinger equation and its applications.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO - 1	gain knowledge in the concepts of special and theory of relativity	PSO - 1	K2(U)
CO - 2	evolve ideas about dual nature of matter	PSO - 2	K5(E)
CO - 3	recognize basic terms in Quantum Mechanics and different operator mechanism	PSO - 3	K6(C)
CO - 4	apply of Schrödinger's equation to micro system	PSO - 4	K3(Ap)

Teaching Plan

Total contact hours: 90 (Including lectures, assignments and Tests)

Unit	Module	Topics	Lecture hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	**Relativity**:					
	1	Frames of reference - Galilean transformation.	4	K2(U)	Lecture, discussion PPT, blended eaching	Multiple Choice Questions Quiz through slido and nearpod, Formative Assessment I Assignment
	2	Michelson-Morley experiment -Postulates of special theory of relativity	3	K3(Ap)	Lecture demonstration PPT	
	3	Lorentz transformation - length Contraction – time dilation - Relativity of simultaneity - addition of velocities	5	K3(Ap)	Lecture demonstration PPT	
	4	Variation of mass with velocity– Mass energy relation - Elementary ideas of general relativity.	3	K4(An)	PPT Lecture discussion	
II	**Wave Theory:**					
	1	Wave Nature of Matter Phase and group velocity.	3	K1(R)	PPT Lecture discussion	Multiple Choice Questions Quiz through slido and nearpod, Formative Assessment I
	2	Wave packet - expression of De Brogile's wave length.	4	K2(U)	PPT Lecture discussion	
	3	Davisson and Germer's experiment - G.P.Thomson's experiment.	5	K4(An)	PPT Lecture	

	4	Heisenberg's uncertainty principle and its consequences.	3	K2(U)	Lecture PPT	
III	**Fundamentals of quantum mechanics:**					
	1	Schrodinger Equation Inadequacy of classical mechanics - Basic postulates of quantum mechanics.	4	K1(R)	Lecture, PPT, blended classroom	Multiple Choice Questions Quiz through slido and nearpod, Formative Assessment I & II
	2	Schrodinger equation - Properties of wave function - Probability interpretation of wavefunction.	5	K2(U)	Lecture PPT	
	3	Linear operators - self adjoint operators .	3	K2(U)	Lecture PPT	
	4	Expectation value - eigenvalues and eigenfunctions - commutativity and compatibility.	3	K5(E)	Lecture PPT	
IV	**Operators:**					
	1	Angular Momentum in Quantum Mechanics Orbital angular momentum operators and their commutation relations.	5	K5(E)	Lecture discussion, PPT	Multiple Choice Questions Quiz through slido and nearpod, Formative Assessment II
	2	Separation of three dimensional Schrodinger equation into radial and angular parts	5	K3(Ap)	Lecture discussion, PPT	
	3	Elementary ideas of spin angular momentum of an electron - Pauli matrices.	5	K4(An)	Lecture discussion, PPT	
V	**Applications of Schrodinger Equation:**					

	1	Solutions of Schrodinger Equation – Time dependent and time independent Schrodinger equation.	5	K6(C)	Lecture discussion, PPT	Multiple Choice Questions Quiz through slido and nearpod, Formative Assessment II
	2	Free particle solution - Particle in a box - Potential well of finite depth (one dimension).	5	K6(C)	Lecture discussion, PPT	
	3	Linear harmonic oscillator - rigid rotator and hydrogen atom.	5	K6(C)	Group discussion, PPT	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Entrepreneurship

Activities (En):Problem solving in relativity.

Course Focussing onCross Cutting Issues(Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues :-

Assignment : Elementary ideas of general relativity.

Seminar Topic: -

Sample questions (minimum one question from each unit)

Part A

1.The laws of Physics are same in all inertial frame of reference. (State True/False)**(K2-U, CO-1)**

2. Choose the correct De Broglie wavelength of a 46 gm gold ball moving with velocity 36m/m. **(K5-E, CO-2)**

a) $4x10^{-34}$ m b) $5x10^{-34}$ m c) $4x10^{-32}$ m d) $5x10^{-32}$ m

3. For a dispersive medium in the case of de Broglie waves, the condition for group and phase velocity is, **(K5-E, CO-2)**

a) $v_g < v_p$ b) $v_g > v_p$ c) $v_g = v_p$ d) none of these

4. Angular momentum is the rotational analog of linear momentum. State True / False

5. Atomic hydrogen constitutes about 75% of the -------- mass of the universe.

a) nuclear b) hydrogen c) baryonic d) thermal

Part – B

6. State and explain the postulates of general theory of Relativity. **(K2-U, CO-1)**

7. Calculate the de Broglie wavelength of the charge particle of charge q and accelerated through the potential V. **(K5-E, CO-2)**

8. State and explain the general postulates of quantum mechanics. **(K2-U, CO-1)**

9. Write short note on Pauli matrices. **(K2-U, CO-1)**

10.Apply Schrodinger equation and find out the energy of a particle in a box having Infinite Square well potential. **(K3-Ap, CO-4)**

Part – C (5 x 8 = 40)

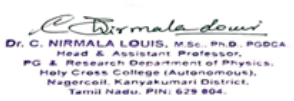
1. Explain in brief about the Michelson-Morley experimental setup and interpret the negative result. **(K2-U, CO-1)**

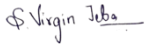
2. Derive a relation connecting group and phase velocity. **(K5-E, CO-2)**

3. Give a detailed account on linear operators and self adjoint operators. **(K2-U, CO-1)**

4. Separate three dimensional Schrodinger equation into radial and angular parts. **(K3-Ap, CO-4)**

5. Apply Schrodinger equation and find out the energy and wave function of a Linear Harmonic Oscillator. **(K3-Ap, CO-4)**





Dr.C.Nirmala Louis — Dr.M.Abila Jeba Queen & Dr. V.Virgin Jeba

Head of the Department — Course Instructors

HOLY CROSS COLLEGE (Autonomous),Nagercoil-629004

Teaching Plan for the Academic Year 2022-2023

Department : Physics

Class : III B.Sc. Physics

Title of the Course: Core IX - Digital and Communication Electronics

Semester : VI

Course code: PC2062

Hours/Week	Credits	Total Hours	Marks
6	5	90	100

Learning Objectives

1. To understand the structure of various number system and basic Logic gates.
2. To design and solve the Boolean Algebra simplification and Karnaugh Maps.
3. To construct sequential circuits and to design counters.

Course Outcome

COs	Upon completion of this course, students will be able to:	PSO addressed	CL
CO -1	Understand the basic operation, and features related to Logic gates and interprets their applications.	PSO-1	U
CO -2	Acquire knowledge on number system, arithmetic building blocks, and memories.	PSO-3	E
CO -3	Understand the fundamental concepts of logic gates, counters, registers, fiber optics, etc.	PSO-1	U

CO -4	Develop skill to build and troubleshoot combinational digital circuits.	**PSO-7**	**Ap**
CO-5	Understand AM, FM and PM modulation and demodulation techniques.	**PSO-1**	**U**
CO-6	Assess the basic concepts of fiber optics and types of fiber diodes, transistor, op-amps and converters.	**PSO-2**	**E**
CO-7	Learn the working principle of satellite communication system.	**PSO-6**	**C**

Modules

Credits: 5 Total contact hours: 90 (Including lectures, assignments and tests)

Unit	Module	Topics	Teaching hours	Cognitive Level	Pedagogy	Assessment/ Evaluation
I	**Digital Fundamentals**					
	1	Number Systems and Conversions - Binary-Coded Decimal (BCD) Code - Gray code - 1's and 2's complements	6	K2 (U)	PPT using GAMMA AI, Descriptive lecture and Group Discussion	Evaluation through: SLIDO Problem solving
	2	Basic logic gates - NAND, NOR and EX-OR gates - NAND and NOR as Universal Building blocks - Laws and theorems of Boolean algebra	6	K3 (Ap)	Illustration, Descriptive lecture, Problem Solving	Descriptive answers Short questions

	3	NAND-NAND circuits - Karnaugh's map- Sum of Product (SOP) and Product of Sum (POS) - applications	6	K2 (U)	Illustration, Lecture using Chalk and Talk	Formative assessment (I CIA) I
II	**Sequential Logic**					
	1	RS-Flip flop, Clocked RS Flip flop, D-Flip flop, J-K and J-K Master-Slave Flip-flop	6	K2 (U)	PPT using GAMMA AI, Illustration, Descriptive Lecture	Evaluation through: MENTIMETER Short questions Descriptive answers Problem solving Formative assessment (I&II CIA)I
	2	Shift registers and Counters - Multiplexers and Demultiplexers	6	K3 (Ap)	Lecture	
	3	Decoders and Encoders - Memory Circuits - D/A and A/D converters - applications	6	K3 (Ap)	Descriptive lecture , Problem Solving	
III	**Modulation and Demodulation**					
	1	Amplitude modulation - Frequency modulation, Phase Modulation and Pulse Width Modulation -	6	K2 (U)	Illustration, Descriptive lecture	Short test Quiz Assignment Formative assessment I
	2	Detectors of Amplitude	6	K3 (Ap)	Lecture using Chalk and Talk	

		Modulation (AM), Frequency Modulation (FM)				
	3	Phase modulation (PM) and Pulse width modulation (PWM), Phase locked loop (PLL) - Noise in Communication Systems.	6	K3 (Ap)	Descriptive lecture , Problem Solving	
IV	**Digital and Satellite Communication**					
	1	Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK) Modulation and Demodulation, Advantages and disadvantages of digital communication.	6	K3 (Ap)	PPT using SLIDESPILOT Illustration, Descriptive lecture.	Short test Quiz Assignment Formative assessment II
	2	Communication Satellite Systems - Telemetry - Tracking and Command System- Satellite Links	6	K4 (A)	Lecture, Group discussion , Demonstration, Problem Solving	

	3	Commonly Used frequency in Satellite Communication - Multiple access - Error Detection.	6	K4 (A)	Lecture using STEVE.AI	
V	**Fibre Optic Communication**					
	1	Basic Fibre Optic System - Advantages of Fibre Optic System - Propagation of light through fibre	6	K3 (Ap)	Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Problem solving Formative assessment (II CIA)
	2	Numerical aperture - Acceptance angle - Losses and distortion in optical fibres	6	K4 (A)	Lecture using Chalk and Talk	
	3	Basic Fibre Optical communication and links - Special applications	6	K4 (A)	Descriptive lecture , Problem Solving	

PO- Program outcome; LO – Learning outcome; Cognitive Level U – Understand; Ap- Apply; A- Analyze; C-Create

Course Focussing on Employability/ Entrepreneurship/ Skill Development :**Employability**

Activities (Em/ En/SD): **Project**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): -

Activities related to Cross Cutting Issues : -

Assignment :**Basic Fiber Optics : Online Assignment**

Seminar Topic: **Communication Satellites**

Sample questions (minimum one question from each unit)

Part A

1. The ratio of change of amplitude of carrier wave to the amplitude of normal carrier wave is called the ---------- factor. **(K2-U, CO-5)**

a) unmodulated b) signal c) modulation d) carrier

2. The ----------frequency is the frequency without modulation or when the modulating voltage is zero. **(K2-U, CO-5)**

a) upper b) lower c) centre d)limiting

3. In ----------shift keying, the binary signal is used to switch the phase between 0o and 180o.

(K2-U, CO-5)

a) upper b) lower c) centre d)phase

4. The process in which the digital codeword modulates the carrier at a high rate spreading the signal spectrum over the available bandwidth is referred as ---------- spectrum.(**(K2-U, CO-5)**

a) digi b) limit c) phase d)limiting

5. De Morgan's first theorem states that **(K2-U, CO-5)**

¯(A+B)= ¯A. ¯B b) ¯AB =¯A+ ¯B c) AB = A-B d) A-B = A/B

Part B

1.ExplainGray Code**.(K2-U, CO-5)**

2. The maximum peak-to-peak voltage of an AM wave is 16 mV and the minimum peak-to-peak voltage is 4 mV. Calculate the modulation factor. **(K3-Ap, CO-3)**

3. Explain the advantages and disadvantages of digital communication. **(K4-A, CO-4)**

4. Discuss Pulse Width Modulation. **(K2-U, CO-5)**

5. What do you mean by Frequency Shift Keying? Explain. **(K2-U, CO-5)**

Part C

1. Describe NOR as Universal gate. **(K4-A, CO-4)**

2. Explain the noise in communication systems**.(K2-U, CO-5)**

3. Discuss the multiple access methods of satellite broadcast**.(K3-Ap, CO-3)**

4. Explain Amplitude Modulated receiver using a Phase Locked Loop**. (K4-A, CO-4)**

5. Discuss the overall link budget calculations in satellite communication circuit. **(K2-U, CO-5)**

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Dr. C. Nirmala Louis

Dr. M. PriyaDharshini & Dr.R.KrishnaPriya

Head of the Department **Course Instructor**

Department : Physics

Class : III B.Sc. Physics

Course Name : Nuclear Physics

Course Code : PC2063

Semester : VI

No of hours per week	No of credits	Total no of hours	Marks
5	5	75	100

Learning Objectives

1. To enable the students to understand the properties, models and radioactive reaction of the nucleus.
2. To create awareness on nuclear reactions such as fission, fusion, radiation detectors and elementary particles so that students can shine.

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	gain knowledge on the fundamentals of nuclear matter (properties of nuclei and Nuclear forces)	PSO-2	R
CO- 2	apply the principles of physics in the measurements of Nuclear size, Nuclear spin, Nuclear energy levels and Nuclear magnetic moment	PSO-1	Ap
CO- 3	Study the various nuclear reactions (nuclear fission and fusion)	PSO-3	E
CO -4	explain the decay modes, Radiation Detectors and Particle Accelerators (Ionisation chamber, Proportional counter, Geiger Muller counter, Linear accelerator, Cyclotron, Synchrocyclotron, Betatron)	PSO-5	U
CO- 5	discuss the classification of elementary particles and Quark model	PSO-5	E
CO -6	analyze the characteristics and behavior of elementary particles and their fundamental interactions	PSO-7	An
CO -7	develop a deeper understanding of some important applications of nuclear physics in Nuclear Reactor and Source of stellar energy.	PSO-6	C

Modules

Total contact hours: 75 (Including lectures, assignment and tests)

Unit	Section	Topics	Lecture Hours	Learning outcomes	Pedagogy	Assessment/Evaluation
I	**Properties of Nuclei**					
	1	Constituents of nuclei - Isotopes, Isobars, Isotones and	**4**	Define the basis of nuclei and stability of nucleus	PPT using Gamma with AI, Lecture discussion	Evaluation: Slido, Class test, oral question Assignment

		mirror nuclei - Nuclear mass and binding energy - Unit of atomic mass - Binding energy and stability of nucleus				I
	2	Mass defect and packing fraction - Binding fraction Vs mass number curve - Nuclear size - Nuclear spin - Nuclear energy levels	**4**	Apply various Binding energy relations	Derivation and group discussion	
	3	Nuclear magnetic moment - Parity of nuclei - Nuclear quadrupole moment - Statistics of nuclei	**4**	solution of Nuclear magnetic moment	Derivation, problem solving and group discussion	
	4	Nuclear forces - Liquid drop model - Semi-empherical mass formula - Shell model	**3**	Apply Nuclear forces in different models	PPT using Gamma with AI, Derivation and group discussion	
II	**Radioactivity**					
	1	Radioactivity - Radioactive reactions - Radioactive decay law - Statistical nature of radioactivity	**3**	Solve Radioactive reactions	PPT using Gamma with AI ,Derivation discussion	Evaluation: Slido, Class test, oral question Assignment I/II
	2	Activity or strength of a radio-sample - Radioactive	**4**	Define and derive Radioactive decay	Derivation and group discussion problem	

		decay : Conservation laws			solving	
	3	Radioactive series: Displacement law - Successive transformation – Radioactive equilibrium	**4**	Statement and proof of displacement law	Derivation and group discussion problem solving	
	4	Radioactive dating: Age of minerals, rocks - Alpha decay - Beta decay - Gamma decay.	**4**	Radioactive dating and its applications	PPT using Gamma with AI ,Derivation and group discussion problem solving	
III	**Nuclear Reactions**					
	1	Nuclear Reactions: Basics - Conservation laws in nuclear Reactions - Energetics of nuclear Reactions	**3**	Analyse Conservation laws in nuclear Reactions	PPT using Gamma with AI Derivation discussion	Evaluation: Slido, Class test, oral question Assignment II
	2	Cross section of nuclear Reactions - Reaction mechanisms - Nuclear fission - Energy released in fission of U-235	**4**	Define and derive nuclear Reactions , Reaction mechanisms &Nuclear fission	Derivation and group discussion	
	3	Liquid drop theory of fission - Nuclear chain reaction - Nuclear Reactor - Types of reactor - Breeder reactor - Fission	**4**	Define and Derive Nuclear chain reaction, Types of reactor, Breeder reactor &	Derivation and group discussion, PPT using Gamma with AI	

		bomb		Fission bomb		
	4	Fusion: Thermo nuclear reaction - Source of stellar energy: Natural fusion - Uncontrolled fusion: Hydrogen bomb.	**4**	Define, derive and apply Uncontrolled fusion: Hydrogen bomb	Derivation and group discussion, PPT using Gamma with AI	
IV	**Radiation Detectors and Particle Accelerators**					
	1	Introduction - Ionisation chamber - Proportional counter - Geiger Muller counter - Neutron detection	**4**	Discuss different types of Radiation Detectors	Derivation discussion	Evaluation Slido, Class test, oral question Assignment II/III
	2	Cloud chamber - Scintillation counter - Photographic detection - Solid state track detector	**3**	Define and derive Cloud chamber & Scintillation counter	Derivation and group discussion, PPT using Gamma with AI	
	3	Semiconductor detector - Particle accelerators - Linear accelerator	**4**	Define and Derive different types of Particle accelerators	Derivation and group discussion	
	4	Cyclotron - Synchro cyclotron - Betatron	**4**	Define , derive and apply Cyclotron , Synchro cyclotron and Betatron	PPT using Gamma with AI ,Derivation and group discussion	
V	**Elementary Particles**					
	1	Introduction - Fundamental Interactions - Pions and Muons - K mesons –	**4**	Analyse Fundamental Interactions	Discussion PPT using Gamma with AI	Evaluation: Slido, Class test, oral question Assignment **III**

		Hyperons, Antiparticles				
	2	Classification of elementary particles - Conservation laws - CPT theorem	**4**	Analyse classification of elementary particles	Derivation and group discussion, PPT using Gamma with AI	
	3	Resonance particles - Symmetry classification of elementary particles	**3**	Explain symmetry classification of elementary particles	Derivation and group discussion, PPT using Gamma with AI	
	4	Quark model Unification of interactions - The standard model.	**4**	Define , derive and apply Quark model	Derivation and group discussion, PPT using Gamma with AI	

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Employability

Activities (SD): Model Making

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Environment Sustainability

Activities related to Cross Cutting Issues:-

Assignment : Seminar Topic: - Classification of elementary particles

Sample questions (minimum one question from each unit)

Part A

1. Nuclei with half integral spin obey _____.

   a) MB statistics b) FD statistics c) BE statistics d) FB statistics

2. 1 Curie of radioactivity is given by

   a) 3.7×10^{10} disint /min b) 3.7×10^{10} disint /hour c) 3.7×10^{10} disint /sec d) none of these

3. For an inelastic nuclear collision the Q value is

   a) $Q>0$ b) $Q<0$ c) $Q=0$ d) *infinite*

4. In linear accelerators the drift tube lengths are progressively increasing in the ratio of

   a) 1: 2: 3 b) 1: 3: 5 c) $\sqrt{1} : \sqrt{2} : \sqrt{3}$ d) $\sqrt{1} : \sqrt{5} : \sqrt{7}$

5. Neutrons comes under ---------- classification of elementary particles.

   a) hadrons b) hyperons c) mesons d) leptons

Part B

1. Define binding energy and packing fraction of nuclei. How does the binding energy per nucleon vary with mass number for light, medium and heavy nuclei? **(K3-Ap, CO-5)**
2. Derive an expression for Half-life and average life value of a radioactive substance. **(K5-E, CO-4)**
3. State and prove the conservation laws in nuclear reactions **(K4-An, CO-3)**
4. Discuss the principle and construction of Cloud chamber. **(K4-An, CO-3)**
5. Explain the classification of elementary particles and its properties. **(K2-U, CO-1)**

Part – C

1. Describe Rutherford's experiment on the scattering of α particles and state some of the important conclusions drawn from the experiment. Give briefly the theory of scattering. **(K2-U, CO-1)**
2. Explain how the phenomenon of radioactivity can be applied for the determination of the age of the earth **(K4-An, CO-3)**
3. Define nuclear fission. Find out the energy released in fission of U-235? Discuss the construction and working of Breeder reactor. **(K5-E, CO-4)**
4. Elucidate the principle, construction and working of Synchro Cyclotron. Hence deduce the frequency of revolution of the particles. **(K4-An, CO-3)**

5. What are quarks?. Describe the quark model of elementary particles. Also discuss the quark content of some of baryons and mesons. **(K1-R, CO-2)**

Dr.C.Nirmala Louis
Head of the Department

Dr.C.Nirmala Louis & Dr. V.Shally
Course Instructors

TeachingPlan

Department : Physics
Class : III B.Sc Physics
Title of the Course : Elective III (b) Nano Physics
Semester : VI
Course Code : PP2065

Hours /Week	Credits	Total hours	Marks
5	4	75	100

LearningObjectives

1. Togainknowledgeonsynthesisandcharacterizationofnanomaterials.
2. Tounderstandthe advancements andapplicationsof nanostructures.

Course Outcome

COs	Uponcompletion ofthiscourse, studentswillbeable to:	PSO addressed	CL
CO-1	inferthehistoryofnanotechnologyandexplainthe synthesis of nanomaterials.	**PSO-1**	**U**
CO-2	interpretquantumwell,quantumwiresandquantum dots.	**PSO-5**	**E**
CO-3	explainthe carbonnanotubes andits applications.	**PSO-6**	**E**
CO-4	discusstheapplicationsofnanotechnologyinvarious fields.	**PSO-4**	**C**

Modules

Totalcontacthours:90 (Includinglectures,assignmentandtests)

Unit	Section	Topics	Lecture Hours	Cognitive Level	Pedagogy	Assessment/Evaluation
I	**Nanomaterials**					
	1	History of Nanotechnology -Background -	4	K1(R)	Lecture Discussion with PPT	

		Conceptual origins - Experimental advances - Nanostructures			Illustration	
	2	Nanomaterials- Synthesis of oxide nanoparticles- Sol-gel processing - Synthesis of semiconductor nanoparticles	4	K2 (U)	Lecture discussion	Evaluation through:Online quiz using Slido Formative assessmentI
	3	Arrested precipitation- Synthesis of metallic nanoparticles	4	K2 (U)	PPT Illustration (using nearpod)	
	4	Sonochemical reduction process - Electrochemical deposition method - Biosynthesisof nanoparticles	3	K2 (U)	Lecture discussion	
II	**QuantumHeterostructure**					
	1	Super lattice - Preparation of Quantum nanostructure- Quantum well lasers	4	K2 (U)	PPT and group Discussion	Evaluation through:Online quiz (Hot potatoes), Shortquestions Descriptive answers Formative assessment I
	2	Quantumcascade laser - Application - Quantum wire - production of nanowires	4	K3 (Ap)	Lecture Discussion with PPT Illustration	
	3	Structure of nanowires-Use of nanowires -	4	K4 (An)	PPT Illustration	

		Quantumdot-Applicationof Quantum dots				
	4	Quantum dot information storage - Quantum dot infraredphoto detectors - Quantumdot lasers	3	K5(E)	Lecture Discussion with PPT Illustration	
III	**Carbon Nanotubes**					
	1	Discovery of Nanotubes - CarbonAllotropes - Diamond - Graphite-Carbon Nanotubes	4	K2 (U)	Lecture discussion	Evaluation Evaluationthrough:Online quiz, Shortquestions Descriptive answers Formative assessment I/II
	2	Types of carbon Nanotubes-Single walled carbonnanotubes - Multiwalled carbonnanotube-Fullerite-Torus-Nanobuds	4	K3 (Ap)	Lecture Discussion with PPT Illustration	
	3	Graphenesheetto a single walled nanotube - Electronic structure of Carbon Nanotubes	4	K4 (An)	Lecture discussion	
	4	Synthesis of Carbon Nanotube - Electric Arc Discharge method-Laser method.	3	K5 (E)	PPT and group Discussion	
IV	**Magneto Electronics**					
	1	Nanocrystallinesoft material - Permanent magnetmaterial	4	K2 (U)	Lecture Discussion with PPT Illustratio	Evaluationthrough: Online quiz, Problem solving short questions Descriptive

					n	answers Formative assessmentII
	2	Theoretical background - Super paramagnetism -Coulomb blockade	4	K3 (Ap)	Lecture discussion	
	3	Quantum cellular Automata- Spintronics	4	K4 (An)	PPT Illustration	
	4	Giant magneto resistance (GMR)-Types of GMR.	3	K5 (E)	Lecture Discussion with PPT Illustration	
V	**ApplicationofNanotechnology**					
	1	Chemistryand Environment- Energy applicationsof nanotechnology	4	K2 (U)	PPT Illustration	Evaluationthrough: Online quiz (Slido), Problem solving short questions Descriptiveanswers Formative assessmentII
	2	Informationand Communication - Heavy Industry– Consumer goods	4	K3 (Ap)	Lecture Discussion with PPT Illustration	
	3	Nanomedicine- Medical application ofNanotechnology - Biomarkers andBioimaging	3	K6 (C)	Lecture discussion	

	4	Targeteddrug delivery - Nanorobots.	4		PPT Illustratio n	

PO-Programoutcome;LO–Learningoutcome;CognitiveLevelR–Remember;U–Understand; Ap- Apply, An- Analyze; E-Evaluate; C- Create

CourseFocussingonEmployability/Entrepreneurship/SkillDevelopment:**Employability**

Activities(Em/En/SD):**Project**

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/EnvironmentSustainability/Gender Equity):-

ActivitiesrelatedtoCross CuttingIssues:Nil

Assignment : (Mention Topic and Type): **Applications of nanoparticles in medicine - Google Classroom**

Seminar Topic: (if applicable):-

Part A (1 mark)

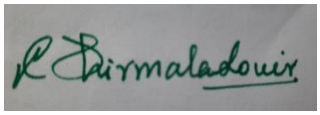
1. Red blood cells are _____ in diameter. **(K2- U, CO-1)**
2. Lasers containing more than one quantum well layer are known as _____ .**(K5- E, CO-2)**
3. Cylindrical fullerenes are called as _____.**(K5- E, CO-3)**
4. Spintronics is also called as _____**(K6- C, CO-4)**
   a) Microelectronics b) Magnetoelectronics c) Nanoelectronics d) None
5. Nanorobots could harvest power directly from the _____. **(K6- C, CO-4)**
   a) Bloodstream b) Nuclear power source c) Optical systems d) vibrating membranes

Part B (4 marks)

1. Describe the approaches used in nanotechnology for synthesizing nanomaterials. **(K2-U, CO-1)**
2. Summarize the applications of Quantum dot laser. **(K5-E, CO-2)**
3. Compare Electric arc discharge method with laser method for the fabrication of CNTs. **(K5-E, CO-3)**
4. Hypothesize in detail about the permanent magnetic material. **(K6-C, CO-4)**
5. Write and explain the energy applications of nanoparticles.**(K6-C, CO-4)**

Part C (8 marks)

1. Describe sol-gel method for synthesizing nanomaterials. **(K2- U, CO-1)**
2. Summarize the growth, properties and applications of quantum cascade laser.**(K5-E, CO-2)**
3. Discriminate single walled CNTs with multiwalled CNTs. **(K5-E, CO-3)**
4. Create Giant magneto resistance and explain its types.**(K6-C, CO-4)**
5. Explain the functioning of targeted drug delivery and the factors influencing the drug Delivery. (**K6-C, CO-4)**



Head of the Department

Ms. A. Lesly Fathima & Ms. S. Sonia
Course Instructor