DEPARTMENT OF PHYSICS

About the Department

The Department of Physics is a founder member of our college from its inception in 1964. From 1964 to 1971, the Department contributed its part in offering Pre-University Programme only. In June 1971, affiliation was granted by the Madurai University to start Special B.Sc., Programme in Physics. The Special B.Sc., Physics was replaced by general B.Sc., Physics Programme from the academic year 1972 – 1973.The Department has dedicated and qualified staff having expertise in the diverse fields of Physics. The Department has research projects in the field of Spectroscopy, Materials Science and Nanoscience.

PRINCIPAL

Dr. P. Balagurusamy, M.A., M.Phil., M.Ed., P.G.D.C.A., Ph.D.,

STAFF

1. Dr. S. Saravanan, M.Sc., M.Phil., B.Ed., Ph.D., -Associate Professor and Dean
2. Dr. R. Jayaraman, M.Sc., M.Phil., Ph.D., - Assistant Professor and HOD
3. Dr. K. Ramavenkateswari, M.Sc., M.Phil., Ph.D., - Assistant Professor
4. Dr. K. Jayabala, M.Sc., M.Phil., Ph.D., - Assistant Professor
5. Dr. T. Rajesh Kumar, M.Sc., M.Phil., B.Ed., Ph.D., - Assistant Professor
6. Dr. P. Uma Mageshwari, M.Sc., M.Phil., B.Ed., Ph.D., - Assistant Professor

Programme Outcomes (POs)

On successful completion of the B.Sc. programme, the graduates will be able to,

1. Apply the knowledge acquired in the respective disciplines and also have a multidisciplinary Perspective towards the study of sciences.
2. Attain skills like analytical reasoning, critical thinking and problem solving to evince interest in higher education and research for offering solutions to societal and environmental problems.
3. Communicate articulately and effectively and interpret the results obtained from scientific studies and put forth innovative ideas to carve a niche in their domain.
4. Instill the principles and ethics learnt from the field of study and exhibit the qualities like leadership, entrepreneurship and teamwork for discharging their duties as responsible citizens.
5. Utilize the growing advancements in Information and Communication Technology and Embrace digital learning to become life-long learners.

Programme Specific Outcomes (PSOs)

On successful completion of the B.Sc., Physics programme, the graduates will be able to

PSO1: Identify the key concepts, principles and fundamental laws that are related to the study of various areas of physics.

PSO2: Demonstrate the applications of physics principles, concepts and laws with necessary experimental background and assess their consequences.

PSO3: Explain the mathematical foundations underlying the physics principles, concepts and laws.

PSO4: Solve problems in physics by identifying the key concepts and principles to solve them.

PSO5: Plan and execute an experiment through careful observations, precise measurements, and effectively present the results.

PSO6: Apply appropriate techniques and modern tools to do scientific activities.

PSO7: Extend the knowledge about the properties of materials and its applications for developing technology to ease the problems related to the society.

PSO8: Understand the broad impact of Physics in a global, economic, environmental, and social context.

PSO9: Gain Knowledge of grammatical conventions and become competent to face competitive examinations through development of language skills.

PSO10: Understand the Environment System, its significance, man- environment relationship, environmental issues faced by the world and realize the need for sustainable ways for living.

PSO11: Extend the knowledge gained from various fields in a proper manner to act as a good citizen by inculcating in them moral values and ethics

PSO12: Translate the skills to recognize the need for the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Under Choice Based Credit System (CBCS)

Course Pattern for B.Sc. (Physics)

The Undergraduate degree Programme consists of five vital components. They are as follows:

Part I Language (Tamil / French)

Part II English

Part III Core Courses (Theory & Practical) Core Electives, Allied, Project and Internship.

Part IV Skill Based, Non Major Electives, Environmental Studies, Value Education and Self Study.

Part V Physical Education (Non Semester) and Extension Activities.

Objectives

The Syllabus for B.Sc. (Physics) programme under semester system has been designed on the basis of Choice Based Credit System (CBCS), which would focus on job oriented programmes and value added education. It will be effected from June 2020 onwards.

Eligibility

Candidates should have passed the Higher Secondary Examination, Government of Tamil Nadu or any other examination accepted by the syndicate of Madurai Kamaraj University as equivalent there to.

Duration of the Programme

The students who join the B.Sc. (Physics) Programme shall undergo a study period of three academic years – Six semesters.

SUMMARY OF HOURS AND CREDITS

Part	Semester	Specification	No. of Courses	Hours	Credit	Total credits
I	I - IV	Languages(Tamil/French)	4	24	12	12
II	I - IV	English	4	24	12	12
III	I - VI	Core Courses Theory Practicals Project Internship	 10 5 1	 36 22 2	 36 16 2	102
	V & VI	Core Elective Courses	2	8	8	
	I - VI	Allied Courses	10	48	40	
IV	V & VI	Skill Based Courses	4	8	8	20
	III & IV	Self Study Courses Soft Skills I Soft Skills II	2	-	4	
	I & II	Non Major Electives	2	4	4	
	I & II	1. Value Education 2. Environment & Gender Studies	1 1	2 2	4	
V	I & II	Physical Education (Non-Semester Course) (Practical)	1	-	2	4
	IV	Extension Activities	1	-	2	
		TOTAL	**48**	**180**	**150**	**150**

B.Sc Physics
Course Pattern – from 2020-2021 Batch
Department of Physics

Semester	Part	Study	Course	Course Title	Hours	Credit
I	I	Tamil - I	20UTAL11	jw;fhy ftpijAk; rpW fijAk;	6	3
	II	English – I	20UENL11	Language Through Literature -I	6	3
	III	Core Course – I	20UPHC11	Mechanics	3	3
		Core Course – II	20UPHC12	Properties of Matter	3	3
		Core Practical – I	20UPHC2P	Major Physics Practicals-I	2	-
		Allied Course – I	20UMAA11	Allied Mathematics - I	6	5
	IV	Non Major Elective I	20UPHN11	Physics in Everyday Life – I	2	2
			20UVEV11	Value Education	2	2
	V	Extension Activity	20UPEV2P	Physical Education – Practical(Non - Semester Course)	-	-
	TOTAL				**30**	**21**
II	I	Tamil – II	20UTAL21	gf;jp ,yf;fpaKk; GjpdKk;	6	3
	II	English –II	20UENL21	Language Through Literature -II	6	3
	III	Core Course – III	20UPHC21	Thermal Physics	3	3
		Core Course – IV	20UPHC22	Geometrical Optics and Acoustics	3	3
		Core Practical – I	20UPHC2P	Major Physics Practicals-I	2	2
		Allied Course – II	20UMAA21	Allied Mathematics - II	6	5
	IV	Non Major Elective II	20UPHN21	Physics in Everyday Life - II	2	2
			20UEGS21	Environment & Gender Studies	2	2
	V	Extension Activity	20UPEV2P	Physical Education – Practical (Non- Semester Course)	-	2
				TOTAL	**30**	**25**
III	I	Tamil - III	20UTAL31	fhg;gpa ,yf;fpaKk; ciueilAk;	6	3
	II	English – III	20UENL31	Language Through Literature -III	6	3
	III	Core Course - V	20UPHC31	Electricity and Electromagnetism	4	4
		Core Practical – II	20UPHC4P	Major Physics Practicals -II	2	-
		Allied Course -III	20UMAA31	Allied Mathematics - III	6	5
		Allied Course - IV	20UCHA11	Inorganic and Organic Chemistry	4	4
		Allied Practical - I	20UCHA2P	Volumetric Analysis	2	-
	IV	Self Study Course – I	20USSS31	Soft Skills -I	-	2
				TOTAL	**30**	**21**

	I	Tamil – IV	20UTAL41	gz;ila ,yf;fpaKk; ehlfKk;	6	3

IV	II	English – IV	20UENL41	Language Through Literature -IV	6	3
	III	Core Course - VI	20UPHC41	Physical Optics & Spectroscopy	4	4
		Core Practical – II	20UPHC4P	Major Physics Practicals -II	2	2
		Allied Course - V	20UMAA41	Allied Mathematics - IV	6	5
		Allied Course - VI	20UCHA21	Inorganic and Physical Chemistry	4	4
		Allied Practical - I	20UCHA4P	Volumetric Analysis	2	2
	IV	Self Study Course – II	20USSS41	Soft Skills II	-	2
	V	Extension Activity	20UEX4SC	All Clubs, NCC,NSS, etc.	-	2
	TOTAL				**30**	**27**
V	III	Core Course – VII	20UPHC51	Relativity & Quantum Mechanics	4	4
		Core Course – VIII	20UPHC52	Atomic Physics	4	4
		Core Practical – III	20UPHC6P	Major Physics Practicals-III	2	-
		Core Practical – IV	20UPHC6Q	Major Physics Practicals-IV	2	-
		Core Practical - V	20UPHC6R	Major Physics Practicals-V	2	-
		Core Elective Course - I	20UPHE51 20UPHE52 20UPHE53	Classical Physics Statistical Physics Physics of Electronic Appliances	4	4
		Core Project Course	20UPHC5P	Major Physics Project	2	2
		Allied Course - VII	20UCHA31	Organic and Physical Chemistry	4	4
		Allied Practical - II	20UCHA4P	Organic Analysis	2	-
	IV	Skill Based Course- I	20UPHS51	Nano Physics	2	2
		Skill Based Course - II	20UPHS52	Basic Electronics	2	2
	TOTAL				**30**	**22**

VI	III	Core Course -IX	20UPHC61	Solid State Physics	4	4
		Core Course - X	20UPHC62	Nuclear Physics	4	4
		Core Practical - III	20UPHC6P	Major Physics Practicals-III	3	4
		Core Practical - IV	20UPHC6Q	Major Physics Practicals-IV	3	4
		Core Practical - V	20UPHC6R	Major Physics Practicals-V	2	4
		Core Elective Course -II	20UPHE61 20UPHE62 20UPHE63	Space Physics Bio-Medical Physics Laser Physics	4	4
		Allied Course - VIII	20UCHA41	Organic , Inorganic and Physical Chemistry	4	4
		Allied	20UCHA4P	Organic Analysis	2	2
	IV	Skill Based Course- III	20UPHS61	Energy Physics	2	2
		Skill Based Course- IV	20UPHS62	Digital and Communication Electronics	2	2
	TOTAL				**30**	**34**
	TOTAL FOR ALL SEMESTERS				**180**	**150**

Allied Courses

There will be TEN Allied courses to fulfill the B.Sc., (Physics) programme during three years.

Subject	Maximum Marks	Year of Study
Mathematics	100	I and II
Chemistry	100	II and III

Allied Courses offered by the Physics Department to Mathematics and Chemistry Departments

Semester	Part	Study Component	Course Code	Course Title	Hrs	Credit
I	III	Allied Course I	20UPHA11	Allied Physics - I	4	4
II		Allied Course II	20UPHA21	Allied Physics - II	4	4
II / IV		Allied practicals -I	20UPHA2P	Allied Physics Practicals - I	2	2
III		Allied Course III	20UPHA31	Allied Physics - III	4	4
IV		Allied Course IV	20UPHA41	Allied Physics - IV	4	4
IV / VI		Allied practicals -II	20UPHA4P	Allied Physics Practicals - II	2	2

Practicals

Record Note Book : 10 marks
Internal : 30 marks
External examination : 60 marks
Total : 100 marks

Value Added Courses

The UG Department of Physics has offered the following Value Added Courses for U.G students

(i) Physics for all
(ii) Sources of Energy
(iii) Optical Sensors
(iv) Electrical Appliances

Extra Credit Self Paced Courses for Advanced Learners

The Department of Physics has offered the following Extra Credit Self Paced Courses to enlighten the advanced learners. The Department persuades students to take virtual courses on MOOCS, SWAYAM and NPTEL.

(i) Trouble Shooting of Electronic Instruments
(ii) Household Wiring
(iii) Physics of Biological systems
(iv) Physics of Smart Materials

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC11	Number of Hours/Cycle	3		
Semester	I	Max. Marks	100		
Part	III	Credit	3		
CORE COURSE I					
Course Title	MECHANICS		L	T	P
Cognitive Level	Upto K3		40	3	2

L – Lecture T – Tutorial P – Practical

Preamble

This course intends to provide the students to have a thorough understanding of the basic concepts of mechanics in physics. It provides the fundamental ideas of projectile motion, impact of elastic bodies, dynamics of rigid body and central of gravity.

Unit I	Projectile Motion	8 Hours
	Introduction - Path of a projectile – projectile projected horizontally – range on an inclined plane – range and time of flight down on inclined plane – two directions of projection – two body problem and the reduced mass.	
Unit II	**Impact of Elastic bodies**	**8 Hours**
	Impulsive force – collision – types of collision – fundamental principles of impact – elastic collision in one dimension - elastic collision in two or three dimensions in the laboratory frame of reference - elastic collision in two or three dimensions in centre of frame of reference .	
Unit III	**Centre of gravity**	**8 Hours**
	Definition – Distinction between centre of gravity and centre of mass – Centre of gravity of a right solid cone – centre of gravity of a hollow right circular cone – centre of gravity of a solid hemisphere – centre of gravity of a hollow hemisphere.	
Unit IV	**Dynamics of Rigid body- I**	**8 Hours**
	Rigid body – translational and rotational motion - Torque – Angular momentum- Angular impulse - Moment of inertia - Radius of Gyration - Physical Significance of Moment of Inertia – perpendicular axes theorem for a plane laminar body - parallel axes theorem for a plane laminar body.	
Unit V	**Dynamics of Rigid body- II**	**8 Hours**
	Moment of inertia of a hoop - Moment of inertia of a Circular lamina – Moment of inertia of an annular ring - Moment of inertia of a Solid cylinder - Moment of inertia of a Hollow cylinder - Moment of inertia of a Solid Sphere- Moment of inertia of a Hollow Sphere about all axes.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1. Murugeshan.R, (1996),*Mechanics and Mathematical Methods*, 1st Edition, Sultan Chand and Company.

Unit – I : Chapter 2: 2.1, 2.2 2.4 – 2.5

Unit – II : Chapter 1: 1.1 – 1.2

Unit – III : Chapter 3 : 3.1 – 3.6

2. Mathur.D.S,(2001), *Mechanics*, Sultan Chand and Company, 2nd Edition.

Unit – II: Chapter 6: 6.6 – 6.7

Unit – IV: Chapter 10: 10.1 – 10.4, 10.7 (I & II)
Unit – V: Chapter 10: 10.9 (section - 3, 4, 5, 6, 8, 9, 10, 11)

Reference Books

1. Murugeshan .R,(2006), *Mechanics & Relativity*, Santha Publications.

2. Halliday.D, Resnick.R and Walker,(1960), *Fundamentals of Physics*,6th Edition, John Wiley and Sons, Inc.

E-Resources

1. https://www.tutorialspoint.com/physics_part1/physics_force_and_laws_of_motion.htm
2. https://www.khanacademy.org/science/ap-physics-1/ap-linear-Momentum/inelastic-collisions- and-2d-collisions-ap/v/elastic-and-inelastic-collisions
3. https://ocw.mit.edu/high-school/physics/exam-prep/circular-motion-rotation/rotational- kinematics-dynamics/
4. https://www.nasa.gov/stem-ed-resources/rockets.html

Course Outcomes

At the end of the course, students would be able to

CO1	Demonstrate Projectile motion in detail
CO2	Apply collision principles in one and two dimensions
CO3	Interpret centre of gravity of various objects
CO4	Illustrate the fundamentals of the dynamics of rigid bodies
CO5	Compute the moment of inertia of various objects

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	2	3	2	2	1	1	1	1	1	1	2	2
CO2	2	3	2	3	3	2	2	1	1	1	2	2
CO3	2	3	2	3	3	2	2	1	1	1	2	2
CO4	2	3	2	3	3	2	2	1	1	1	2	2
CO5	2	3	2	3	3	2	2	1	1	1	2	2

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Projectile Motion	Hours (8)	Mode

I	a) Introduction	1	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) Path of a projectile and projectile projected horizontally.	2	
	c)Range of a projectile on an inclined plane	1	
	d) range and time of flight of a projectile down on inclined plane	1	
	e) two directions of projection of a projectile	2	
	f)two body problem and the reduced mass	1	
Unit	**Impact Of Elastic Bodies**	**Hours (8)**	**Mode**
II	a) Impulsive force	1	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) collision and types of collision	1	
	c) fundamental principles of impact	1	
	d) elastic collision in one dimension	1	
	e) elastic collision in two or three dimensions in the laboratory frame of reference	2	
	f) elastic collision in two or three dimensions in the centre of frame of reference	2	
Unit	**Centre Of Gravity**	**Hours (8)**	**Mode**
III	a) Definition	1	Lecture With Group Discussion Lecture With PPT Lecture Seminar
	b) Distinction between centre of gravity and centre of mass	1	
	c) Centre of gravity of a right solid cone	1	
	d) centre of gravity of a hollow right circular cone	2	
	e) centre of gravity of a solid hemisphere	2	
	f) centre of gravity of a hollow hemisphere	1	
Unit	**Dynamics Of Rigid Body- I**	**Hours (8)**	**Mode**
IV	a) Rigid body	1	Lecture Seminar Lecture With PPT
	b) translational and rotational motion	1	
	c) Torque, Angular momentum and Angular impulse	1	
	d) Moment of inertia and Radius of Gyration	1	
	e) Physical Significance of Moment of Inertia	2	
	f) perpendicular axes theorem for a plane laminar body	1	
	g) parallel axes theorem for a plane laminar body	1	
Unit	**Dynamics Of Rigid Body- II**	**Hours (8)**	**Mode**
V	a) Moment of inertia of a hoop	1	Lecture Group Discussion Lecture With PPT Seminar
	b) Moment of inertia of a Circular lamina	1	
	c) Moment of inertia of an annular ring	1	
	d) Moment of inertia of a Solid cylinder	1	
	e) Moment of inertia of a Hollow cylinder	1	
	f) Moment of inertia of a Solid Sphere	1	
	g) Moment of inertia of a Hollow Sphere	2	

Course Designed By:

1. Dr. S. Saravanan
2. Mr. R. Jayaraman

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC12	Number of Hours/Cycle	3		
Semester	I	Max. Marks	100		
Part	III	Credit	3		
CORE COURSE – II					
Course Title	Properties of Matter		L	T	P
Cognitive Level	Upto K3		40	3	2

L – Lecture T – TutorialP – Practical

Preamble

This course would empower the students to acquire skills and practical knowledge, which help the students in their everyday life. The properties of solids especially knowledge of elasticity help the students to identify the materials suitable for the construction of buildings, houses etc. Properties of fluids especially knowledge of viscosity and surface tension help the students in their daily life and agriculture.

Unit I	Gravitation	8 Hours
	Newton's law of gravitation – G by Boy's method - Acceleration due to gravity by compound pendulum - theory – experiment – gravitational potential at a point distant **r** from a body of mass m - earthquakes – seismic waves and seismographs – seismology and its applications.	
Unit II	**Elasticity - I**	**8 Hours**
	Hook's law – types of elasticity - work done per unit volume in a strain – work done per unit volume in a Elongation strain – work done per unit volume in a volume strain – work done per unit volume in a shearing strain – relation connecting the elastic constants - Poisson's ratio - Relations for **K** and **n** in terms of Poisson's ratio – determination of Poisson's ratio for rubber.	
Unit III	**Elasticity - II**	**8 Hours**
	Twisting couple on a cylinder or a wire - Determination of rigidity modulus of a wire by dynamic torsion method - Bending of Beams - Expression for Bending moment- Determination of Young's modulus by uniform bending- Depression of the loaded end of a Cantilever –Determination of Young's' modulus by Non-uniform bending – I section girders.	
Unit IV	**Surface Tension**	**8 Hours**
	Introduction – free energy of a surface and surface tension - work done in blowing a bubble – curvature, pressure and surface tension – Determination of surface tension –Jaeger's method - drop weight method – Interfacial tension – determination of interfacial tension between water and kerosene.	
Unit V	**Flow of Liquids**	**8 Hours**
	Rate of flow of a fluid – Equation of continuity – energy of liquid – Bernoulli's theorem –Applications of Bernoulli's theorem - Venturi Meter – Pitot tube - Poiseuille's equation for flow of a liquid through horizontal capillary tube (dimensional method) .	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1. Mathur.D.S.,(2001), *Properties of Matter*, Sultan and Chand Company, 2nd Edition.
   Unit – I: Chapter VII - 7.3, 7.6 (iii-a), 7.11, 7.22 -7.24, 7.27
   Chapter VI – 6.4
   Unit – III: Chapter XIV - 14.6, 14.11, 14.12, 14.24, 14.24.2, 14.24.3, 14.24.5
   Unit – IV: Chapter XII - 12.1, 12.3, 12.4, 12.5, 12.6, 12.6(i) &12.6(ii), 12.6(iv), 12.11
   Unit – V: Chapter VIII - 8.2, 8.3, 8.8, 8.11, 8.15- 8.17, 8.20
2. Murugeshan.R.(2006), *Properties of Matter*, Sultan Chand and Company.
   Unit – II: Chapter 1: 1.4, 1.5 , 1.6, 1.7, 1.8, 1.9, 1.13, 1.14
   Unit – III: Chapter 2: Page number 187 & 188

Reference Books

1. Chatterjee & Sengupta,(2015), *A Treatise on General Properties of matter*, New central book agency, NewDelhi.
2. Brijlal & Subramaniam.N,(2002), *Properties of Matter*, Sultan Chand and Company.

E-Resources

1.https://physics.info/elasticity/
2.https://www.usgs.gov/special-topic/water-science-school/science/surface-tension-and-water?qt- science_center_objects=0#qt-science_center_objects
3.https://physics.info/viscosity/
4.https://www.tutorialspoint.com/physics_part1/physics_gravitation.htm

Course Outcomes

At the end of the course, students would be able to

CO1	Apply Newton's Law of gravitation to various systems
CO2	Demonstrate the different moduli of elasticity
CO3	Illustrate the concepts of Surface Tension with experimental studies
CO4	Relate the knowledge of rate of flow of liquids
CO5	Apply the different types of Elasticity

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [Cos]

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	2	3	2	2	1	1	1	1	1	1	2	2
CO2	2	3	2	3	3	2	2	1	1	1	2	2
CO3	2	3	2	3	3	2	2	1	1	1	2	2
CO4	2	3	2	3	3	2	2	1	1	1	2	2
CO5	2	3	2	3	3	2	2	1	1	1	2	2

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Gravitation	Hours (8)	Mode
I	a) Newton's law of gravitation	1	Lecture Lecture With Demo Lecture With PPT
	b) G by Boy's method	1	
	c) Acceleration due to gravity by compound pendulum theory and experiment	2	
	d) gravitational potential at a point distant **r** from a body of mass m	2	
	e)earthquakes, seismic waves, seismographs ,seismology and its applications.	2	
Unit	**Elasticity - I**	**Hours (8)**	**Mode**
II	a) Hook's law	1	
	b) types of elasticity, work done per unit volume in a strain	1	

	c) work done per unit volume in a Elongation strain	1	Lecture Lecture With Demo Group Discussion
	d) work done per unit volume in a volume strain	1	
	e)work done per unit volume in a shearing strain	1	
	f) relation connecting the elastic constants	1	
	g) Poisson's ratio, Relations for **K** and **n** in terms of Poisson's ratio	1	
	h) determination of Poisson's ratio for rubber	1	
Unit	**Elasticity - II**	**Hours (8)**	**Mode**
III	a) Twisting couple on a cylinder or a wire	1	Lecture Lecture With Demo Group Discussion
	b) Determination of rigidity modulus of a wire by dynamic torsion method	1	
	c) Bending of Beams , Expression for Bending moment-	1	
	d) Determination of Young's modulus by uniform bending	2	
	e) Depression of the loaded end of a Cantilever	1	
	f) Determination of Young's' modulus by Non-uniform bending	1	
	g) I section girders.	1	
Unit	**Surface Tension**	**Hours (8)**	**Mode**
IV	a) Introduction – free energy of a surface and surface tension	1	Lecture Lecture With PPT Seminar
	b) work done in blowing a bubble, curvature, pressure and surface tension	2	
	c) Determination of surface tension , Jaeger's method and drop weight method	3	
	d) Interfacial tension, determination of interfacial tension between water and kerosene.	2	
Unit	**Flow Of Liquids**	**Hours (8)**	**Mode**
V	a)Rate of flow of a fluid	1	Lecture Group Discussion Seminar Lecture With PPT
	b) Equation of continuity , energy of liquid	1	
	c) Bernoulli's theorem, Applications of Bernoulli's theorem	2	
	d)Venturi meter	1	
	e) Pitot tube	1	

Course Designed By:

1. Dr. K. Ramavenkateswari
2. Dr. K. Jayabala

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHA11	Number of Hours/Cycle	4		
Semester	I	Max. Marks	100		
Part	III	Credit	4		
ALLIED COURSE - I					
Course Title	Allied Physics – I		L	T	P
Cognitive level	Upto K3		54	3	3

L – Lecture T – Tutorial P – Practical

Preamble

To make the students to understand the Law of Gravitation, Cavendish's method to determine G, concepts of earthquakes, seismic waves, seismographs, concepts of bending of beams , surface tension for various methods, rate of flow of fluid and Moment of Inertia of various laminas.

Unit I	Gravitation	11 Hours
	Newton's law of gravitation– **G** by Boy's method - Acceleration due to gravity by compound pendulum - theory – experiment – earthquakes – seismic waves and seismographs – seismology and its applications.	
Unit II	**Elasticity**	**11 Hours**
	Twisting couple on a cylinder or a wire - Determination of rigidity modulus of a wire by dynamic torsion method - Bending of Beams - Expression for Bending moment- Determination of Young's modulus by uniform bending- Depression of the loaded end of a Cantilever – Determination of Young's' modulus by Non-uniform bending – I section girders.	
Unit III	**Surface Tension**	**10 Hours**
	Introduction – free energy of a surface and surface tension - work done in blowing a bubble –Determination of surface tension - drop weight method -–Interfacial tension – determination of interfacial tension between water and kerosene.	
Unit IV	**Flow of Liquids**	**11 Hours**
	Rate of flow of a fluid – Equation of continuity – energy of liquid – Bernoulli's theorem –Applications of Bernoulli's theorem – Venturi meter – Pitot tube - Poiseuille's equation for flow of a liquid through horizontal capillary tube (Dimensional method) .	
Unit V	**Dynamics of Rigid body**	**11 Hours**
	Moment of inertia of a hoop - Moment of inertia of a Circular lamina – Moment of inertia of an annular ring - Moment of inertia of a Solid cylinder - Moment of inertia of a Hollow cylinder - Moment of inertia of a Solid Sphere.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1. Mathur.D.S.,(2001),*Properties of Matter*, Sultan and Chand Company, 2ndEdition.

Unit – I: Chapter VII - 7.3, 7.6 (iii-a), 7.22 -7.24, 7.27
Chapter VI – 6.4
Unit – III: Chapter XIV - 14.6, 14.11, 14.24, 14.24.2, 14.24.3,14.24.5
Unit – IV: Chapter XII - 12.1, 12.3, 12.4, 12.5, 12.6, 12.6(i) &12.6(ii), 12.6(iv), 12.11
Unit – V: Chapter 10: 10.9 (section - 3, 4, 5, 6, 8, 9, 10)

2. Murugeshan.R.(2006), *Properties of Matter*, Sultan Chand and Company.
Unit – II: Chapter 1: 1.4, 1.5 , 1.6, 1.7, 1.8, 1.9, 1.13, 1.14

Reference Books

1. Chatterjee & Sengupta,(2015), *A Treatise on General Properties of matter*, New central
book agency, NewDelhi.
2. Brijlal & Subramaniam.N.,(2002), *Properties of Matter*, Sultan Chand and Company.

E-Resources

1. https://www.tutorialspoint.com/physics_part1/physics_gravitation.htm

2. http://www.propertiesofmatter.si.edu/contents.html

Course Outcomes
At the end of the course, students would be able to

CO1	Apply Newton's Law of gravitation to various systems
CO2	Demonstrate the different types of bending
CO3	Illustrate the concepts of Surface Tension with experimental studies
CO4	Apply the knowledge of rate of flow of liquids
CO5	Compute the moment of inertia of various objects

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [Cos]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	2	3	2	2	1	1	1	1	1	1	2	2
CO2	2	3	2	3	3	2	2	1	1	1	2	2
CO3	2	3	2	3	3	2	2	1	1	1	2	2
CO4	2	3	2	3	3	2	2	1	1	1	2	2
CO5	2	3	2	3	3	2	2	1	1	1	2	2

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Gravitation	Hours (11)	Mode
I	a) Newton's law of gravitation	2	Lecture
	b) G by Boy's method	2	
	c) Acceleration due to gravity by compound pendulum theory and experiment	4	Lecture With Demo
	d) Earth quakes, seismic waves,seismographs, seismology and its applications.	3	Lecture With PPT
Unit	**Elasticity**	**Hours (11)**	**Mode**
II	a) Twisting couple on a cylinder or a wire.	2	Lecture With Demo

	b) Determination of rigidity modulus of a wire by dynamic torsion method.	2	Lecture
	c) Bending of Beams, Expression for Bending moment.	1	
	d) Determination of Young's modulus by uniform bending.	2	
	e) Depression of the loaded end of a Cantilever.	1	
	f) Determination of Young's' modulus by Non-uniform bending	2	
	g) I section girders.	1	
Unit	**Surface Tension**	**Hours (10)**	**Mode**
III	a) Introduction – free energy of a surface and surface tension	2	Lecture Lecture With Demo
	b) work done in blowing a bubble	2	
	c) Determination of surface tension by drop weight method	3	
	d) Interfacial tension, determination of interfacial tension between water and kerosene.	3	
Unit	**Flow Of Liquids**	**Hours (11)**	**Mode**
IV	a)Rate of flow of a fluid	1	Lecture Lecture With Model
	b) Equation of continuity , energy of liquid	1	
	c) Bernoulli's theorem, Applications of Bernoulli's theorem	3	
	d) Venturi meter	2	
	e) Pitot tube	2	
	f) Poiseuille's equation for flow of a liquid through horizontal capillary tube (Dimensional method)	2	
Unit	**Dynamics Of Rigid Body**	**Hours (11)**	**Mode**
V	a)Moment of inertia of a hoop	2	Lecture
	b)Moment of inertia of a Circular lamina	2	
	c) Moment of inertia of an annular ring	2	
	d) Moment of inertia of a Solid cylinder	1	
	e)Moment of inertia of a Hollowcylinder	2	
	f) Moment of inertia of a Solid Sphere	2	

Course Designed By:

1. Dr. T.Rajesh Kumar
2. Dr. P.Uma Mageshwari

Programme	B.A./B.Sc /B.Com	Programme Code	UPH		
Course Code	20UPHN11	Number of Hours/Cycle	2		
Semester	I	Max. Marks	50		
Part	IV	Credit	2		
NON MAJOR ELECTIVE – I					
Course Title	Physics in everyday life – I		L	T	P
Cognitive Level	K1& K2		24	3	3

L – Lecture T – TutorialP – Practical

Preamble

To make the students to understand the basic concepts of Physics in everyday life such as earth's Atmoshere, Human Body, Sports, Technique and Imaging to students studying other than Physics.

Unit I	Physics in Earth's Atmosphere	5 Hours
	Sun – Earth's Atmosphere as an ideal gas –Pascal's law – Archimede's Principle – corioli's acceleration– Rayleigh scattering – red sunset – reflection – refraction – dispersion of light – total internal reflection – rainbow.	
Unit II	**Physics in Human Body**	**5 Hours**
	The eyes as an optical instrument – vision defects – Rayleigh criterion and resolving power – sound waves and hearing – sound intensity – decibel scale .	
Unit III	**Physics in sports**	**5 Hours**
	Introduction — dynamics of rotating objects – running – Long jump and pole vaulting – motion of a spinning ball –bernoulli's equation – banana shot – magnus force.	
Unit IV	**Physics in technology**	**4 Hours**
	Global Positioning System (GPS) – CD player – electricmotors – telescope – microscope -projector	
Unit V	**Physics in imaging**	**5 Hours**
	Introduction to medical imaging – ultra sound imaging – X-Ray and X-ray CT imaging – Positron Emission Tomography (PET) – MRI.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. F.W. Sears, M.Zeemansky, R.A. Freedman, and H.D. Young, *University Physics*, Pearson Education

Reference Books

1. Louis A. Bloomfield, (2007), *How Everything Works Making Physics Out Of The Ordinary*, University of Virgina, ,John Willey & sons
2. Halliday.D, Resnick.R and Walker,(1960), *Fundamentals of Physics*, 6th Edition, John Wiley and Sons, Inc.

E-Resources

1. https:// physics in everyday life/blog.schoolspeciality.com/

2. https://en.m.wikipedia.org/wiki/physics in everyday life

Course Outcomes

At the end of the course, students would be able to

CO1	Define the basic concepts of Earth's Atmosphere and Weather systems
CO2	Discuss the optical instrument and decibel scale
CO3	Classify the various sports
CO4	Recall the techniques of Physics
CO5	Explain the medical imaging

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**
			Either/ or Choice		**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**
1	CO1	Up to K3	2	K1	1 (K2)
2	CO2	Up to K3	2	K1	1 (K2)
3	CO3	Up to K3	2	K1	1 (K2)
4	CO4	Up to K3	2	K1	1 (K2)
5	CO5	Up to K3	2	K1	1 (K2)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total marks for each Section			30		25

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (Either/or)**	**Section B (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	30	54.5
K2		5	25	45.5
Total Marks	30	25	55	100

Lesson Plan

Unit	Physics In Earth's Atmosphere	Hours (5)	Mode
I	a) Sun, Earth's Atmosphere as an ideal gas	1	Lecture
	b) Pascal's law, Archimede's Principle, corioli's acceleration	1	
	c) Rayleigh scattering, red sunset,reflection, refraction dispersion of light,	2	
	d) Total internal reflection and rainbow.	1	
Unit	**Physics In Human Body**	**Hours (5)**	**Mode**
II	a)The eyes as an optical instrument , vision defects	1	Lecture Lecture With PPT
	b) Rayleigh criterion and resolving power	1	
	c)sound waves and hearing	1	
	d) sound intensity, decibel scale	2	
Unit	**Physics In Sports**	**Hours (5)**	**Mode**
III	a) Introduction	1	Lecture Lecture With Demo
	b) dynamics of rotating objects , running , Long jump and pole vaulting	2	
	c) motion of a spinning ball , bernoulli's equation ,banana shot , magnus force.	2	
Unit	**Physics In Technology**	**Hours (4)**	**Mode**
IV	a) Global Positioning System (GPS)	2	Lecture With PPT Lecture
	b)CD player , electric motors	1	
	c) telescope, microscope and projector	1	
Unit	**Physics In Imaging**	**Hours (5)**	**Mode**
V	a) Introduction to medical imaging	1	Lecture With PPT Lecture
	b) ultra sound imaging , X-Ray and X-ray CT imaging	2	
	c) Positron Emission Tomography (PET) and MRI	2	

Course Designed By

1. Dr. T.Rajesh Kumar

2. Dr. P.Uma Mageshwari

Programme	All	Programme Code	UPH

Course Code	20UVEV11	Number of Hours/Cycle		2
Semester	I	Max. Marks		50
Part	IV	Credit		2
VALUE EDUCATION				
Course Title	Value Education	L	T	P
Cognitive Level	Upto K3	27	3	_

L – Lecture T – Tutorial P – Practical

Preamble

This course aims to develop the students in all dimensions so that they can be the better citizens of this nation with more social responsibility and patriotism.

Unit I	Values and Individual	6 hours
	Values meaning – the Significance of values – Classification of values – Needs of value education – Values and the individual; self-discipline, self-confidence, self-initiative, empathy, compassion, forgiveness, honesty and courage.	
Unit II	**Values and Religion**	**5 hours**
	Karma Yoga in Hinduism – Ahimsa in Jainism – Compassion in Buddhism – Love and justice in Christianity – Universal Brotherhood in Islam – Selfless service in Sikhism – Need for religious harmony.	
Unit III	**Values and Society**	**5 hours**
	Definition of Society – Democracy – Secularism – Socialism – Gender justice human rights – Socio political awareness – Social integration – Social justice	
Unit IV	**Professional Values**	**5 hours**
	Definition – Accountability – Willingness to learn – Team spirit – Competence development – Honesty – Transparency – Respecting others – Democratic functioning – Integrity and commitment.	
Unit V	**Role of Social Institutions in Value formation and Constitutional Values**	**6 hours**
	Role of family, peer group – Society – Educational institutions – Role models – Swami Vivekananda – Mahatma Gandhi – Martin Luther King – Mother Teresa and mass media in value formation – dignity of the individual – Unity and integrity of the nation – International peace.	

Text Book

1. Saravanan. P, Andichamy.P, (2011), *Value Education*, Merit India Publications, Madurai.

Reference Books

1. Murugeshan.R, (2015), *Value Education*, Millennium Publishers & Distributors, Madurai.
2. Subramanyam. K, (2002), *Value Education (Socio-Spiritual)*, Sri Ramakrishna

Tapovanam, Trichy.
3. *"Complete Works of Swami. Vivekananda"*, Sri Ramakrishna Mutt, Chennai
4. M.K. Gandhi, (2019), *An Autobiography or The Story of My Experiment with Truth*, Navajeevan Publication, Ahmadabad.
5. Jeyapragasam.S,(2006), *World Religions*, CEPCHIRA, Madurai.

Course Outcomes

After completion of this course, the students would be able to

CO1	Trace their personality and social values based on the principles of human values
CO2	Relate a sense of Love, Peace and Brotherhood at the local, national and international level
CO3	Identify the social realities and inculcate essential value system towards building a healthy society
CO4	Employ the knowledge of professional values in life
CO5	Associate the role in social institutions, family and constitutional values

Mapping of Programme specific outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	0	0	0	0	0	0	0	2	1	2	2
CO2	0	0	0	0	0	0	0	0	2	1	2	2
CO3	0	0	0	0	0	0	0	0	2	1	2	2
CO4	0	0	0	0	0	0	0	0	2	1	1	1
CO5	0	0	0	0	0	0	0	0	2	1	2	2

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping-K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B
			Either/or Choice		Open choice
			No. of Questions	K-Level	No. of Questions
1	**CO1**	Up to K2	2	K1 & K2	K2
2	**CO2**	Up to K2	2	K1 & K2	K2
3	**CO3**	Up to K3	2	K1 & K2	K3
4	**CO4**	Up to K2	2	K1 & K2	K2
5	**CO5**	Up to K3	2	K1 & K2	K3
No. of Questions to be asked			10		5
No. of Questions to be answered			5		3
Marks for each Question			3		5
Total Marks for each Section			30		25

K1-Remembering and recalling facts with specific answers

K2-Basic understanding of facts and stating main ideas with general answers

K3-Application oriented-Solving problems

Distribution of Section-wise Marks and K Level

K Levels	Section A (Either/or)	Section B (Open choice)	Total Marks	% of Marks without choice	Consolidated marks (Rounded off)
K1	15	-	15	27.2	27
K2	15	15	30	54.5	55
K3	-	10	10	18.1	18
Total Marks	30	25	55	100	100%

Lesson Plan

Unit	Values And Individual	Hours (6)	Mode
I	a)Values meaning, the Significance of values and Classification of values	2	Lecture With PPT Lecture
	b)Needs of value education , Values and the individual, self-discipline,self confidence,	2	
	c)self-initiative,empathy, compassion,forgiveness, honesty and courage.	2	
Unit	**Values And Religion**	**Hours (5)**	**Mode**
II	a)Karma Yoga in Hinduism	1	Lecture With PPT Lecture
	b)Ahimsa in Jainism Compassion Buddhism	1	
	c)Love and justice in Christianity	1	
	d)Universal Brotherhood in Islam	1	
	e)Selfless service in Sikhism, Need for religious harmony.	1	
Unit	**Values And Society**	**Hours (5)**	**Mode**
III	a)Definition of Society Democracy , Secularism and Socialism –	2	Lecture
	b) Gender justice human rights, Socio political awareness	1	
	c) Social integration and Social justice	2	
Unit	**Professional Values**	**Hours (5)**	**Mode**
IV	a)Definition, Accountability, Willingness to learn , Team spirit	1	Lecture With PPT

	b)Competence development, Honesty and Transparency	2	Lecture
	c) Respecting others, Democratic functioning , Integrity and commitment.	2	
Unit	**Role Of Social Institutions In Value Formation And Constitutional Values**	**Hours (6)**	**Mode**
V	a)Role of family, peer group and Society	1	Lecture Lecture With PPT
	b)Educational institutions ,Role models	1	
	c)Swami Vivekananda ,Mahatma Gandhi	2	
	d)Martin Luther King ,Mother Teresa and mass media in value	2	

Course Designed By

1. Dr. J.Sathyabama
2. Dr. M.Inbalakashmi

Programme	B.Sc	Programme Code	UPH
Course Code	20UPHC21	Number of Hours/Cycle	3
Semester	II	Max. Marks	100
Part	III	Credit	3

CORE COURSE - III				
Course Title	Thermal Physics	L	T	P
Cognitive Level	Upto K3	40	3	2

L –Lecture T – Tutorial P- Practical

Preamble

This course make the students to understand the phenomena connected with various units of measurement of temperature, knowing the concept of specific heat capacities of matter, transmission of heat, liquefying gases and process of making heat to do mechanical work. This paper also deals with kinetic theory of matter, transport phenomena in gases, laws of thermodynamics, concept of entropy and thermodynamical relations which form the basis of thermodynamical behaviour of the three states of matter.

Unit I	Calorimetry	8Hours
	Specific heat capacity of solids – Regnault's method of mixtures(solid) – Specific heat capacity of liquids – Calendar and Barnes method – Specific heat capacity of gases – Cp and Cv – Meyer's relation – Cv by Joly's differential steam calorimeter method – Cp by Regnault's method.	
Unit II	**Transmission of Heat**	**8 Hours**
	Conduction – Coefficient of Thermal Conductivity –Lee's disc method of determination of thermal conductivity of a bad conductor– Convection — Newton's law of cooling – Determination of specific heat capacity of liquid - Radiation - Black body – Kirchhoff's law – Stefan – Boltzmann law - Energy distribution in black body spectrum - Wien's law – Rayleigh Jean's law– Planck's law .	
Unit III	**Kinetic Theory of Gases**	**8 Hours**
	Kinetic Theory of gases- assumptions -–mean free path – expression for mean free path – Transport phenomenon - expression for Diffusion, Viscosity and Thermal conductivity of gas. -Vander walls equation of state - Determination of Vander walls constant - Relation between Vander Wall's constant and critical constants.	
Unit IV	**Thermodynamics**	**8 Hours**
	Zeroth and first law of thermodynamics – reversible and irreversible processes – isothermal process-adiabatic process-gas equation during isothermal and adiabatic process - work done during isothermal and adiabatic process - second law of thermodynamics – Entropy – change of entropy in reversible and irreversible processes - change of entropy when ice converted into steam - third law of thermodynamics.	
Unit V	**Low Temperature Physics**	**8 Hours**
	Joule - Kelvin effect - Liquefaction of Air-Linde's Process - liquefaction of hydrogen - liquefaction of helium- Kammerling - Onne's method - Helium I and II - Lambda point - production of low temperatures - adiabatic demagnetization - practical applications of low temperature.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. Brijlal and Subramanyam ,(2012), *Heat and Thermodynamics and Statistical Physics*, Sultan Chand and Company,14th Edition ,New Delhi.

Unit I: Chapter 13 & 14: 13.15, 13.23, 14.2, 14.6, 14.7, 14.11, 14.12,
Unit II: Chapter 8, 14 &15: 15.1, 15.11, 15.22, 14.5, 14.6, 14.7, 8.6, 8.7, 8.8, 8.9, 8.10,8.12, 8.13, 8.14, 8.15, 8.17
Unit III Chapter 1, 2 & 3: 1.3, 3.2, 3.5, 3.7, 3.16,3.8, 3.11, 2.8, 2.10, 2.11, 2.12,
Unit IV: Chapter 4 & 5: 4.2, 4.7, 4.20, 4.12, 4.13, 4.28, 5.1,5.2, 5.3, 5.4, 5.15
Unit V: Chapter 2 & 7: 2.24, 7.8, 7.10, 7.11, 7.12, 7.13, 7.14, 7.15, 7.16, 7.21

Reference Books

1. Rajam. J.B.,(1985), *Heat & Thermodynamics*, Sultan Chand and Company,New Delhi.
2. Narayanamoorthy.M.and Nagarathinam .N,(1987), *Heat*, National publishing Company, EighthEedition,Chennai.
3. Murugeshan.R ,(2004), *Thermal Physics*, Sultan Chand and Company,New Delhi.

E-Resources

1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
2. https://nptel.ac.in/
3. https://www.physicsclassroom.com/class/thermalP/Lesson-2/Calorimeters-and-Calorimetry
4. https://aip.scitation.org/ltp/info/focus

Course Outcomes:

At the end of the course, students would be able to

CO1	Experiment with the methods to determine the Specific heat capacities of Solids,liquids and gases
CO2	Make use of the laws of conduction, convection and radiation
CO3	Solve the kinetic theory of gases and transport phenomena
CO4	Make use of the laws of thermodynamics and apply the concepts of Entropy
CO5	Apply the liquefaction methods for various gases

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [Cos]

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	1	**1**
CO2	**2**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	1	**1**
CO3	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	1	**1**
CO4	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	1	**1**
CO5	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	1	**1**

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Calorimetry	Hours (8)	Mode
I	a) Specific heat capacity of solids	1	Lecture With Demo
	b)Regnault's method of mixtures(solid)	1	
	c) Specific heat capacity of liquids ,Calendar and Barnes method	2	
	d) Specific heat capacity of gases ,Cp and Cv	1	Lecture
	e) Meyer's relation	1	
	f) Cv by Joly's differential steam calorimeter method	1	Lecture With Ppt
	g) Cp by Regnault's method.	1	
Unit	**Transmission Of Heat**	**Hours (8)**	**Mode**
II	a) Conduction and Coefficient of Thermal Conductivity	1	Lecture With Demo Lecture
	b) Lee's disc method of determination of thermal conductivity of a bad conductor	2	
	c) Convection , Newton's law of cooling , Determination of specific heat capacity of liquid	2	
	d) Radiation , Black body , Kirchhoff's law ,Stefan Boltzmann law , Energy distribution in black body spectrum ,Wien's law , Rayleigh Jean's law and Planck's law .	3	
Unit	**Kinetic Theory Of Gases**	**Hours (8)**	**Mode**
III	a)Kinetic Theory of gases- and its assumptions	1	Lecture Lecture With Ppt
	b)mean free path ,expression for mean free path and Transport phenomenon	2	
	c) expression for Diffusion, Viscosity and Thermal conductivity of gas	2	
	d)Vander walls equation of state and Determination of Vander walls constant	1	
	e) Relation between Vander Wall's constant and critical constants	2	
Unit	**Thermodynamics**	**Hours (8)**	**Mode**
IV	a)Zeroth and first law of thermodynamics	2	Lecture Lecture With Ppt
	b) reversible, irreversible isothermal and adiabatic process	2	
	c) gas equation during isothermal and adiabatic process	1	
	d)work done during isothermal and adiabatic process , second law of thermodynamics	2	
	e) Entropy , change of entropy in reversible and irreversible processes	1	
Unit	**Low Temperature Physics**	**Hours (8)**	**Mode**
	a) Joule, Kelvin effect	1	Lecture
	b)Liquefaction of Air, Linde's Process	1	
	c) liquefaction of hydrogen , liquefaction of helium, Kammerling - Onne's method	2	

V	d) Helium I and II , Lambda point , production of low temperatures	1	Lecture With Ppt
	e) adiabatic demagnetization ,Practical applications of low temperature.	1	
	f) change of entropy when ice converted into steam and third law of thermodynamics.	2	

Course Designed By

1. Dr. S.Saravanan
2. Mr. R. Jayaraman

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC22	Number of Hours/Cycle	3		
Semester	II	Max. Marks	100		
Part	III	Credit	3		
CORE COURSE – IV					
Course Title	Geometrical Optics and Acoustics		L	T	P
Cognitive level	Upto K3		40	3	2

L –Lecture T – Tutorial P- Practical

Preamble

This course aims to bring the students the knowledge about Geometrical optics and Acoustics. It deals with the concepts of dispersion, lens aberrations, optical instruments, interference of sound, acoustics and ultrasonics.

Unit I	Dispersion	8 Hours
	Refraction through a prism - Dispersion by a prism– angular dispersion – dispersive power – angular and chromatic dispersions – achromatic combination of prisms – deviation without dispersion – dispersion without deviation – direct vision spectroscope .	
Unit II	**Lens Aberrations**	**8 Hours**
	Aberrations – spherical aberration – aplanatic points – chromatic aberration – chromatic aberration in a lens– expression for longitudinal chromatic aberration for an object at finite distance – achromatic lenses – condition for achromatism of two lenses in contact - condition for achromatism of two lenses separated by a distance.	
Unit III	**Optical Instruments**	**8 Hours**
	Objective and Eyepiece – Kellner's Eyepiece – Huygen's Eyepiece – Ramsden Eyepiece – Comparison of Ramsden Eyepiece with Huygen's Eyepiece – Compound Microscope – Telescopes – Refracting Astronomical telescope - Reflecting Telescope.	
Unit IV	**Interference of sound**	**8 Hours**
	Interference of sound waves – condition for interference of sound waves – energy distribution due to interference of sound waves – quincke's tube – beats – analytical treatment of beats – combination tones – Helmholtz resonator.	
Unit V	**Acoustics and ultrasonics**	**8 Hours**
	Acoustics - reverberation – Sabine's formula – factors affecting the acoustics of buildings – sound distribution in an auditorium – requisites for good acoustics – ultrasonics – production of ultrasonics – piezoelectric oscillator – detection of ultrasonic waves – applications of ultrasonic waves.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1. Brijlal and Subramanyam , (2010), *A Text Book Of Optics*, Sultan Chand and Company, 24th Edition ,New Delhi.

   Unit I: Chapter 8: 8.1-8.8
   Unit II: Chapter 9: 9.1, 9.2, 9.5, 9.6, 9.6.1, 9.10, 9.11, 9.11a, 9.11b, 9.13, 9.13(1,2)
   Unit III: Chapter 10: 10.3, 10.3.1, 10.8, 10.9, 10.10, 10.11, 10.12, 10.13, 10.14, 10.15, 10.15.1, 10.16, 10.16.1

2. Brijlal and Subramanyam , (1992), *Waves and Oscillations*, Vikas Publishing House Private Limited, 2nd Edition ,New Delhi.

   Unit IV: Chapter 6: 6.6- 6.15
   Unit V: Chapter 11: 11.14, 11.15, 11.16, 11.20, 11.21, 11.22, 11.23, 11.24, 11.24.3,11.25, 11.27

Reference Books

1. Ajoy Ghatak , (2006), *Optics*, Tata Mcgraw Hill Publishing Company Limited, , 3rd Edition ,New Delhi

2. Murugeshan.R, Kiruthiga Sivaprasath, (2010), Optics and Spectroscopy , Sultan Chand and Company, Revised Edition ,New Delhi.

E-Resources

1. https://blossoms.mit.edu/resources/physics_resources
2. https://micro.magnet.fsu.edu/optics/webresources/index.html
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
4. https://phys.libretexts.org

Course Outcomes

At the end of the course, students would be able to

CO1	Identify the laws of refraction, reflection and the terminology of prisms
CO2	Organize the kinds of aberrations
CO3	Relate the various types of optical instruments
CO4	Illustrate the interference of sound waves
CO5	Write the acoustics and sabine's formula

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [Cos]

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	2	3	2	2	2	2	1	1	2	1	1	1
CO2	2	3	2	2	2	2	1	1	2	1	1	1
CO3	2	2	1	1	2	1	1	1	2	1	1	1
CO4	2	2	1	1	2	2	2	2	2	1	1	1
CO5	2	2	1	1	1	1	1	1	2	1	1	1

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (NoChoice)	Section B (Either/or)	Section C (OpenChoice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Dispersion	Hours (8)	Mode
I	a) Refraction through a prism, dispersion by a prism	1	Lecture Seminar
	b) angular dispersion, dispersive power , angular and chromatic dispersions	2	
	c) achromatic combination of prisms	1	
	d)deviation without dispersion	2	
	e)dispersion without deviation	1	
	f) direct vision spectroscope	1	
Unit	**Lens Aberrations**	**Hours (8)**	**Mode**
II	a) Aberrations , spherical aberration, aplanatic points	2	Lecture With Demo Lecture With Ppt Lecture Seminar
	b) chromatic aberration, chromatic aberration in a lens	1	
	c) expression for longitudinal chromatic aberration for an object at finite distance	2	
	d) achromatic lenses , condition for achromatism of two lenses in contact	2	
	e) condition for achromatism of two lenses separated by a distance.	1	
Unit	**Optical Instruments**	**Hours (8)**	**Mode**
III	a) Objective and Eyepiece	1	Lecture Lecture With Ppt Group Discussion
	b)Kellner's Eyepiece, Huygen's Eyepiece , Ramsden Eyepiece	2	
	c) Comparison of Ramsden Eyepiece with Huygen's Eyepiece	2	
	d) Compound Microscope, Telescopes	2	
	e) Refracting Astronomical telescope ,Reflecting Telescope	2	
Unit	**Interference Of Sound**	**Hours (8)**	**Mode**
IV	a) Interference of sound waves	1	Lecture Lecture With Ppt Seminar
	b) condition for interference of sound waves	1	

	c) energy distribution due to interference of sound waves	1	
	d) quincke's tube	1	
	e) beats and analytical treatment of beats	2	
	f) Combination tones and Helmholtz resonator.	2	
Unit	**Acoustics And Ultrasonics**	**Hours (8)**	**Mode**
V	a) Acoustics and reverberation	1	Lecture Lecture With Ppt
	b) Sabine's formula , factors affecting the acoustics of buildings, sound distribution in an auditorium	3	
	c) requisites for good acoustics	1	
	d)ultrasonics and production of ultrasonics	1	
	e)piezoelectric oscillator, detection of ultrasonic waves and applications of ultrasonic waves.	2	

Course Designed By:

1. Dr. K. Ramavenkateswari
2. Dr. K. Jayabala

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHA21	Number of Hours/Cycle	4		
Semester	II	Max. Marks	100		
Part	III	Credit	4		
ALLIED COURSE - II					
Course Title	Allied Physics – II		L	T	P
Cognitive Level	Upto K3		55	3	2

L –Lecture T – Tutorial P- Practical

Preamble

To understand the concept of heat, transmission of heat, kinetic theory of gases and Low temperature physics, Dispersion, Acoustics and ultrasonics.

Unit I	Transmission of Heat	11 Hours
	Conduction – Coefficient of Thermal Conductivity –Lee's disc method of determination of thermal conductivity of a bad conductor– Convection — Newton's law of cooling – Determination of specific heat capacity of liquid - Radiation - Black body – Kirchhoff's law – Stefan – Boltzmann law - Energy distribution in black body spectrum - Wien's law – Rayleigh Jean's law– Planck's law .	
Unit II	**Kinetic Theory of Gases**	**11 Hours**
	Kinetic Theory of gases- assumptions -–mean free path – expression for mean free path – Transport phenomenon - expression for Diffusion, Viscosity and Thermal conductivity of gas. -Vander walls equation of state - Determination of Vander walls constant - Relation between Vander Wall's constant and critical constants.	
Unit III	**Low Temperature Physics**	**11 Hours**
	Joule - Kelvin effect - Liquefaction of Air-Linde's Process - liquefaction of hydrogen - liquefaction of helium- Kammerling - Onne's method - Helium I and II - Lambda point - production of low temperatures - adiabatic demagnetization - practical applications of low temperature.	
Unit IV	**Dispersion**	**11 Hours**
	Refraction through a prism - dispersion by a prism — angular dispersion – dispersive power – angular and chromatic dispersions – achromatic combination of prisms – deviation without dispersion – dispersion without deviation – direct vision spectroscope.	
Unit V	**Acoustics and ultrasonics**	**11 Hours**
	Acoustics - reverberation – Sabine's formula – factors affecting the acoustics of buildings – sound distribution in an auditorium – requisites for good acoustics – ultrasonics – production of ultrasonics – piezoelectric oscillator – detection of ultrasonic waves – applications of ultrasonic waves.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1. Brijlal and Subramanyam ,(2012), "*Heat and Thermodynamics and Statistical Physics"*, Sultan Chand and Company,14th Edition ,New Delhi.

   Unit I: Chapter 8, 14 &15: 15.1, 15.11, 15.22, 14.5, 14.6, 14.7, 8.6, 8.7, 8.8, 8.9, 8.10, 8.12, 8.13, 8.14, 8.15, 8.17
   Unit II: Chapter 1, 2 & 3: 1.3, 3.2, 3.5, 3.7, 3.16, 3.8, 3.11, 2.8, 2.10, 2.11, 2.12,
   Unit III: Chapter 2 & 7: 2.24, 7.8, 7.10, 7.11, 7.12, 7.13, 7.14, 7.15, 7.16, 7.21

2. Brijlal and Subramanyam , (2010), "*A Text Book Of Optics"*, Sultan Chand and Company, 24th Edition ,New Delhi.
   Unit IV: Chapter 8: 8.1-8.8
3. Brijlal and Subramanyam , (1992), "*Waves and Oscillations"*, Vikas Publishing House Private Limited, 2nd Edition ,New Delhi.
   Unit V: Chapter 11: 11.14, 11.15, 11.16, 11.20, 11.21, 11.22, 11.23, 11.24, 11.24.3, 11.25, 11.27

Reference Books

1. Mathur.D.S,(2006), "*Heat and Thermodynamic"s*, Sultan Chand and Company, New Delhi.
2. Murugesan.R,(2015),"*Thermal Physics"*, Sultan Chand and Company,New Delhi.
3. Rajam. J.B,(1985), "*Heat and Thermodynamics"*, Sultan Chand and Company , New Delhi.

E-Resources

1. https://blossoms.mit.edu/resources/physics_resources
2. https://micro.magnet.fsu.edu/optics/webresources/index.html
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
4. https://phys.libretexts.org
5. https://aip.scitation.org/ltp/info/focus

Course Outcomes:

At the end of the course, students would be able to

CO1	Make use of the laws of conduction, convection and radiation
CO2	Solve the kinetic theory of gases and transport phenomena
CO3	Apply the liquefaction methods for various gases
CO4	Identify the laws of refraction, reflection and the terminology of prisms
CO5	Write the acoustics and sabine's formula

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [Cos]

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	2	3	2	2	2	2	1	1	2	1	1	1
CO2	2	3	2	2	2	2	1	1	2	1	1	1
CO3	2	2	1	1	2	1	1	1	2	1	1	1
CO4	2	2	1	1	2	2	2	2	2	1	1	1
CO5	2	2	1	1	1	1	1	1	2	1	1	1

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (NoChoice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

LessonPlan

Unit	Transmission Of Heat	Hours (11)	Mode
I	a) Conduction and Coefficient of Thermal Conductivity	2	Lecture Lecture With Demo
	b) Lee's disc method of determination of thermal conductivity of a bad conductor	2	
	c) Convection , Newton's law of cooling , Determination of specific heat capacity of liquid	3	
	d) Radiation , Black body , Kirchhoff's law ,Stefan Boltzmann law , Energy distribution in black body spectrum ,Wien's law , Rayleigh Jean's law and Planck's law .	4	
Unit	**Kinetic Theory Of Gases**	**Hours (11)**	**Mode**
II	a)Kinetic Theory of gases- and its assumptions	2	Lecture Lecture With Ppt Seminar
	b)mean free path ,expression for mean free path and Transport phenomenon	2	
	c) expression for Diffusion, Viscosity and Thermal conductivity of gas	2	
	d)Vander walls equation of state and Determination of Vander walls constant	3	
	e) Relation between Vander Wall's constant and critical constants	2	
Unit	**Low Temperature Physics**	**Hours (11)**	**Mode**
III	a) Joule, Kelvin effect	2	Lecture Lecture With Ppt Seminar
	b)Liquefaction of Air, Linde's Process	2	
	c) liquefaction of hydrogen , liquefaction of helium, Kammerling - Onne's method	3	
	d) Helium I and II , Lambda point , production of low temperatures, adiabatic demagnetization	2	
	e) Practical applications of low temperature.	2	
Unit	**Dispersion**	**Hours (11)**	**Mode**
1V	a) Dispersion by a prism, refraction through a prism	2	Lecture Lecture With Ppt
	b) angular dispersion, dispersive power , angular and chromatic dispersions	2	
	c) achromatic combination of prisms	2	

	d)deviation without dispersion	2	Seminar
	e)dispersion without deviation	2	
	f) direct vision spectroscope	1	
Unit	**Acoustics And Ultrasonic**	**Hours (11)**	**Mode**
V	a) Acoustics and reverberation	2	Lecture Lecture With Ppt Seminar
	b) Sabine's formula , factors affecting the acoustics of buildings, sound distribution in an auditorium	3	
	c) requisites for good acoustics	2	
	d)ultrasonics and production of ultrasonics	2	
	e)piezoelectric oscillator, detection of ultrasonic waves and applications of ultrasonic waves.	2	

Course Designed By:

1. Dr. T.Rajesh Kumar
2. Dr. P.Uma Mageshwari

Programme	B.A./B.Sc /B.Com	Programme Code	UPH		
Course Code	20UPHN21	Number of Hours/Cycle	2		
Semester	II	Max. Marks	100		
Part	IV	Credit	2		
NON MAJOR ELECTIVE – II					
Course Title	Physics in Everyday life – II		L	T	P
Cognitive level	K1& K2		25	3	2

L –Lecture T – Tutorial P- Practical

Preamble:

Introduce the students to get better insight on Home appliances, Electric current and voltage, AC generation , electrical circuits & connections and make the students to inculcate the basic principles of Lab components and equipments.

Unit I	Physics in Home Appliances - I	5 Hours
	Electrical bulbs – fluorescent lamps – inverter–principle and op of fan—television – washing machine –vacuum cleaner .	
Unit II	**Physics in Home Appliances – II**	**5 Hours**
	water heater – electric iron box – microwave oven – refrigerator - induction stove – pressure cooker.	
Unit III	**Physics in Electrical connections**	**5 Hours**
	AC and DC – single phase and three phase connections – three phase transformer – house wiring star-star, star-delta, delta – star connections – overloading – earthing – short circuiting – fuses.	
Unit IV	**Physics in Lab Components**	**5 Hours**
	Condenser boxes - condenser in series - condensers in parallel – resistance – colour codes of resistance - resistance in series – resistance in parallel – inductance coil.	
Unit V	**Physics in Lab Instruments**	**5 Hours**
	Power supply – galvanometer - voltmeter – ammeter – multimeter - Travelling microscope – spectrometer – Cathode Ray Oscilloscope (CRO).	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. Metha.K, Ramanamurthy.G.V, (2014), *Electrician*, Computech Publications Limited

Reference Books

1. Hallidary.D, Resnick and Walker.J, (2001), *Fundamental of Physics*,6th edition, Wiley, NewYork.
2. Priti Agrawal and RahulGarg, *IIT Electrician Theory I and II*, Neelkanth Publishers Private Limited.

E-Resources

1.https://blog.schoolspecialty.com/physics-in-everyday-life-examples-for-the-classroom/
2. https://www.onlinecolleges.net/100-amazing-videos-for-teaching-and-studying-physics/
3. http://www.physics.org/explore.asp

Course Outcomes

At the end of the course, students would be able to

C01	Describe the better insight on Home Appliances-I
C02	Discuss the better insight on Home Appliances-II
C03	List the electrical connections
C04	Recall the various lab components
C05	Demonstrate the various lab Instrument

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**
			Either/ or Choice		**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**
1	CO1	Up to K3	2	K1	1 (K2)
2	CO2	Up to K3	2	K1	1 (K2)
3	CO3	Up to K3	2	K1	1 (K2)
4	CO4	Up to K3	2	K1	1 (K2)
5	CO5	Up to K3	2	K1	1 (K2)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total marks for each Section			30		25

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (NoChoice)**	**Section B (Either/or)**	**Section C (OpenChoice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	-	10	10
K2	-	40	20	60	60
K3	-	-	30	30	30
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Physics In Home Appliances - I	Hours (5)	Mode
I	a)Electrical bulbs ,fluorescent lamps	1	Lecture With Demo
	b) inverter, principle and operations of fan kettle	2	
	c) television ,washing machine and Vacuum cleaner.	2	Lecture
Unit	**Physics In Home Appliances – Ii**	**Hours (5)**	**Mode**
II	a) water heater	1	Lecture Lecture With Demo
	b) electric iron box and microwave oven	2	
	c) refrigerator	1	
	d) Induction stove and pressure cooker.	1	
Unit	**Physics In Electrical Connections**	**Hours (5)**	**Mode**
III	a) AC, DC, single phase and three phase connections	2	Lecture With Demo
	b) three phase transformer , house wiring star-star, star-delta, delta , star connections	2	Lecture
	c) Overloading, earthing, short circuiting fuses .	1	
Unit	**Physics In Lab Components**	**Hours (5)**	**Mode**
IV	a) Condenser boxes , condenser in series and parallel	2	Lecture With Demo Seminar
	b) resistance , colour codes of resistance	1	
	c) resistance in series, resistance in parallel and inductance coil.	2	
Unit	**Physics In Lab Instruments**	**Hours (5)**	**Mode**
V	a) Power supply, galvanometer	1	Lecture With Demo
	b),voltmeter , ammeter and multimeter	2	
	c)Travelling microscope, spectrometer and CRO.	2	

Course Designed By

1. Dr. T.Rajesh Kumar
2. Dr. P.Uma Mageshwari

Programme	All	Programme Code	UPH	
Course Code	20UEGS21	Number of Hours/Cycle	2	
Semester	II	Max. Marks	100	
Part	IV	Credit	2	
ENVIRONMENT AND GENDER STUDIES				
Course Title	Environment and Gender Studies	L	T	P
Cognitive level	Upto K3	26	4	-

L –Lecture T – Tutorial P- Practical

Preamble

This course aims to bring to the knowledge of the students that environment and conservation play a vital role in any nation. Nations across the globe face newer environmental challenges. The degradation of our biodiversity in the form of deforestation, industrialization, etc. and further the equality between sexes and gender sensitization are the need of the hour that led to placing both environment and gender studies in Curricula.

Unit I	Environment Education:	6 Hours
	Objectives – Nature and Scope – Environment Education in India, Components of Environment – Biosphere, Lithosphere, Hydrosphere, and Atmosphere. Global Environmental Issues – Global Warming, Ozone Layer Depletion, Acid Rain, Desertification – Loss of Biodiversity – E-wastes and Cloud Bursting.	
Unit II	**Ecosystem & Biodiversity**	**6 Hours**
	Ecosystem: Concept – Structure and Functions of an Ecosystem: Producers, Consumers and Decomposers – Energy Flow in an Ecosystem; Food Chains, Food Webs and Ecological Pyramids; Biodiversity: Introduction – National and Global Levels – Loss of Biodiversity – Hotspots – Conservation Strategies: In Situ and Ex Situ.	
Unit III	**Energy Resources and Conservation**	**4 Hours**
	Definition – Classification: Conventional and Non-Conventional – Types of Wastes: Solid, Liquid and Gaseous – Conversion of Wastes into Wealth – Energy from Wastes.	
Unit IV	**Natural Resources**	**6 Hours**
	Introduction – Types of Resources: Forest, Water, Mineral, Animal and Livestock, Land and Food – Resources Depletions: Causes, Consequences and Remedial Measures – Environmental Laws – Acts, Rules and Procedures in India – Social Issues – Sustainable Development	
Unit V	**Gender**	**4 Hours**
	Introduction – Constitutional Guarantees - Types of Gender – Influence of Genes, Hormones and their Roles – Agents of Gender Socialization: Role of Family – Role of Peer Group – Role of Religion.	

Text Book

1. Ravichandran, P. and Muthumari, M. (2019). *Environmental Studies*, New Century Book House, Channai, Tamil Nadu, India.

Reference Books

1. AbhijitMallick (2014). *Environmental Science and Management*, Viva Books Private Limited, New Delhi, India.
2. Kanagasabai, S. (2010). *Textbook on Environmental Studies*, PHI Learning Private Limited, New Delhi, India.
3. Rajagopalan, R. (2005). *Environmental Studies*, Oxford University Press, New Delhi, India.
4. UlaganathanSankar (2001). *Environmental Economics*, Oxford University Press, New Delhi, India.
5. Shukla, R.S. and Chandel, P.S. (2003). *Plant Ecology*, S.Chand& Company Limited, New Delhi, India.
6. Ramakrishnan, P.S. (2013). *Ecology and Sustainable Development*, National Book Trust, New Delhi, India.
7. Chattopadhyay, S.K. (2017). *Gender Socialization and the Making of Gender in the Indian Context* ,Sage Publication, New Delhi, India.

Journal Source

The Indian Journal of Gender Studies [Journals.sagepub.com]

Course Outcomes [CO]: On completion of this course, the students will be able to

CO	Statement
CO1	Define the concepts of Environmental Education and Relate the various environmental issues.
CO2	Classify the behaviour of various Tropic Levels of Ecosystems and Interpret their Energy Flow. And make use of acquired knowledge in mitigation of Loss of Biodiversity.
CO3	Identify and apply knowledge in various types of wastes and their conversion into wealth.
CO4	Illustrate the Environmental Laws and Develop knowledge about Sustainable Development.
CO5	Make use of acquired knowledge in issues related to gender equality.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [Cos]

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	0	0	0	0	0	0	1	1	2	1	1	1
CO2	0	0	0	0	0	0	1	1	2	2	1	1
CO3	0	0	0	0	0	0	1	1	2	2	1	1
CO4	0	0	0	0	0	0	1	1	2	2	1	1
CO5	0	0	0	0	0	0	1	1	2	1	1	1

3 - High . 2 - Moderate. 1- Low

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	Cos	K-Level	Section A		Section B
			Either/or Choice		Open choice
			No. of Questions	K-Level	No. of Questions
1	**CO1**	Up to K2	2	K1 & K2	K2
2	**CO2**	Up to K2	2	K1 & K2	K2
3	**CO3**	Up to K3	2	K1 & K2	K3
4	**CO4**	Up to K2	2	K1 & K2	K2
5	**CO5**	Up to K3	2	K1 & K2	K3
No. of Questions to be asked			10		5
No. of Questions to be answered			5		3
Marks for each Question			3		5
Total Marks for each Section			30		25

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open choice)	Total Marks	% of Marks without choice	Consolidated marks (Rounded off)
K1	15	-	15	27.2	27
K2	15	15	30	54.5	55
K3	-	10	10	18.1	18
Total Marks	30	25	55	100	100%

Lesson Plan

Unit	Environment Education	Hours (6)	Mode
I	a) Objectives , Nature and Scope, Environment Education in India	2	Lecture Group Discussion
	b) Components of Environment, Biosphere, Lithosphere, Hydrosphere, and Atmosphere.	2	
	c) Global Environmental Issues , Global Warming, Ozone Layer Depletion, Acid Rain.	2	
	d) Desertification , Loss of Biodiversity, E-wastes and Cloud Bursting.	2	
Unit	**Ecosystem & Biodiversity**	**Hours (6)**	**Mode**
II	a) Concept , Structure and Functions of an Ecosystem	1	Lecture Group Discussion
	b)Producers, Consumers and Decomposers, Energy Flow in an Ecosystem	2	
	c) Food Chains, Food Webs and Ecological Pyramids	1	
	d) Biodiversity Introduction , National and Global Levels	1	
	e) Loss of Biodiversity, Hotspots Conservation Strategies: In Situ and Ex Situ.	1	
Unit	**Energy Resources And Conservation**	**Hours (4)**	**Mode**
III	a) Definition, Conventional and Non-Conventional resources, types of Wastes	2	Lecture
	b) Solid, Liquid and Gaseous, Conversion of wastes into wealth ,Energy from Wastes.	2	
Unit	**Natural Resources**	**Hours (6)**	**Mode**
IV	a)Introduction, Types of Resources, Forest,Water, Mineral, Animal and Livestock, Land and Food	2	Lecture Group Discussion
	b) Resources Depletions: Causes, Consequences and Remedial Measures, Environmental laws	2	
	c) Acts, Rules and Procedures in India, Social Issues and Sustainabl Development.	2	
Unit	**Gender**	**Hours (4)**	**Mode**
V	a) Introduction, Constitutional Guarantees Types of Gender and Influence of Genes	2	Lecture
	b) Hormones and their Roles, Agents of GenderSocialization, Role of Family Role of Peer Group Role of Religion.	2	

Course Designed By

1. Dr. M. Muthumari
2. Dr.P. Ravichandran

Programme	**B.Sc**	**Programme Code**	**UPH**
Course Code	**20UPHC2P**	**Number of Hours/Cycle**	**2**
Semester	**II**	**Max. Marks**	**100**
Part	**III**	**Credit**	**3**
CORE PRACTICAL - I			
Course Title	**Major Physics Practicals - I**		

LIST OF EXPERIMENTS (Any 12)

1. Young's Modulus – Uniform bending (Pin and Microscope)

2. Young's Modulus – Nom- Uniform bending (Pin and Microscope)

3. Acceleration due to gravity –Compound Pendulum

4. Moment of Inertia & Rigidity modulus – Torsion pendulum

5. Verification of Laws – Sonometer

6. Frequency of the tuning fork - Sonometer

7. Calibration of Voltmeter - Potentiometer

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8. Calibration of Ammeter – Potentiometer

9. Young's Modulus - Uniform Bending Optic Lever and Telescope

10. Young's Modulus - Non - Uniform Bending Optic Lever and Telescope

11. Thermal conductivity of bad conductor using Lee’s disc

12. Coefficient of Viscosity –Stoke’s method

13. Surface tension by capillary rise method

14. Surface tension by Drop weight method

Programme	B.Sc	Programme Code	UPH
Course Code	20UPHA2P	Number of Hours/Cycle	2
Semester	II	Max. Marks	100
Part	III	Credit	2
ALLIED PRACTICAL - I			
Course Title	Allied Physics Practicals - I		

LIST OF EXPERIMENTS (Any 12)

1. Young's Modulus – Uniform bending (Pin and Microscope)
2. Young's Modulus – Nom- Uniform bending (Pin and Microscope)
3. Acceleration due to gravity & Radius of gyration –Compound Pendulum
4. Moment of Inertia & Rigidity Modulus of a given wire– Torsion pendulum
5. Frequency of the tuning fork - Sonometer
6. Verification of Laws - Sonometer
7. Calibration of Voltmeter - Potentiometer
8. Calibration of Ammeter - Potentiometer
9. Young's Modulus - Uniform Bending Optic Lever and Telescope
10. Young's Modulus - Non - Uniform Bending Optic Lever and Telescope
11. Thermal conductivity of bad conductor using Lee's disc
12. Coefficient of Viscosity –Stoke's method
13. Surface tension by capillary rise method
14. Surface tension by Drop weight method

Programme	**B.Sc**	**Programme Code**	**UPH**		
Course Code	**20UPHC31**	**Number of Hours/Cycle**	**4**		
Semester	**III**	**Max. Marks**	**100**		
Part	**III**	**Credit**	**4**		
Core Course V					
Course Title	**Electricity and Electromagnetism**		**L**	**T**	**P**
Cognitive Level	**Up to K3**		**55**	**3**	**2**

L –Lecture T – Tutorial P- Practical

Preamble

To provide basic concepts of electricity and electromagnetism and their applications. It will equip the students with required pre requisites to understand electro dynamical phenomena.

Unit I	**Thermal effect of electric current**	**11 Hours**
	Thermoelectricity- Seebeck effect- laws of thermo e.m.f-– measurement of thermo e.m.f using potentiometer-Peltier effect-demonstration—Thomson effect- demonstration - thermodynamics of thermo couple – thermo electric diagram –uses.	
Unit II	**DC and AC Circuits**	**11Hours**
	Growth and decay of current in LR circuit - determination of high resistance by leakage –growth and decay of charge in LCR circuit-Alternating Current-EMF induced in a coil rotating in a magnetic field-LCR series resonance circuit -sharpness of resonance-parallel resonance	
Unit III	**Magnetic effect of electric current**	**11 Hours**
	Magnetic flux and magnetic induction- Biot Savart law- magnetic induction at a point due to a straight conductor carrying current - magnetic induction at a point on the axis of a circular coil carrying current- force on a current carrying conductor in a magnetic field -torque on a current loop in a uniform magnetic field - amperes circuital law - magnetic field inside a long solenoid - Moving coil Ballistic galvanometer-theory -experiment to find charge sensitivity.	
Unit IV	**Electromagnetic induction**	**11 Hours**
	Faraday's laws of electromagnetic induction-self induction –self inductance of a long solenoid – determination of L by Rayleigh's methods- mutual induction-mutual inductance between two co-axial solenoids-experimental determination of mutual inductance – co-efficient of coupling- eddy currents-uses.	
Unit V	**Maxwell's equation & electromagnetic waves**	**11 Hours**
	Introduction- Maxwell's equations-Displacement current- Poynting vector-Electromagnetic waves in free space-Hertz experiment for production and detection of EM waves - Wave equations for Electric field and Magnetic field-monochromatic plane waves-EM waves in a matter	

Pedagogy

These concepts are better understood when lectures are accompanied with Class Room Lectures, chalk and talk, Power point presentation, Quiz, Assignment and Group Discussion.

Text Books

1. Murugeshan.R., (2002) ,*Electricity and Electromagnetism*, Sultan Chand and Company, New Delhi.
   Unit – III : Chapter 5: 5.1- 5.6,5.8 – 5.10,5.12,5.16 – 5.18.
   Unit – IV : Chapter 7: 7.1 – 7.10.
   Unit – V : Chapter 5: 5.1- 5.6,5.8 – 5.10,5.12,5.16 – 5.18.
2. Murugeshan.R., (2008) ,*Electricity and Magnetism*, Sultan Chand and Company, New Delhi.
   Unit – I: Chapter 8: 8.1-8.8.
   Unit – II : Chapter 12: 12.1,12.2,12.4,12.5,12.6
   Chapter 13 :13.1 – 13.5.

Reference Books

1. Brij Lal,Subramanian N and Jivan Seshan, (2005), *Mechanics and Electromagnetics* , Eurasia Publishing House Private limited, New Delhi.
2. Tiwari.K.K.,(2001), *Electricity and Magnetism*, Sultan Chand and Company, New Delhi.
3. Sehgal. D.L. Chopra K. L .and Sehgal.N.K , *Electricity and Magnetism*, Sultan chand and Company, New Delhi.

4.Halliday.D,Resnick.R and Walker.J,(2011), *Fundamentals of Physics – Electicity and Magnetism* ,Wiley India Private Limited.

E-Resources

- https://nptel.ac.in/courses/115/101/115101005/
- https://ocw.mit.edu/courses/physics/8-311-electromagnetic-theory-spring-2004/
- https://www.khanacademy.org/science/physics/light-waves/introduction-to-light-waves/v/electromagnetic-waves-and-the-electromagnetic-spectrum
- https://ocw.mit.edu/courses/physics/8-07-electromagnetism-ii-fall-2012/

Course Outcomes

At the end of the course, students would be able to

CO1	Build the Ideas of Thermal effect of Electric Current
CO2	Make use of DC and AC Circuits with Transient Currents
CO3	Organize the concepts of Magnetic effect of Electric Current
CO4	Identify and Explore the types of Electromagnetic Induction
CO5	Construct Maxwell's equation of Electromagnetic Waves

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	PSO5	PSO6	PSO7	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Question	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (NoChoice)	Section B(Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Thermal Effect Of Electric Current	11 Hours	Mode
I	a) Thermoelectricity	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) Seebeck effect	1	
	c) laws of thermo e.m.f	1	
	d) measurement of thermo e.m.f using potentiometer	2	
	e) Peltier effect-demonstration	2	
	f) Thomson effect- demonstration	2	
	g) thermodynamics of thermo couple –thermo electric diagram –uses	2	
Unit	**DC and AC Circuits**	**11 Hours**	**Mode**
II	a) Growth and decay of current in LR circuit	2	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) determination of high resistance by leakage	1	
	c) growth and decay of charge in LCR circuit	1	
	d) Alternating Current	1	
	e) EMF induced in a coil rotating in a magnetic field	2	
	f) LCR series resonance circuit	2	
	g)sharpness of resonance-parallel resonance	2	
Unit	**Magnetic Effect Of Electric Current**	**11 Hours**	**Mode**
III	a) Introduction	1	Lecture
	b) Magnetic flux and magnetic induction	2	
	c) Biot Savart law	1	
	d) magnetic induction at a point due to a straight conductor carrying current	2	

			Lecture With PPT Group Discussion Lecture With Demo Seminar
	e) magnetic induction at a point on the axis of a circular coil carrying current	2	
	f)force on a current carrying conductor in a magnetic field	1	
	g)Torque on a current loop in a uniform magnetic field , amperes circuital law.	2	
Unit	**Electromagnetic Induction**	**11 Hours**	**Mode**
IV	a) Faraday's laws of electromagnetic induction	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) self induction	1	
	c) self inductance of a long solenoid	2	
	d) determination of L by Rayleigh's methods	2	
	e) mutual induction-mutual inductance between two co-axial solenoids	2	
	f) experimental determination of mutual inductance	2	
	g)co-efficient of coupling- eddy currents-uses.	1	
Unit	**Maxwell's equation & Electromagnetic waves**	**11 Hours**	**Mode**
V	a)Introduction- Maxwell's equations	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b)Displacement current- Poynting vector	2	
	c)Electromagnetic waves in free space	2	
	d)Hertz experiment for production and detection of EM wave	2	
	e)Wave equations for Electric field and Magnetic field	1	
	f)monochromatic plane waves	2	
	g)EM waves in a matter.	1	

Course Designed by

1.Dr. S. Saravanan

2**.** Mr. R. Jayaraman

Programme	**B.Sc**	**Programme Code**	**UPH**	
Course Code	**20UPHA31**	**Number of Hours/Cycle**	**4**	
Semester	**III**	**Max. Marks**	**100**	
Part	**III**	**Credit**	**4**	
Allied Course - III				
Course Title	**Allied Physics - III**	**L**	**T**	**P**
Cognitive Level	**K1,K2 & K3**	**56**	**2**	**2**

L –Lecture T – Tutorial P- Practical

Preamble

To provide the fundamental laws of current electricity, electromagnetism and utilize the ideas of interference and diffraction. It will equip the students to understand spectroscopic phenomena.

Unit I	**Current electricity**	**11 Hours**
	Current and current density – Expression for current density - Ohm's law and electrical conductivity – Kirchhoff's laws – Wheatstone's network – condition for balance -Carey-Foster's bridge – measurement of resistance – measurement of specific resistance -Potentiometer – Principle- calibration of Voltmeter and Ammeter.	
Unit II	**Electromagnetism**	**11 Hours**
	Electromagnetic Induction – Faraday's laws - Self Induction – Mutual Induction – Coefficient of Coupling –E.M.F.induced in a coil rotating in a magnetic field– Mean value – RMS value – Peak value – A.C. Circuits LCR in series and parallel circuits – impedance – resonant frequency.	
Unit III	**Interference**	**12 Hours**
	Interference – conditions for interference maxima and minima – Air wedge – thickness of a thin wire – Newton's rings – determination of wavelength using Newton's rings.	
Unit IV	**Diffraction**	**11 Hours**
	Diffraction – Types of Diffraction - Difference between interference and diffraction- Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength of a Spectral line using the transmission grating.	
Unit V	**Spectroscopy**	**11 Hours**
	Infrared spectroscopy – sources and detector – uses – ultraviolet spectroscopy – sources - applications - Raman effect - Experiment (Wood's apparatus) – Quantum theory of Raman effect – applications.	

Pedagogy

These concepts are better understood when lectures are accompanied with hands on experiments, Power point presentation and Seminar.

Text Books

1. Murugeshan.R., (2014) ,*Electricity and Magnetism*, Sultan Chand and Company, New Delhi.
   Unit – I : Chapter 6: 6.1,6.2,6.4,6.6
   Chapter 7: 7.1,7.2.
   Unit – II : Chapter 13: 13.1,13.2,13.3.
   Unit – III: Chapter 14: 14.4.,14.7.
2. Subramanyam and Brijlal. S., (2010),*A text book of Optics*, Chand and Company, 25th Edition, New Delhi .
   Unit – III: Chapter 14: 14.4.,14.7,
   Unit – IV: Chapter 18: 18.5,18.7.1,18.7.6.
3. Murugeshan.R.,(2008),*Optics and Spectroscopy*, Sultan Chand and Company, New Delhi.
   Unit – III : Chapter 2: 2.7 – 2.9.
   Unit – V : Chapter 5 : 5.1-5.8.

Reference Books

1. Brij Lal,Subramanian N and Jivan Seshan, (2005), *Mechanics and Electromagnetics*, Eurasia Publishing House Private limited, New Delhi.
2. Tiwari.K.K.,(2001), *Electricity and Magnetism*, Sultan Chand and Company, New Delhi.
3. Sathyaprakash, Ratan Prakashan Mandhir,(1990),*Optics*, NewDelhi.
4. Banewell.C.N.,(2006), *Introduction to Molecular Spectroscopy*,TMH Publishing,New Delhi.

E Resources

1.https://ocw.mit.edu/courses/physics/8-311-electromagnetic-theory-spring-2004/
2.https://www.texasgateway.org/resource/172-applications-diffraction-interference-and- coherence
3.https://www.ece.gatech.edu/sites/default/files/documents/stepup/2017/interference_and_diffraction.pdf
4.https://edu.rsc.org/download?ac=12446

Course Outcomes

At the end of the course, students would be able to

CO1	Experiment with Carey Foster's bridge and Potentiometer in Current Electricity
CO2	Build the relevant concepts of Electromagnetism
CO3	Utilize the ideas of Interference
CO4	Make use of the Diffraction phenomena
CO5	Apply Spectroscopy principles

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	2	3	3	3	3	2	1	1	1	1	1	1
CO2	3	2	3	3	3	2	2	1	1	1	1	1
CO3	3	3	3	3	3	2	1	1	1	1	1	1
CO4	3	3	3	3	3	2	1	1	1	1	1	1
CO5	3	1	2	1	1	2	1	1	1	1	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Question	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	l Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Current Electricity	11 Hours	Mode
I	a) Current and current density	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) Expression for current density	1	
	c) Ohm's law and electrical conductivity	1	
	d) Kirchhoff's laws	1	
	e) Wheatstone's network- condition for balance	2	
	f) Carey-Foster's bridge- measurement of resistance – measurement of specific resistance	2	
	g) Potentiometer –Principle	1	
	h) calibration of Voltmeter	1	
	i) Calibration of Ammeter	1	
Unit	**Electromagnetism**	**11 Hours**	**Mode**
II	a) Electromagnetic Induction	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) Faraday's laws	1	
	c) Self Induction	1	
	d) Mutual Induction	2	
	e) Coefficient of Coupling	2	
	f) E.M.F.induced in a coil rotating in a magnetic field Mean value – RMS value – Peak value	2	
	g) A.C. Circuits LCR in series and parallel circuits- impedance – resonant frequency .	2	
Unit	**Interference**	**12 Hours**	**Mode**
III	a) Interference	2	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) conditions for interference maxima and minima	2	
	c) Air wedge – thickness of a thin wire	2	
	d) Newton's rings	2	
	e) determination of wavelength using Newton's rings.	2	
	f) Determination of wavelength of light	2	
Unit	**Diffraction**	**11 Hours**	**Mode**
IV	a) Diffraction	2	Lecture Lecture With PPT Group Discussion Lecture With
	b) Types of Diffraction	2	
	c) Difference between interference and diffraction	2	
	d) Plane diffraction grating	2	

	e) experiment to determine wavelength of a Spectral line using the transmission Grating.	3	Demo Seminar
Unit	**Spectroscopy**	**11 Hours**	**Mode**
V	a) Infrared spectroscopy	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) IR-sources and detector & uses	2	
	c)Ultraviolet spectroscopy	1	
	d) UV- sources and uses	2	
	e) Raman effect - Experiment(Wood's apparatus)	2	
	f) Quantum theory of Raman effect	1	
	g) applications of Raman effect	2	

Course Designed by

1**.** .Dr. K. Ramavenkateswari

2. Dr. K. Jayabala

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC41	Number of Hours/Cycle	4		
Semester	IV	Max. Marks	100		
Part	III	Credit	4		
Core Course VI					
Course Title	Physical Optics and Spectroscopy		L	T	P
Cognitive Level	K1 , K2 & K3		55	2	3

L –Lecture T – Tutorial P- Practical

Preamble

To provide the optical phenomena like interference, diffraction, and polarization lays the foundation for an understanding of interferometers and also to gain the knowledge of Spectroscopic studies.

Unit I	Interference	11 Hours
	Conditions for interference – Theory of interference fringes – colours of thin films- interference due to reflected light (thin films) - wedge shaped thin film – theory – determination of diameter of a thin wire by Air wedge – Newton's rings by reflected light – Determination of wavelength of light - Michelson's Interferometer – theory and its Application (Measurement of wavelength).	
Unit II	**Diffraction**	**11 Hours**
	Fresnel's diffraction –Rectilinear propagation of light – zone plate –action of zone plate -diffraction at circular aperture (Theory) – opaque circular disc – Fraunhofer diffraction at single slit – Double slit – Plane diffraction grating – theory of plane transmission grating - experiment to determine wavelength of a Spectral line using the transmission Grating.	
Unit III	**Polarisation**	**11 Hours**
	Double refraction — Huygens's explanation of double refraction in uniaxial crystals– Nicol Prism – Nicol Prism as polarizer and analyzer -Plane, elliptically and circularly polarized light– Quarter wave plates and Half wave plates – Production and detection of plane, circularly and elliptically polarized light- Optical activity– Fresnel's explanation of optical activity – Specific rotatory power –Laurent's half shade polarimeter.	
Unit IV	**Spectroscopy**	**11 Hours**
	Infrared spectroscopy – sources and detector – uses – ultraviolet spectroscopy – sources – quartz spectrograph –Rayleigh's Scattering - applications - Raman Spectroscopy **–** Quantum theory of Raman effect – applications.	
Unit V	**Magnetic resonance Spectroscopy**	**11 Hours**
	Nuclear magnetic resonance –Theory- Experimental arrangement-Applications-Nuclear quadrupole resonance – Instrumentation-Applications -– Electron spin resonance spectroscopy (Qualitative study).	

Pedagogy

These concepts are better understood when lectures are accompanied with hands on experiments, Group discussion and Learning aids.

Text Books

1. Subramanyam and Brijlal. S., (2010),*A text book of Optics,* Chand and Company, 25th Edition, New Delhi .
   - Unit – I : Chapter 14: 14.4.1,14.7,
     Chapter 15: 15.5.4,15.2.1,15.5,
   - Unit – II : Chapter 17: 17.1 -17.5.1,17.8.,17.9
     Chapter 18: 18.2,18.4,18.7,18.7.1,18.7.6
2. Murugeshan.R.,(2008),*Optics and Spectroscopy,* Sultan Chand and Company, New Delhi.
   - Unit – I : Chapter 2: 2.7 – 2.9,2.11,2.12.

Unit – III : Chapter 4: 4.5,4.6,4.8,4.10,4.12 - 4.17,4.19,4.20.
Unit – IV : Chapter 5 : 5.1-5.8.
Unit – V : Chapter 5 : 5.9 ,5.10,5.12.

Reference Books

1. Gupta S.L., Kumar.V and Sharma.R.C.,(2009), *Elements of Spectroscopy*, Pragati Prakashan, Meerut.
2. Aruldhass.G., (2007), *Molecular structure and spectroscopy*, PHI Private limited, New Delhi.
3. Banewell C.N.,(2006), *Introduction to Molecular Spectroscopy*., TMH Publishing company,New Delhi.
4. Ajoy Ghatak, (2009), *Optics*, TMH Publishing Company, New Delhi.

E-Resources

1.https://www.texasgateway.org/resource/172-applications-diffraction-interference-and-coherence
2.https://www.ece.gatech.edu/sites/default/files/documents/stepup/2017/interference_and_diffraction.pdf
3.https://www.khanacademy.org/science/organic-chemistry/spectroscopy-jay/proton-nmr/v/introduction-to-proton-nmr
4. https://edu.rsc.org/resources/nuclear-magnetic-resonance-nmr-spectroscopy/11330.article
5.https://onlinelibrary.wiley.com/journal/1097458xa

Course Outcomes

At the end of the course, students would be able to

CO1	Utilize the ideas of Interference
CO2	Make use of the Diffraction phenomena
CO3	Identify the fundamental concepts of Polarization
CO4	Apply Spectroscopy principles
CO5	Organize the Magnetic Resonance Spectroscopy techniques

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	3	3	3	3	2	1	1	1	1	1	1
CO2	3	3	3	3	3	2	1	1	1	1	1	1
CO3	3	2	2	2	1	2	1	1	1	1	1	1
CO4	3	1	2	1	1	2	1	1	1	1	1	1
CO5	3	2	1	1	1	1	1	1	1	1	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Interference	11 Hours	Mode
I	a) Conditions for interference- Theory of interference fringes	2	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) colours of thin films	1	
	c) interference due to reflected light (thin films)	1	
	d) wedge shaped thin film – theory	2	
	e) determination of diameter of a thin wire by Air wedge	1	
	f) Newton's rings by reflected light – Determination of wavelength of light	2	
	g)Michelson's Interferometer – theory and its Application (Measurement of Wavelength).	2	
Unit	**Diffraction**	**11 Hours**	**Mode**
II	a) Fresnel's diffraction	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) Rectilinear propagation of light	1	
	c) Zone plate – action of Zone plate	2	
	d) diffraction at circular aperture (Theory)	1	
	e) opaque circular disc	1	
	f) Fraunhofer diffraction at single slit	1	
	g) Fraunhofer diffraction at double slit	1	
	h) Plane diffraction grating – theory of plane transmission grating	2	
	i) experiment to determine wavelength of a Spectral line using the transmission Grating.	1	
Unit	**Polarisation**	**11 Hours**	**Mode**
III	a) Double refraction — Huygens's explanation of double refraction in uniaxial crystals–	2	

	b) Nicol Prism – Nicol Prism as polarizer and analyzer	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	c) Plane, elliptically and circularly polarized light	2	
	d) Quarter wave plates and Half wave plates	1	
	e) Production and detection of plane, circularly and elliptically polarized light	2	
	f) Optical activity– Fresnel's explanation of optical activity	1	
	g) Specific rotatory power –Laurent's half shade polarimeter	2	
Unit	**Spectroscopy**	**11 Hours**	**Mode**
IV	a) Infrared spectroscopy	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) IR - sources and detector – uses	2	
	c) ultraviolet spectroscopy – sources	1	
	d) quartz spectrograph	1	
	e) Rayleigh's Scattering - applications	2	
	f) Raman Spectroscopy	2	
	g)Quantum theory of Raman effect – applications .	2	
Unit	**Nuclear magnetic resonance**	**11 Hours**	**Mode**
V	a) Nuclear magnetic resonance –Theory-	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) NMR- Experimental arrangement	2	
	c) NMR - Applications	2	
	d) Nuclear quadrupole resonance	2	
	e) Nuclear quadrupole resonance – Instrumentation- Applications	2	
	f) Electron spin resonance spectroscopy (Qualitative study).	2	

Course Designed by

1.Dr. S. Saravana

2. Mr. R. Jayaraman

Programme	B.Sc	Programme Code	UPH	
Course Code	20UPHA41	Number of Hours/Cycle	4	
Semester	IV	Max. Marks	100	
Part	III	Credit	4	
Allied Course - IV				
Course Title	Allied Physics - IV	L	T	P
Cognitive Level	K1, K2 & K3	55	3	2

L –Lecture T – Tutorial P- Practical

Preamble

To provide knowledge about the nuclear models and their roles in explaining the ground state properties of the nucleus and also leads to understand the junction diodes, transistor characteristics and the synthesis of digital circuits.

Unit I	Atomic Physics	11 Hours
	Introduction (atom model) - Bohr atom model (qualitative)-–Atomic excitation -Ionization potential– Vector atom model –Quantum Numbers associated with the vector atom model- Coupling Schemes- Pauli's Exclusion principle - applications.	
Unit II	**Nuclear Physics**	**11 Hours**
	Nucleus – Nuclear properties – Mass defect – Binding energy – Nuclear fission - Nuclear Reactor – atom bomb - Nuclear fusion – Proton Proton cycle - Carbon nitrogen cycle – hydrogen bomb.	
Unit III	**Modern Physics**	**11 Hours**
	Frames of Reference-Types-Galilean Transformation equations - Michelson Morely's experiment - Significance of negative result - Postulates of special theory of relativity - Lorentz transormation equations (No derivation) - Length contraction - Time dilation - Variation of mass with velocity – Einstein's mass - energy relation (Simple derivation)	
Unit IV	**Analog Electronics**	**11 Hours**
	Formation of PN junction diode – forward and reverse biasing of a junction diode– Zener diode – forward and reverse biasing of a zener diode - LED - Bridge rectifier –filter circuits - Transistor – Working of npn transistor – Transistor Characteristics – CE Configuration only – Hartley oscillator - modulation.	
Unit V	**Digital Electronics**	**11 Hours**
	Number system – Decimal – Binary – conversion of one number system to another number system- Binary addition and subtraction– Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables –Laws and theorems of Boolean's algebra – De Morgan's theorems.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1.Murugeshan.R., Kiruthiga Sivaprasath.,(2010),*Modern Physics*,Sultan Chand and Company, New Delhi.

Unit – I : Chapter 6: 6.1, 6.4, 6.8, 6.9, 6.12, 6.13, 6.14, 6.15

Unit – II : Chapter 27: 27.1, 27.3, 27.4,

Chapter 35: 35.1, 35.2, 35.5, 35.6, 35.7, 35.8, 35.9.

Unit – III: Chapter 1: 1.1, 1.2, 1.4, 1.6, 1.7, 1.8, 1.9, 1.10, 1.13, 1.14.

2. Murugeshan.R., (2015), Electricity and Electroics, Sultan Chand and Company, New Delhi.

Unit – IV : Chapter 5: 5.1, 5.2, 5.4 - 5.10, 5.12, 5.15, 5.16.

3.Vijayendran.V., (2007) , *Introduction to integrated*

Electronics,S.Viswanathan Printers and publishers Private., Limited, Chennai.

Unit – V : Chapter 1: 1.1 – 1.4,
Chapter 2: 2.1, 2.2
Chapter 4: 4.3, 4.7, 4.8
Chapter 5: 5.1, 5.2

Reference Books

1. Donald P Leach, Albert Paul Malvino and Goutam Saha., (2007), *Digital Principles and Applications*, Tata McGraw Hill Publishing Company Limited, New Delhi.

2. Kulkarni. V. W., (2008), *Atomic and Nuclear Physics*, Himalaya Books Private Limited, Mumbai.

3. Jacob Millman, Christos C.Halkias., (2008), *Integrated Electronics (Analog and Digital circuits and systems)* Tata McGraw Hill Publishing Company Limited, New Delhi.

E-Resources

1. https://nptel.ac.in/courses/115/104/115104043/
2. https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types- of-decay
3. https://worldscientific.com/worldscibooks/10.1142/11209
4. https://www.tutorialspoint.com/digital_circuits/digital_circuits_logic_gates.htm
5. https://www.electronicsforu.com/resources/electronic-devices-and-circuit-theory

Course Outcomes

At the end of the course, students would be able to

CO1	Build the concepts of Atomic Physics
CO2	Develop the ideas of Nuclear Physics
CO3	Organize the theories of Modern Physics
CO4	Experiment with Analog Electronic techniques
CO5	Make use of theorems of Digital Electronics

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	1	2	2	1	1	1	1	1	1	1	1
CO2	3	1	1	1	1	2	2	2	1	2	2	1
CO3	3	2	2	2	1	1	1	1	1	1	1	1
CO4	3	3	2	2	2	3	2	2	1	1	1	1
CO5	3	3	2	3	3	3	2	2	1	1	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Atomic Physics	11 Hours	Mode
I	a) Introduction (atom model)	2	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) Bohr atom model (qualitative)	1	
	c) Atomic excitation -Ionization potential	1	
	d) Vector atom model	2	
	e) Quantum Numbers associated with the vector atom model	2	
	f) Coupling Schemes	1	
	g) Pauli's Exclusion principle - applications	2	
Unit	**Nuclear Physics**	**11 Hours**	**Mode**
II	a) Nucleus – Nuclear properties	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) Mass defect – Binding energy	1	
	c) Nuclear fission	1	
	d) Nuclear Reactor	1	
	e) Atom bomb	1	
	f) Nuclear fusion	1	
	g) Proton Proton cycle	2	
	h) Carbon nitrogen cycle	2	
	i) Hydrogen bomb	1	
Unit	**Modern physics**	**11 Hours**	**Mode**
III	a) Frame of Reference	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) Galilean Transformation equations	1	
	c) Michelson Morely's experiment - Significance of negative result	2	
	d) Postulates of special theory of relativity	1	
	e) Lorentz transormation equations (No derivation)	1	
	f) Length contraction - Time dilation	2	
	g) Variation of mass with velocity	1	

	h) Einstein's mass - energy relation (Simple derivation)	2	
Unit	**Analog Electronics**	**11 Hours**	**Mode**
IV	a) Formation of PN junction diode	1	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) forward and reverse biasing of a junction diode	1	
	c) Zener diode – forward and reverse biasing of a zener diode	2	
	d) LED	1	
	e) Bridge rectifier –filter circuits	1	
	f) Transistor – Working of npn transistor	2	
	g) Transistor Characteristics – CE Configuration only	1	
	h)Hartley oscillator- modulation	2	
Unit	**Digital Electronics**	**11 Hours**	**Mode**
V	a) Number system – Decimal – Binary	2	Lecture Lecture With PPT Group Discussion Lecture With Demo Seminar
	b) conversion of one number system to another number system	2	
	c) Binary addition and subtraction	2	
	d) Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables	2	
	e) Laws and theorems of Boolean's algebra	1	
	f) De Morgan's theorems.	2	

Course Designed by

1. Dr. T.Rajesh Kumar
2. Dr.P.Uma Mageshwari

Extra Credit Value Added Courses

Programme	**B.Sc**	**Programme Code**	**PHY**
Course Code	**20CPHY31**	**Number of Hours/Semester**	**30**
Semester	**III**	**Max. Marks**	**50**
Part		**Credit**	
Value Added Course I			
Course Title	**Physics for All**		
Cognitive Level			

Preamble

To provide basic ideas about units, dimensions, uses of dimensions, types of motion, terms related to motion, balanced forces, unbalanced forces, laws of motion, work, types of energy, law of conservation of energy, production of sound, propagation of sound and properties of sound.

Unit I	**Units and Dimensions**	
	Types of Physical quantities - Types of Units – S.I.Units – Definitions- Dimension formula for Distance, Displacement,Area,Volume,Mass,Density,Speed,Velocity,Accelaration, Momentum, Force - Uses of dimensions.	
Unit II	**Motion**	
	Motion – Describing motion - Motion along a straight line-Uniform and Non Uniform motion - Distance and displacement – Speed- Speed with direction – Velocity - Rate of change of velocity – Accelaration.	
Unit III	**Force and laws of Motion**	
	Balanced and unbalanced forces – First law of motion – Inertia and mass – Second law of motion **–** Expression for force - Third law of motion **–** Examples.	
Unit IV	**Work , Energy and Power**	
	Work – Scientific conception of work – Work done by a constant force - Energy –Types of energy – Kinetic energy – Potential energy – Law of conservation of energy.	
Unit V	**Sound**	
	Production of Sound – Propagation of Sound – Characteristics of sound waves – reflection of sound – Echo –Reverberation – Uses of multiple reflection of sound – Range of hearing – Applications of ultrasound – SONAR.	

Text Book

1.Material Prepared by Physics Department

Reference Book

1. Poonam Yadav., (2010)., *Understanding Physics.*, Discovery publishing house private limited , New Delhi.

Programme	**B.Sc**	**Programme Code**	**CPHY**
Course Code	**20CPHY41**	**Number of Hours/Semester**	**30**
Semester	**IV**	**Max. Marks**	**50**
Part		**Credit**	
Value Added Course - II			
Course Title	**Sources of Energy**		
Cognitive Level			

Preamble

To provide basic ideas about conventional sources of energy, hydro power technologies, fundamentals of wind energy, non conventional sources of energy, types of non conventional sources of energy, ocean energy, characteristics of ocean energy and ocean thermal energy.

Unit I	**Conventional Sources of energy**
	Conventional sources of energy – thermal power plant – hydro power plant – Wind energy.
Unit II	**Hydro energy**
	Hydro power resources – hydropower technologies – environment impact of hydro power sources.
Unit III	**Wind energy harvesting**
	Fundamentals of wind energy, wind turbines and different electrical machines in wind turbines
Unit IV	**Non conventional sources of energy**
	Non Conventional sources of energy – Solar energy – Tidal energy – wave energy – Ocean Thermal energy – Geo thermal energy – Nuclear energy.
Unit V	**Ocean energy**
	Ocean energy potential against wind and solar,wave characteristics and statistics – wave energy devices – Ocean Thermal Energy – Osmotic power – Ocean Biomass.

Text Book

1**.** Material prepared by physics Department

Reference Books

1.Rai.G.D.,Non conventional energy sources, Krishna Publishers, New Delhi.
2.Jayakumar.P.,(2009),Solar energy : Resource Assesment Handbook.
3.Agarwal.M.P.,Solarr Energy, Sultan Chand and Company Limited,

Programme	B.Sc	Programme Code	UPH
Course Code	20UPHC4P	Number of Hours/Cycle	2
Semester	IV	Max. Marks	100
Part	III	Credit	2
Core Practical - II			
Course Title	Major Physics Practicals - II		

List of Experiments (Any 12)

1. Thickness of the wire - Air wedge
2. Comparison of Capacitances - De Sauty's Bridge
3. Comparison of emf's - Potentiometer
4. Determination of B_H - Axial coil
5. Refractive index of the prism – Spectrometer
6. Figure of merit - Table Galvanometer
7. Determination of R - Newton's Rings
8. Determination of m - Axial coil
9. Inductance of the coil - Owen's Bridge
10. Wavelength of the different colours (N and λ) - Grating normal incidence
11. Comparison of Capacitances - Ballistic Galvanometer
12. Wavelength of the different colours (N and λ) - Grating minimum deviation
13. Figure of merit – Ballistic Galvanometer
14. Resistivity of a given coil – Carey Foster's bridge

Programme	B.Sc	Programme Code	UPH
Course	20UPHA4P	Number of Hours/Cycle	2
Semester	II	Max. Marks	100
Part	III	Credit	2
Allied Practical - II			
Course Title	Allied Physics Practicals - II		

List Of Experiments (Any 12)

1. LCR - Series Resonance Circuit
2. LCR – Parallel Resonance Circuit
3. Junction diode characteristics
4. Zener diode characteristics & break down voltage
5. Thickness of a wire - Air wedge
6. Determination of R - Newton's Rings
7. AND , OR , NOT - Truth Table Verification - Logic Gates - Discrete Components
8. N and λ by Normal Incidence - Spectrometer
9. Dispersive power of prism – Spectrometer
10. Refractive index of the prism – Spectrometer
11. π Filter - Bridge Rectifier
12. Comparison of Capacitances - De Sauty's Bridge
13. Figure of merit – Ballistic Galvanometer
14. Voltage and current sensitiveness – Ballistic Galvanometer

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC51	Number of Hours/Cycle	4		
Semester	V	Max. Marks	100		
Part	III	Credit	4		
CORE COURSE VII					
Course Title	Relativity and Quantum Mechanics		L	T	P
Cognitive Level	Upto K3		55	3	2

L – Lecture T – Tutorial P – Practical

Preamble

To provide basic concepts of General theory of relativity, Experimental set up of Michelson interferometer and discussion about the result, Black body radiation, limitations of classical physics, Uncertainty principle and diffraction of electron through a single slit, Basics of wave mechanics, time independent and time dependent Schrodinger equations, eigen value and eigen function, applications of Schrodinger equation. It will equip the students with required pre requisites to understand quantum phenomena.

Unit I	Relativity - I	11Hours
	Frames of reference - Inertial frames of reference - Galilean transformation - Michelson Morley experiment - Explanation of the negative result- Newtonian relativity - Types of frames of reference - Postulates of special theory of relativity - Explanation - Lorentz transformation equations - Derivation.	
Unit II	**Relativity - II**	**11 Hours**
	Lorentz - Fitzgerald length contraction - Derivation - Examples - Time dilation - Derivation - The Twin Paradox - Addition of Velocities - Relativity of Simultaneity - Variation of mass with velocity - Derivation - Explanation - Einstein's mass energy relation - Derivation - Examples - Relation between total energy, rest mass energy and the momentum.	
Unit III	**Dual nature of Matter waves**	**11 Hours**
	Limitations of classical theory - Planck's quantum theory of black body radiation- Matter waves - De Broglie's theory - De Broglie wavelength - Experimental verification - Davisson and Germer experiment - G.P. Thompson's experiment with relativistic correction - Wave velocity, group velocity & their relations - Heisenberg's uncertainty principle through experiment illustration - Diffraction of electron through a single slit.	
Unit IV	**Schrodinger wave Equation**	**11 Hours**
	Basic postulates of wave mechanics - Derivation of time dependent form of Schrodinger wave equation - Derivation of time independent form of Schrodinger wave equation - Properties of the wave function - Physical significance of ψ - Eigen functions and Eigen values - Energy function - Expectation value - Normalization of wave function of simpler types.	
Unit V	**Applications of Schrodinger wave Equation**	**11 Hours**
	Schrodinger equation for free particle in one dimension potential box - Its Eigen functions and Eigen values - Extension to three dimensions - Linear harmonic oscillator - zero point energy.	

Pedagogy

These concepts are better understood when lectures are accompanied with Class Room Lectures, chalk and talk, Power point presentation and Group Discussion.

Text Books:

1. Murugesan .R, (2006), "*Mechanics & Relativity*", Santha Publications.

UNIT – I : Page No: 17 – 22 , 30 – 36.
UNIT – II : Page No: 36 – 56

2. Murugesan.R, (2002), "Theoretical Physics", Santha Publications.

UNIT – III: Page No: 94 – 97, 108 – 127
UNIT – IV: Page No: 131 – 136.
UNIT – V: Page No: 136 – 144.

Reference Books:

1. Sathyaprakash.R., (1994),"Quantum Mechanics",Ratan Prakasan Mandir.
2. Mathews.P.M and Venkatesan.K , (2011), "A Text Book of Quantum Mechanics", Tata McGraw Hill Education Private Limited, New Delhi.
3. Gupta & Kumar JayPrakash, (2007),"*Quantum Mechanics*",Nata & Company.

E-Resources

- http://www.physics.gla.ac.uk/~dmiller/lectures/RQM_2008.pdf
- http://www.nucleares.unam.mx/~alberto/apuntes/fgross.pdf
- http://home.iitk.ac.in/~dipankar/RelativisticQM.pdf
- http://websites.umich.edu/~ners311/CourseLibrary/book.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Organize the concepts of Galilean Transformation
Unit II	**CO2**	Build the Ideas of length contraction and time dilation and also determine Einstein mass energy relation
Unit III	**CO3**	Show and Demonstrate the concept of Dual nature of matter waves
Unit IV	**CO4**	Illustrate the concept of wave mechanics
Unit V	**CO5**	Apply Schrodinger Wave equations

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Relativity - I	Hours (11)	Mode
I	a) Frames of reference - Inertial frames of reference	2	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) Galilean transformation - Michelson Morley Experiment	2	
	c) Explanation of the negative result - Newtonian relativity	2	
	d) Types of frames of reference	1	
	e) Postulates of special theory of relativity - Explanation	2	
	f)Lorentz transformation Equations - Derivation	2	
Unit	**Relativity - II**	**Hours (11)**	**Mode**
II	a) Lorentz Fitzgerald Length contraction - Derivation - Explanation – Examples	2	Lecture Group Discussion

	b) Time dilation - Derivation – Explanation	2	Lecture With PPT Lecture With Demo Seminar
	c) The Twin Paradox – Addition of Velocities	1	
	d) Relativity of Simultaneity - Variation of mass with velocity - Derivation - Explanation	2	
	e) Einstein's mass energy relation – Derivation – Explanation – Examples	2	
	f) Relation between total energy, rest mass energy and the momentum.	2	
Unit	**Dual nature of Matter waves**	**Hours (11)**	**Mode**
III	a) Limitations of classical theory	1	Lecture With Group Discussion Lecture With PPT Lecture Seminar
	b) Planck's Quantum theory of black body radiation - Matter waves	2	
	c) De Broglie's theory – De Broglie wavelength – Experimental verification	2	
	d) Davisson's and Germer experiment - G.P Thomson's experiment with relativistic correction	2	
	e) wave velocity, group velocity & their relations	2	
	f) Heisenberg's uncertainty principle through experiment illustration - Diffraction of electron through a single slit.	2	
Unit	**Schrodinger wave Equation**	**Hours (11)**	**Mode**
IV	a) Basic postulates of wave mechanics	1	Lecture Seminar Lecture With PPT
	b) Derivation of time dependent form of Schrodinger wave equation	2	
	c) Derivation of Time independent form of Schrodinger wave equation	2	
	d) Properties of the wave function	2	
	e) Physical significance of ψ	1	
	f) Eigen function and Eigen value - energy function	2	
	g) Expectation value and normalization of wave function of simpler types.	1	
Unit	**Applications Schrodinger wave Equation**	**Hours (11)**	**Mode**
V	a) Schrodinger equation for a free particles in one dimensional potential box	2	Lecture Group Discussion Lecture With PPT Seminar
	b) Eigen functions and Eigen values of free particles in one dimensional potential box	2	
	c) Schrodinger equation for a free particles in three dimensional potential box	2	

	d) Eigen functions and Eigen values of free particles in three dimensional potential box	2	
	e) Linear harmonic oscillator	2	
	f) Zero point energy	1	

Course Designed by

1.Dr. S. Saravanan
2.Dr.R.Jayaraman

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC52	Number of Hours/Cycle	4		
Semester	V	Max. Marks	100		
Part	III	Credit	4		
CORE COURSE VIII					
Course Title	Atomic Physics		L	T	P
Cognitive Level	Upto K3		55	3	2

L – Lecture T – Tutorial P – Practical

Preamble

To provide an introductory account about the atomic structure and the impact of X-rays.

Unit I	Band Theory Of Solids	11 Hours
	Determination of the electronic charge - Millikan's oil drop method - The free electron theory of metals - Expression for electrical conductivity - Expression for thermal conductivity - Wiedman-Franz's law - Band theory of solids - classification of solids on the basis of band theory.	
Unit II	**Positive Rays**	**11 Hours**
	Discovery - Properties – Analysis - Thomson's parabola method - Aston's mass spectrograph - Bainbridge's mass spectrograph - Dempster's mass spectrograph - Mass defect and packing fraction - Polarization of X-rays (Thomson's Formula) - Determination of number of electrons per atom.	
Unit III	**Atomic Structure**	**11 Hours**
	Introduction - Rutherford Nuclear Atom Model - Bohr Atom Model - Sommerfeld's Relativistic Atom Model - The Vector Atom Model - Quantum Numbers associated with the vector Atom Model - Coupling Schemes - The Pauli's Exclusion Principle.	
Unit IV	**Atoms in external field**	**11 Hours**
	X rays - Production of X-Rays - X-Rays Spectra - Main features of Continuous X-Ray Spectrum - Characteristics X-Ray Spectrum - Moseley's Law and its importance - Compton's Scattering - Experimental Verification - Zeeman Effect - Lorentz classical theory of normal Zeeman Effect - Stark Effect	
Unit V	**The Photo Electric Effect**	**11 Hours**
	Introduction - Nature of photo particles - Lenard's method to determine e/m for photoelectrons - Experimental investigations on the photoelectric effect Laws of Photoelectric emission - Failure of the electromagnetic theory - Einstein's photoelectric equation - Photoelectric cells.	

Pedagogy

These concepts are better understood when lectures are accompanied with Class Room Lectures, chalk and talk, Power point presentation and Group Discussion.

Text Book:

1. Murugesan .R, Kiruthiga Sivaprasath, (2010), "Modern Physics", Sultan Chand and Company Limited.

UNIT – I: Page No: 35 - 44

UNIT – II: Page No: 48 – 60

UNIT – III: Page No: 65 – 67, 71 – 74, 88 - 97
UNIT – IV: Page No: 121 -122, 132 – 138, 108 – 110, 116 – 117
UNIT – V: Page No: 150 - 159

Reference Books:

1. Dr.Kulkarni.V.M, (2008), "Atomic and Nuclear Physics", Himalaya Publishing House.
2. Joseph Mohan, (2010), "Atomic Physics", Apple Academic Press Incorporated.
3. Kenneth S.Krane, (1998) "Modern Physics", John Willey & sons.

E-Resources

- https://users.physics.ox.ac.uk/~ewart/Atomic%20Physics%20lecture%20notes%20C%20port.pdf
- https://ncert.nic.in/ncerts/l/leph204.pdf
- https://gacbe.ac.in/pdf/ematerial/18BPH63C-U4.pdf.

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Illustrate the concepts of Band Theory Of Solids
Unit II	**CO2**	Build the Ideas of Positive Rays
Unit III	**CO3**	Organize the concept of Atomic Structure
Unit IV	**CO4**	Construct Zeeman effect using Lorentz classical theory
Unit V	**CO5**	Experiment with investigation of Photo Electric Effect

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Band Theory Of Solids	Hours (11)	Mode
I	a) Determination of the electronic charge; Millikan's oil drop method	2	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) The free electron theory of metals	1	
	c) expressions for electrical conductivity	2	
	d) expression for thermal conductivity	2	
	e) Wiedman-Franz's law-Band theory of solids	2	
	f) Classification of solids on the basis of band theory.	2	
Unit	**Positive Rays**	**Hours (11)**	**Mode**
II	a) Discovery-properties- analysis	2	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) Thomson's parabola method – Aston's mass spectrograph	2	
	c) Bainbridge's mass spectrograph – Dempster's mass spectrograph	2	
	d) Mass defect and packing fraction	2	
	e) polarization of X-rays (Thomson's Formula)	2	
	f) Determination of number of electrons per atom	1	
Unit	**Atomic Structure**	**Hours (11)**	**Mode**
III	a) Introduction - Rutherford Nuclear Atom Model	2	Lecture With Group Discussion
	b) Bohr Atom Model	1	
	c) Sommerfeld's Relativistic Atom Model	2	

	d) The Vector Atom Model	2	Lecture With PPT Lecture Seminar
	e) Quantum Numbers associated with the vector Atom Model	2	
	f) Coupling Schemes – The Pauli's Exclusion Principle	2	

Unit	Atoms in external field	Hours (11)	Mode
IV	a) X rays – Production of X-Rays	1	Lecture Seminar Lecture With PPT
	b) X-Rays Spectra – Main features of Continuous X-Ray Spectrum	2	
	c) Characteristics X-Ray Spectrum	2	
	d) Moseley's Law and its importance	1	
	e) Compton's Scattering – Experimental Verification	2	
	f) Zeeman Effect	1	
	g) Lorentz Classical theory of normal Zeeman Effect – Stark Effect	2	
Unit	**The Photo Electric Effect**	**Hours (11)**	**Mode**
V	a) Introduction – Nature of photo particles	2	Lecture Group Discussion Lecture With PPT Seminar
	b) Lenard's method to determine e/m for photoelectrons	2	
	c) Experimental investigations on the photoelectric effect	2	
	d) Laws of Photoelectric emission – Failure of the electromagnetic theory	2	
	e) Einstein's photoelectric equation	2	
	f) Photoelectric cells.	1	

Course Designed by

1. Dr. K.Ramavenkateswari
2. Dr.k.Jayabala

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHE51	Number of Hours/Cycle	4		
Semester	V	Max. Marks	100		
Part	III	Credit	4		
CORE ELECTIVE COURSE– I					
Course Title	Classical Physics		L	T	P
Cognitive Level	Upto K3		60	-	-

L – Lecture T – Tutorial P – Practical

Preamble

To make the students to understand the basic concepts of classical physics such as Mechanics of a system of particles, coordinate systems, dynamics of Lagrangian concepts ,dynamics of Hamiltonian and variational principle.

Unit I	Mechanics of particles	12 Hours
	Introduction - Mechanics of particle - Conservation of linear momentum - Conservation of angular momentum - Conservation of energy - Mechanics of system of particles - Conservation of linear momentum - conservation of angular momentum - conservation of energy - Work energy theorem	
Unit II	**Conservative forces**	**12 Hours**
	Conservative forces - Examples - Constraints - Types of Constraints - Degrees of freedom - generalized velocities - Configuration space - Coordinate systems - Symmetry properties of space and time and conservation laws.	
Unit III	**Lagrangian Dynamics**	**12 Hours**
	Introduction - Principle of virtual work - D'Alembert's principle - Lagrange's equations of motion from D'Alembert's principle (Derivation) - simple applications (simple pendulum, compound pendulum, Atwood's machine) - Superiority of Lagrangian approach to Newton's approach.	
Unit IV	**Hamiltonian Dynamics**	**12 Hours**
	Hamilton's principle and Lagrange's equations of motion from Hamilton's principle - Deduction of Hamilton's principle from D'Alembert's principle-Simple applications (simple pendulum, compound pendulum, Atwood's machine , One Dimension Harmonic oscillator)	
Unit V	**Variational Principle**	**12 Hours**
	Introduction - Cyclic co-ordinates - Hamiltonian function H - Physical significance - Hamilton's equation of motion (derivation) - Variational principle - Hamilton's equation of motion from variational principle - Simple applications (Harmonic oscillator , Compound pendulum , Motion of a particle in central force field).	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. Murugesan .R, (2004), "Theoretical Physics", Shantha Publications.

Reference Books

1. Goldstein,(1998),"*Classical Mechanics"*, Narosa Publishing House, New Delhi.

2. Upadhya.J.C., (1999), "*Classical Mechanics"*, Himalaya Publishing House, Delhi, Bangalore, Hyderabad.

E-Resources

- https://sites.astro.caltech.edu/~golwala/ph106ab/ph106ab_notes.pdf
- https://www.tutorialsduniya.com/notes/classical-dynamics-notes/

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Relate Mechanics of a particles and system of particles.
Unit II	**CO2**	Illustrate the concepts of Coordinate systems.
Unit III	**CO3**	Interpret the dynamics of Lagrangian.
Unit IV	**CO4**	Manipulate the dynamics of Hamiltonian.
Unit V	**CO5**	Apply the concepts of variational principle into Hamilton's equations of motion.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Mechanics of particles	Hours (12)	Mode
I	a)Introduction - Mechanics of particles	2	Lecture Lecture With PPT
	b) conservation of linear momentum - conservation of angular momentum - conservation of energy	4	
	c)Mechanics of system of particles - conservation of linear momentum - conservation of angular momentum	4	
	d) conservation of energy - Work energy theorem	2	
Unit	**Conservative forces**	**Hours (12)**	**Mode**
II	a)Conservative forces - Examples	3	Lecture Lecture With PPT
	b) constraints – Types of Constraints	3	
	c) Degrees of freedom - generalized velocities, Configuration space – Coordinate systems	3	
	d) Symmetry properties of space and time and conservation laws.	3	
Unit	**Lagrangian Dynamics**	**Hours (12)**	**Mode**
III	a)Introduction - Principle of virtual work	4	Lecture Lecture With PPT
	b) D'Alemberts principle - Lagrange'sequations of motion from D'Alembertsprinciple (Derivation)	4	
	c) Simple applications (simple pendulum, compound pendulum, Atwood's machine) - Superiority of Lagrangian approach to Newton's approach.	4	
Unit	**Hamiltonian Dynamics**	**Hours (12)**	**Mode**
IV	a)Hamilton's principle and Lagrange's equations of motion from Hamilton's principle.	4	Lecture With PPT Lecture
	b) Deduction of Hamilton's principle from D'Alemberts principle.	4	
	c) Simple applications (simple pendulum, compound pendulum, Atwood's machine, One Dimension Harmonic oscillator).	4	

Unit	Variational Principle	Hours (12)	Mode
V	a)Introduction - Cyclic co-ordinates - Hamiltonian functions H - Physical significance.	4	Lecture With PPT Lecture
	b) Hamilton's equation of motion (derivation) - Variational principle - Hamilton's equation of motion from variational principle.	4	
	c) Simple applications (Harmonic oscillator, Compound pendulum, motion of a particle in central force field).	4	

Course Designed by

1. Dr. T.Rajesh Kumar
2. Dr. P.Uma Mageshwari

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHE52	Number of Hours/Cycle	4		
Semester	V	Max. Marks	100		
Part	III	Credit	4		
CORE ELECTIVE COURSE – I					
Course Title	Statistical Physics		L	T	P
Cognitive Level	Upto K3		60	-	-

L – Lecture T – Tutorial P – Practical

Preamble

This Course provides the students to acquire the required knowledge to apply the principles of statistical mechanics to selected problems.

Unit I	Microscopic And Macroscopic System	12 Hours
	Microscopic and macroscopic system - Ensembles - Degenerate and non degenerate Ensembles - Phase space - Micro and Macro States - Basic Postulates of statistical mechanics.	
Unit II	**Thermodynamic Probability**	**12 Hours**
	Definition of mathematical probability - Thermodynamic probability - Boltzmann theorem of entropy and probability - Boltzmann Relation connecting Entropy and Probability - Statistical equilibrium.	
Unit III	**Classical Statistics**	**12 Hours**
	Maxwell Boltzmann statistics - Maxwell Boltzmann energy distribution law - Maxwell Boltzmann in terms of Temperature - Application of Maxwell Boltzmann Distribution law to an Ideal gas - Maxwell Boltzmann velocity distribution law.	
Unit IV	**Quantum Statistics - I**	**12 Hours**
	Introduction - Quantum statistics of identical particles - Types of Quantum particles - Bose-Einstein statistics - Bose-Einstein distribution law - Planck's law of black body radiation (Derivation) - Deduction of Wien's and Rayleigh Jeans law of black body radiation.	
Unit V	**Quantum Statistics - II**	**12 Hours**
	Fermi Dirac Statistics - Derivation of Fermi Dirac distribution law - Application of Fermi Dirac Statistics - Electron gas - Expression for Fermi Energy - Comparison between the three statistics.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. Murugesan .R, (2004), "Theoretical Physics", Shantha Publications.

Reference Books

1.Agarwal ,(1996),"*Statistical Physics and Thermodynamics"*, Sultan Chand and Company, New Delhi .

2.Sears.F.W., and Salinger.G.L.,(1986),"*Kinetic theory and statistical thermodynamics"*, Narosa Publishing House, New Delhi.

E-Resources

- https://courses.physics.ucsd.edu/2010/Spring/physics210a/LECTURES/210_COURSE.pdf
- http://www.tapir.caltech.edu/~sperhake/Lectures/Notes/StatPhys/notes.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Organize the concepts Microscopic and Macroscopic System.
Unit II	**CO2**	Show Boltzmann theorem of entropy and probability.
Unit III	**CO3**	Apply Maxwell Boltzmann Distribution law to an Ideal gas
Unit IV	**CO4**	Use Bose-Einstein statistics to derive Planck's radiation formula.
Unit V	**CO5**	Relate statistical and Quantum Statistics.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Microscopic And Macroscopic System	Hours (12)	Mode
I	a)Microscopic and macroscopic system .	3	
	b) Ensembles – Degenerate and non degenerate Ensembles.	3	
	c) Phase space – Micro and Macro States.	3	
	d) Basic Postulates of statistical mechanics.	3	Lecture
Unit	**Thermodynamic Probability**	**Hours (12)**	**Mode**
II	a) Definition of mathematical probability - thermodynamic probability	3	
	b) Boltzmann theorem of entropy and probability	3	Lecture
	c) Boltzmann Relation connecting Entropy and Probability	3	Lecture
	d) Statistical equilibrium	3	With PPT
Unit	**Classical Statistics**	**Hours (12)**	**Mode**
III	a) Maxwell Boltzmann statistics - Maxwell Boltzmann energy distribution law	4	Lecture
	b) Maxwell Boltzmann in terms of Temperature – Application of Maxwell Boltzmann Distribution law to an Ideal gas	5	Lecture With Demo
	c) Maxwell Boltzmann velocity distribution law	3	
Unit	**Quantum Statistics - I**	**Hours(12)**	**Mode**
IV	a) Introduction – Quantum statistics of identical particles	4	Lecture With PPT
	b) Types of Quantum Particles - Bose-Einstein statistics - Bose-Einstein distribution law	4	Lecture
	c) Planck's law of black body radiation (Derivation) - Deduction of Wien's and Rayleigh Jeans law of black body radiation.	4	
Unit	**Quantum Statistics - II**	**Hours (12)**	**Mode**
V	a) Fermi Dirac Statistics – Derivation of Fermi Dirac distribution law	4	Lecture With PPT
	b) Application of Fermi Dirac Statistics – Electron gas	4	Lecture
	c) Expression for Fermi Energy - Comparison between the three statistics.	4	

Course Designed by

1. Dr. S.Saravanan
2. Dr. R.Jayaraman

Programme	B.Sc	Programme Code		UPH	
Course Code	20UPHE53	Number of Hours/Cycle		4	
Semester	V	Max. Marks		100	
Part	III	Credit		4	
CORE ELECTIVE COURSE – I					
Course Title	Physics of Electronic Appliances	L	T	P	
Cognitive Level	Upto K3	60	-	-	

L – Lecture T – Tutorial P – Practical

Preamble

To make the students to understand the basic concepts of Physics of Electronic appliances such as Passive Devices, Diodes and Transistors, Semiconductor Devices, Voltage Regulator and Basic concepts of Transmitter and Receiver.

Unit I	Passive Devices	12 Hours
	Passive devices - Resistors - Types - Characteristics - Colour coding - Capacitors - Types - Characteristics - Colour coding - Star and delta connection of resistors and capacitors.	
Unit II	**Diodes and Transistors**	**12 Hours**
	Chokes - Transformers - Testing of diodes, transistors and ICs - CRO - Waveforms and Lissajoue's figures - AF and RF oscillators - usage of bread board.	
Unit III	**Semiconductor Devices**	**12 Hours**
	Semiconductor diode - Zener diode - Transistor - Transistor configurations - diode rectifier - half wave and full wave - Bridge rectifier -Diode voltage doublers and multiplier.	
Unit IV	**Voltage Regulator**	**12 Hours**
	Regulated power supply, Zener diode voltage regulator (Series and Shunt type) IC Voltage regultors: fixed positive - fixed negative - adjustable.	
Unit V	**Basic concepts of Transmitter and Receiver**	**12 Hours**
	Basic concepts of radio transmitter and receiver - Basic concepts of TV Transmitter and receiver - TV antennas: Resonance antennas and their characteristics - DTH system - Mobile communication system - MODEM.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. Materials Prepared by Department of Physics.

Reference Books

1. Metha.V.K,(2001), "Principles of Electronics",Sulthan Chand and Company.

2. Halliday.D, Resnick.R and Walker,(1960), *Fundamentals of Physics*, 6th Edition, John Wiley and Sons, Inc.

E-Resources

- http://engineering.nyu.edu/gk12/amps-cbri/pdf/Basic%20Electronics.pdf
- https://ncert.nic.in/textbook/pdf/gesc114.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Manipulate the various types of resistors and its colour coding.
Unit II	**CO2**	Make use of diodes and transistors for various appliances.
Unit III	**CO3**	Construct the various semiconductor devices.
Unit IV	**CO4**	Experiment to determine the characteristics of zener diode.
Unit V	**CO5**	Build TV antennas, DTH and MODEM using the concepts of Transmitter and Receiver.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Passive Devices	Hours (12)	Mode
I	a) Passive devices – Resistors – types	3	Lecture
	b) characteristics – colour coding	3	
	c) capacitors – type – characteristics	3	
	d) colour coding star and delta connection of a resistors and capacitors..	3	
Unit	**Diodes and Transistors**	**Hours (12)**	**Mode**
II	a) Chokes – Transformers	3	Lecture Lecture With PPT
	b) testing of diodes, transistors and ICs	3	
	c) CRO – Waveforms and Lissajoue's figures	3	
	d) A/F and R/F oscillators – usage of bread board	3	
Unit	**Semiconductor Devices**	**Hours (12)**	**Mode**
III	a) Semiconductor diode – Zener diode	4	Lecture Lecture With Demo
	b) Transistor – Transistor configurations – diode rectifier – half wave and full wave	4	
	c) Bridge retifier – Diode voltage doublers and multiplier	4	
Unit	**Voltage Regulator**	**Hours (12)**	**Mode**
IV	a) Regulated power supply, Zener diode voltage regulator (Series and Shunt type)	4	Lecture With PPT Lecture
	b) IC Voltage regultors: fixed positive	4	
	c) fixed negative – adjustable.	4	
Unit	**Basic concepts of Transmitter and Receiver**	**Hours (12)**	**Mode**
V	a) Basic concepts of radio transmitter and receiver	4	Lecture With PPT Lecture
	b) Basic concepts of TV Transmitter and receiver – TV antennas: Resonance antennas and their characteristics	4	
	c) DTH system – Mobile communication system - MODEM.	4	

Course Designed by

1. Dr.K.Ramavenkateswari
2. Dr.K.Jayabala

Programme	**B.Sc**	**Programme Code**	**UPH**
Course Code	**20UPHC5P**	**Number of Hours/Cycle**	
Semester	**V**	**Max. Marks**	**50**
Part	**III**	**Credit**	**2**
Major Physics Project			
Course Title	**Major Physics Project**		
Cognitive Level			

Course Outcomes

Upon successful completion of this project work the student:

CO1	can develop a Scientific approach in solving problems related to Physics
CO2	Can understand the importance of theoretical and experimental analysis
CO3	Able to write a dissertation
CO4	Can familiarize about various applications of Physics

Project work:

- Each faculty will be allotted a group of **(2-3)** students for their research project in any one of the areas of Physics in consultation with their guide and the Head of the Department.
- The topic / area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation.
- The project report should be submitted to the Head of the Department of Physics through the Guide one week prior to the commencement of the summative examination.
- They shall submit T**hree** copies of their project report for valuation.
- The choice of the topic for the project can be from a wide range of subjects, but a text or topic prescribed for study should be strictly avoided.

Area of work:

Area of work related to Physics

Methodology

Each project should contain the following details:

Introduction - Literature Survey -Theory / Experimental details - Results and Discussion Conclusion - Bibliography

- The project should be at least 25 pages excluding bibliography and appendices.
- There shall be single **internal valuation only**.
- The maximum marks for the project work shall be 100.

Internal Assessment: 100 Marks

Mode of Evaluation	**Marks**
Project Report	60
Viva Voce	40

- Further for a pass in this course as a whole, a group should secure at least 40 marks in project report and viva-voce put together.

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHS51	Number of Hours/Cycle	2		
Semester	V	Max. Marks	50		
Part	IV	Credit	2		
SKILL BASED COURSE – I					
Course Title	Nano Physics		L	T	P
Cognitive Level	Upto K3		24	3	3

L – Lecture T – Tutorial P – Practical

Preamble

To create the basic knowledge in nano materials. Scientific perspective of nanomaterials, techniques suitable for nanomaterial synthesis, and the significance of nanomaterials.

Unit I	Nano Science	5 Hours
	Introduction - Nanomaterials categories - Chemical reduction - Catalysis on nanoparticles - Reduction of oxide – Reaction of rare earth elements	
Unit II	**Synthesis**	**4 Hours**
	Introduction - Top down vs bottom up method - Lithographic process and its challenges - Sol-gel technique- Eletectrodeposition	
Unit III	**Instrumentation and Characterization- I**	**5 Hours**
	Introduction - Basic principles of electron microscopy - Scanning electron microscope (SEM) - Transmission electron microscope (TEM) - Atomic Force Microscope (AFM)	
Unit IV	**Instrumentation and Characterization - II**	**5 Hours**
	Introduction - structure of nanomaterials - X-ray diffraction (XRD) - the Laue method - Powder method - Analysis of some commercially important oxides	
Unit V	**Application of Nanotechnology**	**5 Hours**
	Applications of nanomaterials - Sensitivity sensors - Water purification - food - Fabric industry - Environment - Molecular machine - nanobiometrics	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1.Rajesh Kumar T., Sangeetha R. and Langeswaran V.K (2022), “Nano Physics”, New Century Book House Private Limited.

Reference Books

1. Chattopadhyay K.K, Banerjee A.N (2012), “Introduction to Nanoscience and Nanotechnology”, PHI Learning Private Limited.
2. Shah M.A., Tokeer Ahmad, (2013), “Principles of Nanoscience and nanotechnology”, Naroa publishing house Private Limited.

E-Resources

- http://indico.ictp.it/event/a10137/session/2/contribution/1/material/0/0.pdf
- http://www.phys.nthu.edu.tw/~spin/course/102S/102-2-21_nanophysics-introduction-Kwo- English.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Identify the various conduction mechanisms in bulk and low dimensional systems.
Unit II	**CO2**	Make use of Top down and bottom up techniques.
Unit III	**CO3**	Develop the Instrumental concepts of SEM, TEM and AFM.
Unit IV	**CO4**	Develop the Instrumental concepts of XRD.
Unit V	**CO5**	Apply the concepts of Nanotechnology in fabric, food, sensors and Molecular machine.

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**
			Either/ or Choice		**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**
1	CO1	Up to K3	2	2 (K2 & K2)	1 (K3)
2	CO2	Up to K3	2	2 (K2 & K2)	1 (K3)
3	CO3	Up to K3	2	2 (K2 & K2)	1 (K3)
4	CO4	Up to K3	2	2 (K2 & K2)	1 (K3)
5	CO5	Up to K3	2	2 (K2 & K2)	1 (K3)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total marks for each Section			15		15

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (Either/or)**	**Section B (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	30	54.5
K2		5	25	45.5
Total Marks	30	25	55	100

Lesson Plan

Unit	Nanoscience	Hours (5)	Mode
I	a) Introduction – energy bands	1	Lecture
	b) density of states at low-dimensional structures	1	
	c) various conduction mechanisms in 3D (bulk)	2	
	d) 2D (thin film)and low dimensional systems	1	
Unit	**Synthesis**	**Hours (4)**	**Mode**
II	a) Introduction	1	Lecture Lecture With PPT
	b) top-down vs. bottom up technique	1	
	c) lithographic process and its limitations	1	
	d) sol-gel technique- eletectrodeposition	1	
Unit	**Instrumentation and Characterization - I**	**Hours (5)**	**Mode**
III	a) Introduction-basic principles of electron microscopy	2	Lecture Lecture With Demo
	b) scanning electron microscope (SEM) - Transmission electron microscope (TEM)	2	
	c) Atomic Force Microscope (AFM)	1	
Unit	**Instrumentation and Characterization - II**	**Hours (5)**	**Mode**
IV	a) Introduction – structure of nanomaterials	1	Lecture With PPT Lecture
	b) X-ray diffraction-(XRD) - the laue method- powder method	2	
	c) analysis of some commercially important oxides	2	
Unit	**Application of Nanotechnology**	**Hours (5)**	**Mode**
V	a) Applications of nanomaterials – sensitivity sensors	2	Lecture With PPT Lecture
	b) water purification- food – fabric industry	1	
	c) environment– molecular machine – nanobiometrics	2	

Course Designed by

1. Dr. T. Rajesh Kumar
2. Dr. P. Uma Mageshwari

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHS52	Number of Hours/Cycle	2		
Semester	V	Max. Marks	50		
Part	IV	Credit	2		
SKILL BASED COURSE – II					
Course Title	Basic Electronics		L	T	P
Cognitive Level	Upto K3		24	3	3

L – Lecture T – Tutorial P – Practical

Preamble

To provide concepts of Basic electronics, Semiconductor devices, Transistors, Amplifiers, Oscillators, Number systems and Digital Communication systems.

Unit I	Introduction of Electronics	5 Hours
	Introduction - Electronics - Atomic Structure - Structure of elements - The electron - Energy of an electron - Valence electrons – Free electrons - Diffusion and drift current – Voltage source – Constant voltage source – Constant current source – Thevenin's theorem – Nortan's theorem – Chassis and Ground.	
Unit II	**Semiconductor Diodes**	**5 Hours**
	Formation of pn junction diode – Forward and Reverse biasing of a junction diode - VI characteristics of a junction diode -Zener diode - Experiment to study the characteristics of the zener diode - Light Emitting Diode (LED) Uses – Bridge Rectifier -Filter Circuits.	
Unit III	**Transistors**	**5 Hours**
	Transistor symbols - Transistor as an amplifier - Transistor connections - Common base connection - Characteristics of Common Base connection - Common Emitter connection - Characteristics of Common Emitter connection.	
Unit IV	**Amplifiers**	**4 Hours**
	Introduction - Single stage transistor amplifier - DC and AC equivalent circuits - Voltage gain - Classification of amplifiers - Amplifier equivalent circuit - Equivalent circuit with signal source.	
Unit V	**Oscillators**	**5 Hours**
	Introduction - Sinusoidal oscillator - Types of sinusoidal oscillations - Positive feedback amplifier - Oscillator - Essentials of transistor oscillators - Different types of transistor oscillators - Tuned collector oscillator - Colpitt's oscillator - Hartley oscillator.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books:

1. Mehta.V.K, (2004), "Principles of Electronics", S. Chand & Company Lmited.
   UNIT – I: Page No: 1 – 24
   UNIT – III: Page No: 177 – 195
   UNIT – IV: Page No: 246 – 260, 267 – 269
   UNIT – V: Page No: 346 - 360
2. Murugesan.R, (2014), "Electricity and Electronics", shantha Publications Private Limited.
   UNIT – II: Page No: 99 - 108

Reference Books:

1. Donald P Leach, Albert Paul Malvino, Goutam Saha, (2006), "Digital Principles and Electronics", Tata McGraw Hill Publishing Company Limited.
2. Jacob Millman, Christos Halkias, Chetan D Parikh, (2011). "Millman's Integrated Electronics",Tata McGraw Hill Education Private Limited

E-Resources

- http://engineering.nyu.edu/gk12/amps-cbri/pdf/Basic%20Electronics.pdf
- https://igitsarang.ac.in/assets/documents/coursematerial/basic_electronics_note-2nd_sesmester_btech_compressed_1589976528.pdf
- http://cbseacademic.nic.in/web_material/Curriculum/Vocational/2018/Basic_Electronics_XI.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Organize the concepts of Electronics
Unit II	**CO2**	Build the Ideas of Semiconductor diodes
Unit III	**CO3**	Show and Demonstrate the Common Emitter Transistor
Unit IV	**CO4**	Illustrate the concept of Amplifiers
Unit V	**CO5**	Illustrate the different types of oscillators

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**
			Either/ or Choice		**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**
1	CO1	Up to K3	2	2 (K2 & K2)	1 (K3)
2	CO2	Up to K3	2	2 (K2 & K2)	1 (K3)
3	CO3	Up to K3	2	2 (K2 & K2)	1 (K3)
4	CO4	Up to K3	2	2 (K2 & K2)	1 (K3)
5	CO5	Up to K3	2	2 (K2 & K2)	1 (K3)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total marks for each Section			15		15

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (Either/or)**	**Section B (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	30	54.5
K2		5	25	45.5
Total Marks	30	25	55	100

Lesson Plan

Unit	Introduction of Electronics	Hours (5)	Mode
I	a) Introduction – Electronics	1	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) Atomic Structure - Structure of elements – The electron – Energy of an electron	1	
	c) Valence electrons – Free electrons – Voltage source – Constant voltage source	1	
	d) Constant current source	1	
	e) Thevenin's theorem - Nortan's theorem – Chassis and Ground	1	
Unit	**Semiconductor Diodes**	**Hours (5)**	**Mode**
II	a) Formation of p-n junction diode	1	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) Forward and Reverse biasing of a junction diode	1	
	c) V-I characteristics of a junction diode	1	
	d) Zener diode – Experiment to study the characteristics of the zener diode	1	
	e) Light Emitting Diode (LED) – Uses - Bridge Rectifier – Filters Circuits	1	
Unit	**Transistors**	**Hours (5)**	**Mode**
III	a) Transistor symbols	1	Lecture With Group Discussion Lecture With PPT Lecture Seminar
	b) Transistor as an amplifier – Transistor connections – Common base connection – Characteristics of Common Base connection	2	
	c) Common Emitter connection – Characteristics of Common Emitter connection	2	
Unit	**Amplifiers**	**Hours (4)**	**Mode**
IV	a)Introduction – Single stage transistor amplifier	1	Lecture Seminar Lecture With PPT
	b) DC and AC equivalent circuits	1	
	c) Voltage gain – Classification of amplifiers	1	
	d) Amplifier equivalent circuit - Equivalent circuit with signal source.	1	
Unit	**Oscillators**	**Hours (5)**	**Mode**
V	a) Introduction – Sinusoidal oscillator – Types of sinusoidal oscillations	1	Lecture Group Discussion Lecture With PPT Seminar
	b) Positive feedback amplifier – Oscillator	1	
	c) Essentials of transistor oscillators – Different types of transistor oscillators	1	
	d) Tuned collector oscillator – Colpitt's oscillator	1	
	e) Hartley Oscillator	1	

Course Designed by

1. Dr. S.Saravanan
2. Dr. R.Jayaraman

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC61	Number of Hours/Cycle	4		
Semester	VI	Max. Marks	100		
Part	III	Credit	4		
CORE COURSE IX					
Course Title	Solid State Physics		L	T	P
Cognitive Level	Upto K3		55	3	2

L – Lecture T – Tutorial P – Practical

Preamble

To provide basic concepts of Crystallography, Bonding in crystals, applications of Liquid crystals and to acquire knowledge on the basics of magnetic phenomena on materials and various types of magnetization and the properties of superconducting materials.

Unit I	Crystallography	11 Hours
	Introduction - Classification of solids - Lattice - Basis - Unit Cell - Lattice parameters of unit cell - Crystal systems - Bravais Lattices - Characteristics of a Unit cell.	
Unit II	**Bonding in Crystals**	**11 Hours**
	Ionic bond - Covalent bond - Metallic bond - Molecular bond - Hydrogen bond - Born - Haber Cycle - Crystal structures of NaCl and Diamond - Specific heat capacity of solids - Debye's theory of specific heat capacity of a solid .	
Unit III	**Liquid Crystals & Superconductivity**	**11 Hours**
	Liquid crystals - Thermotropic liquid crystals - Lyotropic Liquid crystals - Applications - Glass - Glass transition temperature - Metallic glasses - Quasi Crystals. Superconductivity - Meissner Effect - The BCS theory - AC and DC Josephson effect - Flux Quantization - High T c Superconductivity - Applications.	
Unit IV	**Magnetic Properties of Materials**	**11 Hours**
	Introduction - Langevin's theory of Diamagnetism - Langevin's theory of paramagnetism - Ferromagnetism - Weiss theory of Ferromagnetism - Nuclear Magnetic Resonance - Quantum Theory of Paramagnetism.	
Unit V	**Dielectric Properties of Solids**	**11 Hours**
	Introduction - Polarization - Macroscopic Electric field - Depolarization Field - Local Electric field at an atom - Dielectric constant - Polarizability - Derivation of the Clausius-Mossotti relation - Frequency dependence of polarizability - Electronic polarizability - Classical theory of Electronic Polarizability	

Pedagogy

These concepts are better understood when lectures are accompanied with Class Room Lectures, chalk and talk, Power point presentation and Group Discussion.

Text Books:

2. Dr.Mani.P, (2011), "*A Text Book of Engineering Physics - I*", Dhanam Publications.

UNIT – I: Page No: 5.1 – 5.25,

2. Murugesan.R, (2010), “Modern Physics”, S.Chand & CompanyLimited.

UNIT – II: Page No: 551 – 567.
UNIT – III: Page No: 573 – 586.
UNIT – IV: Page No: 617 - 630.
UNIT – V: Page No: 666 - 675.

Reference Books:

1. Charles Kittel, (2012), “Introduction to Solid State Physics”, Willey India Private Limited.
2. Nisha Gupta , (2011) , “Elements of Solid State Physic” , Anmol Publications Private Limited.
3. Saxena.B.S, Gupta.R.C & Saxena.P.N, (2009), “Fundamentals of Solid State Physics”,Pragati Prakashan Educational Publisher

E-Resources

- https://pdfcoffee.com/kittel-charles-introduction-to-solid-state-physics-7th01pdf-pdf-free.html
- http://www.issp.ac.ru/ebooks/books/open/Introduction%20to%20Modern%20Solid%20State%20Phys.pdf
- https://www.thphys.physics.ox.ac.uk/people/SteveSimon/condmat2012/LectureNotes2012.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Illustrate the concepts of Crystallography and its types.
Unit II	**CO2**	Manipulate the basics of crystal bonding.
Unit III	**CO3**	Apply the superconductivity phenomenon in liquid crystals.
Unit IV	**CO4**	Organize the magnetic properties of materials.
Unit V	**CO5**	Calculate the dielectric properties of Solids.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Crystallography	Hours (11)	Mode
I	a) Introduction	1	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) Classification of Solids	2	
	c) Lattice– Basis	2	
	d) Unit Cell – Lattice parameters of unit cell	2	
	e) Crystal systems - Bravais Lattices	2	
	f) Characteristics of a Unit cell.	2	
Unit	**Bonding in Crystals**	**Hours (11)**	**Mode**
II	a) Ionic bond – Covalent bond – Metallic bond	1	Lecture Group Discussion Lecture With PPT Lecture With Demo Seminar
	b) Molecular bond – Hydrogen bond	2	
	c) Born –Haber Cycle	2	
	d) Crystal structures of NaCl and Diamond	2	
	e) Specific heat capacity of solids - Debye's theory of specific heat capacity of a solid	2	
	f) Debye's theory of specific heat capacity of a solid	2	
Unit	**Liquid Crystals & Superconductivity** .	**Hours (11)**	**Mode**
III	a) Liquid crystals – Thermotropic liquid crystals	1	Lecture With Group Discussion Lecture With PPT Lecture Seminar
	b) Lyotropic Liquid crystals – Applications	2	
	c) Glass – Glass transition temperature – Metallic glasses – Quasi Crystals	2	
	d) Superconductivity - Meissner Effect, The BCS theory	2	
	e) Theory of AC Josephson effect	2	
	f) Flux Quantization – High T_c Superconductivity – Applications	2	
Unit	**Magnetic Properties of Materials**	**Hours (11)**	**Mode**
IV	a) Introduction	1	Lecture Seminar Lecture With PPT
	b) Langevin's theory of Diamagnetism	2	
	c) Langevin's theory of paramagnetism	2	
	d) Ferromagnetism	2	
	e) Weiss theory of Ferromagnetism	2	
	f) Nuclear Magnetic Resonance	1	
	g)Quantum Theory of paramagnetism.	1	

Unit	Dielectric Properties of Solids	Hours (11)	Mode
V	a) Introduction – Polarization – Macroscopic Electric field	2	Lecture Group Discussion Lecture With PPT Seminar
	b) Depolarization Field – Local Electric field at an atom	2	
	c) Dielectric constant – Polarizability	2	
	d) Derivation of the Clausius-Mossotti relation	2	
	e) Frequency dependence of polarizability	1	
	f) Electronic polarizability - Classical theory of Electronic Polarizability	2	

Course Designed by

1.Dr. K.Ramavenkateswari
2.Dr.K.Jayabala

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHC62	Number of Hours/Cycle	4		
Semester	VI	Max. Marks	100		
Part	III	Credit	4		
CORE COURSE X					
Course Title	Nuclear Physics		L	T	P
Cognitive Level	Upto K3		55	3	2

L – Lecture T – Tutorial P – Practical

Preamble

To provide the students to understand the Properties of Nucleus, Particle Accelarators, Radioactivity, Nuclear Disintegration, Nuclear Reactor and their applications

Unit I	Properties of Nucleus	11 Hours
	Introduction - Classification of Nuclei - General properties of Nucleus - Binding Energy - Nuclear stability - Theories of Nuclear Composition - Nuclear Forces - Meson theory of nuclear forces - Models of Nuclear structure - The liquid drop model - The shell model - The collective model.	
Unit II	**Particle Accelarators**	**11 Hours**
	Introduction - Van de Graaff generator - The Linear Accelerator - The Cyclotron - The synchrocyclotron - The Betatron - The Synchrotrons - The protron Synchroton (Bevatron, Cosmotron) - Detectors - Wilson cloud chamber - Bubble chamber - Photographic emulsion technique .	
Unit III	**Radioactivity**	**11 Hours**
	Discovery of radio activity - Natural radio activity - Alpha, Beta and Gamma rays - Properties of Alpha, Beta and Gamma rays - Geiger-Nuttal Law - Geiger-Nuttal Experiment - Internal Conversion - Law of Radioactive disintegration - Half life period - Mean life.	
Unit IV	**Nuclear Disintegration**	**11 Hours**
	Nuclear transmutation by alpha particles , protons, deuterons , neutrons and electrons - Nuclear Fission - Energy released in Fission - Chain Reaction - Atom Bomb - Nuclear Fusion – Source of Stellar Energy - CN cycle, pp cycle - Thermonuclear reactions - Hydrogen Bomb - Controlled Thermonuclear Reactions.	
Unit V	**Nuclear Reactor**	**11 Hours**
	Nuclear Reactors - PWR - Boiling Water Reactor - Fast Breeder Reactor - Radiation Hazards - Applications of Radio Isotopes - Cosmic Rays - Discovery of Cosmic Rays - East West Effect - Van Allen Belts .	

Pedagogy

These concepts are better understood when lectures are accompanied with Class Room Lectures, chalk and talk, Power point presentation and Group Discussion.

Text Books:

1. Murugesan.R, Kiruthiga Sivaprasath, (2010), “Modern Physics”, Sultan Chand and Company Limited.

UNIT – I: Page No: 383 - 397

UNIT – II: Page No: 420 – 433, 412 - 417

UNIT – III: Page No: 434 – 440, 453, 456 – 459.

UNIT – IV: Page No: 480 – 481, 495 – 500, 503 – 505.
UNIT – V: Page No: 501 – 503, 509 – 511, 515 - 520

Reference Books:

1. Seghal Chopra and Seghal,Sultan,(1998),"*Modern Physics*",Sultan Chand & Company.
2. Thayal,D.C.,(1998), "*Nuclear Physics*",Himalaya Publishing House New Delhi.
3. Richtmayer, Kennard of Cooper,(1998),"*Introduction to Modern Physics*",Tata Mc.Graw Hill.
4. Subramanyan,N.&Brijlal,(2000)," *Atomic and Nuclear Physics*",Sultan Chand & Company.

E-Resources

- https://ocw.mit.edu/courses/nuclear-engineering/22-02-introduction-to-applied-nuclear-physics-spring-2012/lecture-notes/MIT22_02S12_lec_ch1.pdf
- http://faculty.washington.edu/bulgac/560_2014/[Samuel_S._M._Wong]_Introductory_Nuclear_Physics.pdf
- http://www.sfu.ca/~mxchen/phys1021003/P102LN34.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Identify the Properties of Nucleus using various nuclear models
Unit II	**CO2**	Manipulate Van de Graaff generator, The Linear Accelerator and Photographic Emulsion technique using particle accelerators.
Unit III	**CO3**	Show and Demonstrate the concept of Radioactivity
Unit IV	**CO4**	Illustrate the concept of Nuclear Disintegration
Unit V	**CO5**	Construct various types of nuclear reactors.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. Of Questions	K-Level	No. of Question	No.of Question
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Properties of Nucleus	Hours (11)	Mode
I	a) Introduction - Classification of Nuclei - General properties of Nucleus	2	Lecture
	b) Binding Energy – Nuclear stability	2	Group Discussion
	c) Theories of Nuclear Composition – Nuclear Forces	2	Lecture With PPT
	d) Meson theory of nuclear forces – Models of Nuclear structure	2	Lecture With Demo
	e) The liquid drop model – The shell model	2	Seminar
	f) The collective model.	1	
Unit	**Particle Accelarators**	**Hours (11)**	**Mode**
II	a) Introduction – Van de Graaff generator	1	Lecture
	b) The Linear Accelerator – The	2	Group Discussion

	Cyclotron		Lecture With PPT
	c) The synchrocyclotron – The Betatron	2	Lecture With Demo
	d) The Synchrotrons – The protron Synchroton (Bevatron, Cosmotron)	2	Seminar
	e) Detectors - Wilson Cloud Chamber	2	
	f) Bubble Chamber - Photographic Emulsion technique	2	
Unit	**Radioactivity**	**Hours (11)**	**Mode**
III	a) Discovery of Radio Activity – Natural Radio Activity	2	Lecture With Group Discussion Lecture With PPT Lecture Seminar
	b) Alpha, Beta and Gamma rays – Properties of Alpha, Beta and Gamma rays	2	
	c) Range of Alpha Particles	1	
	d) Geiger-Nuttal Law – Geiger-Nuttal Experiment	2	
	e) Internal Conversion - Law of Radioactive disintegration	2	
	f) Half life period – Mean life	2	
Unit	**Nuclear Disintegration**	**Hours (11)**	**Mode**
IV	a) Nuclear transmutation by alpha particles , protons, deuterons , neutrons and electrons	3	Lecture Seminar Lecture With PPT
	b) Nuclear Fission - Energy released in Fission	1	
	c) Chain Reaction – Atom Bomb	1	
	d) Nuclear Fusion – Source of Stellar Energy	2	
	e) CN cycle, pp cycle	2	
	f) Thermonuclear reactions - Hydrogen Bomb	1	
	g) Controlled Thermonuclear Reactions	1	
Unit	**Nuclear Reactor**	**Hours (11)**	**Mode**
V	a) Nuclear Reactors – PWR	2	Lecture Group Discussion Lecture With PPT Seminar
	b) Boiling Water Reactor – Fast Breeder Reactor	2	
	c) Radiation Hazards - Applications of Radio Isotopes	2	
	d) Cosmic Rays	1	
	e) Discovery of Cosmic Rays – East West Effect	2	
	f) Van Allen Belts .	2	

Course Designed by

1. Dr. T.Rajesh Kumar
2. Dr.P.Uma Mageshwari

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHE61	Number of Hours/Cycle	4		
Semester	VI	Max. Marks	100		
Part	III	Credit	4		
CORE ELECTIVE COURSE – II					
Course Title	Space Physics		L	T	P
Cognitive Level	Upto K3		60	-	-

L – Lecture T – Tutorial P – Practical

Preamble

To study the concepts of Astronomy, understand the optical telescopic methods, concepts of stellar evolution and classify the types of Galaxy.

Unit I	Spectroscopy in Astronomy	12 Hours
	Introduction - Sunlight and spectroscopy - Atoms and matter - Model of the atom - Simple spectroscopy - Analyzing sunlight -The conservation of energy - Electromagnetic spectrum.	
Unit II	**The Earth and the Moon**	**12 Hours**
	History of the earth - Temperature of a planet - The atmosphere - Pressure distribution - Magnetosphere - The moon - The lunar surface - The lunar interior - Eclipses - Lunar eclipse - Solar eclipse.	
Unit III	**The Sun**	**12 Hours**
	Introduction - Ordinary gases - Physical Properties of the sun - Structure of the sun - Solar atmosphere - Solar wind - Solar flares - Sunspots - Auroras - Solar prominences.	
Unit IV	**The Universe of Stars**	**12Hours**
	Birth of Stars - Chemical composition and the energy generation of the stars - Hertzsbrung Russell Diagram - Stellar evolution and the HR diagram - Stellar anatomy - Spectral classification of stars - Luminosity of a star - Star models.	
Unit V	**Galaxy**	**12 Hours**
	Introduction - Classification of galaxies - Milky way galaxy - Galactic clusters - Differential galactic rotation - Rotation and mass distribution - Rotation curve and Doppler shift - The galactic center.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1. Mujiber Rahman.A , (2019), " Concepts of Astro Physics", Scitech Publications Private Limited
   Education

Reference Books

1. Abell, Morrison and Wolf,(1987),"*Exploration of the Universe*",Saunders College Publications.
2. Carrol and Ostlie, (2007),"*Introduction to Modern Astrophysics*",Pearson International.
3. Niclolas.A., Pananides and Thomas Arny.,(1979), "*Introductory Astronomy*",Addison Wesley Publication Company.

E-Resources

- https://www.slac.stanford.edu/econf/C0307073/papers/LNEA_complete.pdf
- https://people.lam.fr/buat.veronique/SPACE_poly1_M1.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Interpret the concept of Spectroscopy in Astronomy
Unit II	**CO2**	Illustrate the pressure and temperature distribution of the Earth and the Moon.
Unit III	**CO3**	Organize the physical properties and structure of the Sun.
Unit IV	**CO4**	Identify the spectral classification of stars.
Unit V	**CO5**	Manipulate the rotation and mass distribution of the Galaxy.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Spectroscopy in Astronomy	Hours (12)	Mode
I	a)Introduction - Sunlight and Spectroscopy	3	Lecture
	b) Atoms and Matter and model of the atom – Simple spectroscopy	3	
	c) Analyzing Sunlight – The Conservation of Energy	3	
	d) Electromagnetic Spectrum	3	
Unit	**The Earth and the Moon**	**Hours (12)**	**Mode**
II	a) History of the Earth – Temperature of a Planet – The Atmosphere	3	Lecture
	b) Pressure Distribution – Magnetosphere – The moon	3	Lecture With PPT
	c) The Lunar Surface –The Lunar Interior	3	
	d) Eclipses – Lunar Eclipse – Solar Eclipse.	3	
Unit	**The Sun**	**Hours (12)**	**Mode**
III	a) Introduction – Ordinary gases – Physical Properties of the sun	4	Lecture
	b) Structure of the Sun – Solar Atmosphere– Solar wind – Solar flares	4	Lecture With Demo
	c) Sunspots – Auroras – Solar prominences	4	
Unit	**The Universe of Stars**	**Hours (12)**	**Mode**
IV	a) Birth of Stars – Chemical composition and the energy generation of the stars	4	Lecture With PPT
	b) Hertzsbrung Russell Diagram – Stellar evolution and the HR diagram	4	
	c) Stellar Anatomy – Spectral classification of stars – Luminosity of a star – Star models.	4	Lecture
Unit	**Galaxy**	**Hours (12)**	**Mode**
V	a) Introduction – Classification of galaxies – Milky way galaxy	4	Lecture With PPT
	b) Galactic clusters – Differential galactic rotation	4	
	c) Rotation and mass distribution – Rotation curve and Doppler shift – The galactic center.	4	Lecture

Course Designed by

1. Dr. S.Saravanan
2. Dr. R.Jayaraman

Programme	**B.Sc**	**Programme Code**		**UPH**	
Course Code	**20UPHE62**	**Number of Hours/Cycle**		**4**	
Semester	**VI**	**Max. Marks**		**100**	
Part	**III**	**Credit**		**4**	
CORE ELECTIVE COURSE – II					
Course Title	**Bio - Medical Physics**	**L**	**T**	**P**	
Cognitive Level	**Upto K3**	**60**	**-**	**-**	

L – Lecture T – Tutorial P – Practical

Preamble

To provide an understanding of the Anatomy and various medical instruments.

Unit I	**Basic Anatomy**	**12 Hours**
	Introduction - Anatomical terminology - Modelling and measurement - Forces on and in the body - How forces affect the body - Frictional forces – Physics of the Skeleton.	
Unit II	**Physics of Heart**	**12 Hours**
	Introduction – Pressure system of the body- Physics of cardio vascular system – Working of the heart – Transmural pressure across blood vessel walls – Blood flow conditions – Turbulent flow – Electricity within a body.	
Unit III	**Physics of Ear and Eye**	**12 Hours**
	Introduction - Sound in medicine - Physics of ear and hearing - Configuration of ear - The outer ear - The ear drum - The middle ear - The inner ear- Physics of eye and vision - General structure of the eye - Eye defects.	
Unit IV	**Light in Medicine and ECG**	**12 Hours**
	Introduction - Applications of light in medicine - Applications of UV and IR in medicine - Applications of Laser in medicine - Electro Cardio Graph (ECG) - ECG lead configuration - ECG recording set up.	
Unit V	**EEG**	**12 Hours**
	Electroencephalography (EEG) - Eletcromyography (EMG) - Recording Setup - Computer Tomography (CT) - Block diagram of CT - Data Presentation - Scan Artifacts - Applications of Computer Tomography.	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books

1. Dr. Mujiber Rahman.A, (2019), “Medical Physics”. Scitech Publications India Private Limited.

Reference Books

1. John.R., Cameron and James & Skofronick. G, (1978), “Medical Physics”, John Willy & Sons.
2. Dr.Arumugam.M, (2019), “Biomedical instrumentation”, Anuradha publications.

E-Resources

- https://www.osti.gov/servlets/purl/4420406

- https://www.tutorialsduniya.com/notes/medical-physics-notes/

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Organize the Anatomical Terminology & Modelling and Measurement.
Unit II	**CO2**	Interpret configuration of ear.
Unit III	**CO3**	Sketch the Applications of Laser in Medicine.
Unit IV	**CO4**	Manipulate the lead configuration and recording setup.
Unit V	**CO5**	Demonstrate the medical imaging techniques.

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Basic Anatomy	Hours (12)	Mode
I	a) Introduction - Anatomical terminology	3	Lecture
	b) Modelling and measurement - Forces on and in the body	3	
	c) How forces affect the body	3	
	d) Frictional forces – Physics of the Skeleton.	3	
Unit	**Physics of Heart**	**Hours (12)**	**Mode**
II	a) Introduction – Pressure system of the body-	3	Lecture Lecture With PPT
	b) Physics of cardio vascular system	3	
	c) Working of the heart – Transmural pressure across blood vessel walls	3	
	d) Blood flow conditions – Turbulent flow – Electricity within a body.	3	
Unit	**Light in Medicine and ECG**	**Hours (12)**	**Mode**
III	a)Introduction - Applications of light in medicine	4	Lecture Lecture With Demo
	b) Applications of UV and IR in medicine - Applications of Laser in medicine	4	
	c) Electro Cardio Graph (ECG) - ECG lead configuration – ECG recording set up.	4	
Unit	**X-Rays and ECG**	**Hours (12)**	**Mode**
IV	a)X-rays - The Coolidge Tube-Production of X-rays	4	Lecture With PPT Lecture
	b) X-ray spectra – Characteristics of X-Ray Spectrum – Origin of Characteristics X-Rays	4	
	c) Electro Cardio Graph (ECG) - ECG Lead Configuration -ECG recording set up.	4	
Unit	**EEG**	**Hours (12)**	**Mode**
V	a)Electroencephalography (EEG) - Eletcromyography (EMG) – Recording Setup	4	Lecture With PPT Lecture
	b) Computer Tomography (CT) - Block diagram of CT	4	
	c) Data Presentation – Scan Artifacts - Applications of Computer Tomography.	4	

Course Designed by

1. Dr. K.Ramavenkateswari
2. Dr. K.Jayabala

Programme	**B.Sc**	**Programme Code**		**UPH**	
Course Code	**20UPHE63**	**Number of Hours/Cycle**		**4**	
Semester	**VI**	**Max. Marks**		**100**	
Part	**III**	**Credit**		**4**	
CORE ELECTIVE COURSE – II					
Course Title	**Laser physics**		**L**	**T**	**P**
Cognitive Level	**Upto K3**		**60**	**-**	**-**

L – Lecture T – Tutorial P – Practical

Preamble

To make the students to understand the basic concepts of Lasers and its applications in various fields.

Unit I	**Elements of Laser**	**12 Hours**
	Spontaneous emission - Stimulated emission – Active material - Population inversion - Pumping and pumping schemes - Characteristics of laser – Coherence – Directionality - Monochromaticity	
Unit II	**Production of Laser**	**12 Hours**
	Ruby laser – Nd:YAG laser – Dye laser - Helium -Neon laser - CO_2 laser - Semiconductor laser	
Unit III	**Lasers in Industry**	**12 Hours**
	Materials processing with lasers – Hole drilling with lasers - Laser cutting – Laser welding – Manufacture of circuits - Marking and wire striping with lasers	
Unit IV	**Lasers in Medicine**	**12 Hours**
	Lasers diagnostics - Lasers in ophthalmology – Lasik – Lasers in dermatology - Lasers against viruses – Lasers used in medicine	
Unit V	**Other Applications of Lasers**	**12 Hours**
	Block diagram of fiber optic communication - Recording and reconstruction of hologram – Laser range finders – Submarine laser communication - Laser gyro	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. Nambiar K.R., (2004), Lasers: Principles, Types and Applications, New Age International (P) Ltd, New Delhi.

Reference Books

1. Avadhanulu.N.,(2001), “An Introduction To Lasers” ,Sultan Chand & Company, ,New Delhi.
2. William.T.Silfvast,(1998), “Laser Fundamentals”, University Press, Published in South Asia by Foundation books.
3. Subir Kumar Sarkar (IV Edn, 2010), “Optical fibers & Fiber optic communication systems”, Sultan Chand & Company,New Delhi.

Course Outcome

At the end of the course, students would be able to

Unit I	**CO1**	Illustrate the characteristics of Laser
Unit II	**CO2**	Demonstrate different types of Laser
Unit III	**CO3**	Use Lasers in various industrial applications
Unit IV	**CO4**	Apply Lasers in Medicine
Unit V	**CO5**	Choose Lasers in communication systems

Mapping of Programme Specific Outcomes [PSOs] with Course Outcomes [COs]

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**	**PSO9**	**PSO10**	**PSO11**	**PSO12**
CO1	3	2	2	2	2	1	1	1	1	1	1	1
CO2	3	2	2	2	2	1	2	1	1	1	1	1
CO3	3	3	2	2	2	2	1	1	1	1	1	1
CO4	2	2	3	3	2	2	1	2	1	1	1	1
CO5	2	2	3	3	1	1	2	1	1	1	1	1

1-Low 2- Moderate 3- High

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**	**No.of Question**
1	CO1	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
2	CO2	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
3	CO3	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
4	CO4	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
5	CO5	Up to K3	2	K1&K1	2 (K2&K2)	1 (K3)
No of Questions to be asked			10		10	5
No of Questions to be			10		5	3
Marks for each Question			1		4	10
Total marks for each			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	-	10	10
K2	-	40	-	40	40
K3	-	-	50	50	50
Total Marks	10	40	50	100	100

Lesson Plan

Unit	Elements of Laser	Hours (12)	Mode
I	a) Spontaneous emission - Stimulated emission	3	Lecture
	b) Active material - Population inversion	3	
	c) Pumping and pumping schemes - Characteristics of laser – Coherence	3	
	d) Directionality - Monochromaticity	3	
Unit	**Production of Laser**	**Hours (12)**	**Mode**
II	a) Ruby laser – Nd:YAG	3	Lecture Lecture With PPT
	b) Dye laser - Helium -Neon Laser	3	
	c) CO2 Laser	3	
	d) Semiconductor Laser	3	
Unit	**Lasers in Industry**	**Hours (12)**	**Mode**
III	a) Materials processing with lasers – Hole drilling with lasers	4	Lecture Lecture With Demo
	b) Laser cutting – Laser welding	4	
	c) Manufacture of circuits - Marking and wire striping with lasers	4	
Unit	**Lasers in Medicine**	**Hours (12)**	**Mode**
IV	a)Lasers diagnostics - Lasers in ophthalmology	4	Lecture With PPT Lecture
	b) Lasik – Lasers in dermatology	4	
	c) Lasers against viruses – Lasers used in medicine	4	
Unit	**Other Applications of Lasers**	**Hours (12)**	**Mode**
V	a)Block diagram of fiber optic communication	4	Lecture With PPT Lecture
	b) Recording and reconstruction of hologram – Laser range finders	4	
	c) Submarine laser communication - Laser gyro	4	

Course Designed by

1. Dr. T.Rajesh Kumar
2. Dr.P.Uma Mageshwari

Programme	B.Sc	Programme Code		UPH
Course Code	20UPHS61	Number of Hours/Cycle		2
Semester	VI	Max. Marks		50
Part	IV	Credit		2
SKILL BASED COURSE – III				
Course Title	Energy Physics	L	T	P
Cognitive Level	Upto K3	24	3	3

L – Lecture T – Tutorial P – Practical

Preamble

To provide an understanding of the present energy crisis and various available energy sources.

Unit I	Various Forms of Energy	5 Hours
	Energy - An introduction - Forms of potential Energy - Forms of kinetic Energy - Renewable and non-renewable energy systems - Merits and demerits of renewable and non-renewable sources.	
Unit II	**Solar Energy**	**5 Hours**
	Sun-An introduction - Physical properties of the sun - Solar Energy - Energy flow in the Sun - Solar radiation propagation in the atmosphere - Solar heater - Crop dryers - Space cooling.	
Unit III	**Solar Energy Applications**	**5 Hours**
	Solar ponds - Solar cooker - Water desalination - Photo voltaic basics - Photo conduction.	
Unit IV	**Geothermal, wave Tidal and Biomass Energy**	**4 Hours**
	Geothermal energy - Wind energy - Ocean Thermal Electric Conversion (OTEC) - Wave and tidal energy - Biogas conversion - Gobar gas plants	
Unit V	**Solar Energy Collectors**	**5 Hours**
	Physical principles of the conversion of solar radiation into heat - Flat plate collector - Types of flat plate collectors - Solar concentrating collectors - Advantages and disadvantages of concentrating collectors - Concentrating collectors over flat plate collector - Difference between Flat plate and concentrating collectors - Solar selective coatings	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Book

1. Mujiber Rahman.A , (2019), " Solar Energy", Scitech Publications Private Limited Education

Reference Books

1. Rai.G.D, (1987), " Solar Energy Utilization", Khanna Publishers.
2. Julien Chen.C, " Physics of Solar Energy", WileyPublications.

E-Resources

- http://www.columbia.edu/~jcc2161/documents/Solar_Energy.pdf
- https://www.advan-kt.com/principlesofsolarengi.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Identify the various forms of Energy
Unit II	**CO2**	Illustrate the physical properties of sun
Unit III	**CO3**	Apply solar energy in various fields
Unit IV	**CO4**	Manipulate Geothermal, wave Tidal and Biomass Energy
Unit V	**CO5**	Interpret solar collectors

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**
			Either/ or Choice		**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**
1	CO1	Up to K3	2	2 (K2 & K2)	1 (K3)
2	CO2	Up to K3	2	2 (K2 & K2)	1 (K3)
3	CO3	Up to K3	2	2 (K2 & K2)	1 (K3)
4	CO4	Up to K3	2	2 (K2 & K2)	1 (K3)
5	CO5	Up to K3	2	2 (K2 & K2)	1 (K3)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total marks for each Section			15		15

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (Either/or)**	**Section B (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	30	54.5
K2		5	25	45.5
Total Marks	30	25	55	100

Lesson Plan

Unit	Various Forms of Energy	Hours (5)	Mode
I	a)Energy – an Introduction	1	Lecture
	b) Forms of Potential Energy – Forms of Kinetic Energy	1	
	c) Renewable and non-renewable energy system	2	
	d) Merits and Demerits of renewable and non-renewable sources.	1	
Unit	**Solar Energy**	**Hours (5)**	**Mode**
II	a) Sun-an introduction – Physical properties of the sun	1	Lecture Lecture With PPT
	b) Solar Energy – Energy flow in the Sun	1	
	c) Solar radiation propagation in the atmosphere	1	
	d) Solar Heater – Crop dryers – Space cooling.	2	
Unit	**Solar Energy Applications**	**Hours (5)**	**Mode**
III	a) Solar ponds - Solar cooker	2	Lecture Lecture With Demo
	b) Water desalination – Photo voltaic basics	2	
	c) Photo conduction.	1	
Unit	**Geothermal, wave Tidal and Biomass Energy**	**Hours (4)**	**Mode**
IV	a) Geothermal Energy - Wind Energy	1	Lecture With PPT Lecture
	b) Ocean Thermal Electric Conversion (OTEC) – Wave and Tidal Energy	1	
	c) Biogas Conversion – Gobar gas plants	2	
Unit	**Solar Energy Collectors**	**Hours (5)**	**Mode**
V	a) Physical principles of the conversion solar radiation into heat – Flat plate collector – types of flat plate collectors	2	Lecture With PPT Lecture
	b) Solar concentrating collectors – Advantages and disadvantages of concentrating collectors – Concentrating collectors over flat plate collector	2	
	c) Difference between Flat plate and concentrating collectors – Solar selective coatings	1	

Course Designed by

1. Dr. S.Saravanan
2. Dr. R.Jayaraman

Programme	B.Sc	Programme Code	UPH		
Course Code	20UPHS62	Number of Hours/Cycle	2		
Semester	VI	Max. Marks	50		
Part	IV	Credit	2		
SKILL BASED COURSE IV					
Course Title	Digital And Communication Electronics		L	T	P
Cognitive Level	Upto K3		24	3	3

L – Lecture T – Tutorial P – Practical

Preamble

To acquire knowledge on number system, arithmetic building blocks, memories, fundamental concepts of logic gates, counters, registers, fiber optics etc. and also develop skill to build and troubleshoot combinational digital circuits

Unit I	Digital Fundamentals	5 Hours
	Number Systems and Conversions - BCD Code - Gray code - 1's and 2's complements - Basic logic gates - NAND, NOR and EX-OR gates - NAND and NOR as Universal Building blocks - Laws and theorems of Boolean algebra	
Unit II	**Sequential Logic**	**5Hours**
	RS, Clocked RS, D, J-K and J-K Master-Slave Flip-flop - Shift registers and Counters- Multiplexers and Demultiplexers - Decoders and Encoders - Memory Circuits -D/A and A/D converters	
Unit III	**Modulation and Demodulation**	**4 Hours**
	Amplitude modulation - Frequency modulation, Phase modulation and Pulse Width modulation - Detectors of AM, FM, and PM	
Unit IV	**Digital and Satellite Communication**	**5 Hours**
	ASK, FSK, PSK Modulation and Demodulation - Advantages and disadvantages of digital communication - Communication - satellite Systems - Commonly Used frequency in Satellite Communication	
Unit V	**Fibre Optic Communication**	**5 Hours**
	Basic fibre optic system - Advantages of fibre optic system - Propagation of light through fibre - Numerical aperture - Acceptance angle - Losses and distortion in optical fibres - Basic fibre optical communication and links - Special applications	

Pedagogy

These concepts are better understood when lectures are accompanied with chalk and talk method, demonstration, Power Point Presentation and Learning aids.

Text Books:

Materials prepared by Department of Physics.

Reference Books:

1. Donald P Leach, Albert Paul Malvino, Goutam Saha, (2006), "Digital Principles and Electronics" ,Tata McGraw Hill Publishing Company Limited.
2. Jacob Millman, Christos Halkias, Chetan D Parikh, (2011). " Millman's Integrated Electronics", Tata McGraw Hill Education Private Limited.

E-Resources

- https://mrcet.com/downloads/digital_notes/ECE/III%20Year/DIGITAL%20COMMUNICATIONS.pdf
- https://www.skylineuniversity.ac.ae/pdf/computer/An%20Introduction%20to%20Digital%20Multimedia.pdf

Course Outcomes

At the end of the course, students would be able to

Unit I	**CO1**	Identify the Fundamentals of digital system
Unit II	**CO2**	Manipulate Various Flip flops
Unit III	**CO3**	Demonstrate Modulation and De Modulation
Unit IV	**CO4**	Show Digital and Satellite Communication
Unit V	**CO5**	Illustrate Fibre Optic Communication

BLUE PRINT – End Semester Examinations

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	**COs**	**K-Level**	**Section A**		**Section B**
			Either/ or Choice		**Open Choice**
			No. Of Questions	**K-Level**	**No. of Question**
1	CO1	Up to K3	2	2 (K2 & K2)	1 (K3)
2	CO2	Up to K3	2	2 (K2 & K2)	1 (K3)
3	CO3	Up to K3	2	2 (K2 & K2)	1 (K3)
4	CO4	Up to K3	2	2 (K2 & K2)	1 (K3)
5	CO5	Up to K3	2	2 (K2 & K2)	1 (K3)
No of Questions to be asked			10		5
No of Questions to be answered			5		3
Marks for each Question			3		5
Total marks for each Section			15		15

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems

Distribution of Section –wise Marks with K Levels

K Levels	**Section A (Either/or)**	**Section B (Open Choice)**	**Total Marks**	**% of Marks without Choice**
K1	10	-	30	54.5
K2		5	25	45.5
Total Marks	30	25	55	100

Lesson Plan

Unit	Digital Fundamentals	Hours (5)	Mode
I	a)Number Systems and Conversions	1	Lecture Lecture With PPT Lecture With Demo Seminar
	b) BCD Code - Gray code - 1's and 2's complements	1	
	c) Basic logic gates - NAND, NOR and EX-OR gates	1	
	d) NAND and NOR as Universal Building blocks	1	
	e) Laws and theorems of Boolean algebra	1	
Unit	**Sequential Logic**	**Hours (5)**	**Mode**
II	a)RS, Clocked RS, D, Flip flop	1	Lecture Group Discussion Lecture With PPT Seminar
	b) J-K and J-K Master-Slave Flip-flop	1	
	c) Shift registers and Counters	1	
	d) Multiplexers and Demultiplexers – Decoders and Encoders - Memory Circuits	1	
	e) D/A and A/D converters	1	
Unit	**Modulation and Demodulation**	**Hours (4)**	**Mode**
III	a)Amplitude modulation	1	Lecture With PPT Lecture Seminar
	b) Frequency modulation	1	
	c) Phase Modulation and Pulse Width Modulation	1	
	d) Detectors of AM, FM, PM and PWM	1	
Unit	**Digital and Satellite Communication**	**Hours (5)**	**Mode**
IV	a)ASK, FSK, PSK Modulation	1	Lecture Seminar Lecture With PPT
	b) ASK, FSK, PSK Demodulation	1	
	c) Advantages of digital communication. Communication Satellite Systems	1	
	d)disadvantages of digital communication. Communication Satellite Systems	1	
	e) Commonly Used frequency in Satellite Communication	1	
Unit	**Fibre Optic Communication**	**Hours (5)**	**Mode**
V	a)Basic Fibre Optic System - Advantages of Fibre Optic System	1	Lecture Lecture With PPT Seminar
	b) Propagation of light through fibre	1	
	c) Numerical aperture - Acceptance angle - Losses and distortion in optical fibres	2	
	d) Basic fibre Optical communication and links - Special applications	1	

Course Designed by

1. Dr. K.Ramavenkateswari

2. Dr. K.Jayabala

Programme	**B.Sc**	**Programme Code**	**UPH**
Course Code	**20UPHC6P**	**Number of Hours/Cycle**	**3**
Semester	**VI**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
CORE PRACTICAL - III			
Course Title	**Major Physics Practicals - III**		

List of Practicals

1. Spectrometer - Grating – Normal incidence method
2. Spectrometer - Cauchy's constants
3. Spectrometer - Grating - Minimum deviation method
4. Spectrometer – i-d curve
5. Spectrometer – i-i’ curve
6. LCR - Series resonance circuit
7. LCR - Parallel resonance circuit
8. LR Circuit - Impedance and Power Factor
9. CR Circuit - Impedance and Power Factor
10. Maxwell's Bridge - Self Inductance
11. Anderson’s Bridge – Self inductance
12. Dielectric constant measurement

Programme	B.Sc	Programme Code	UPH
Course Code	20UPHC6Q	Number of Hours/Cycle	3
Semester	VI	Max. Marks	100
Part	III	Credit	4
CORE PRACTICAL - IV			
Course Title	Major Physics Practicals - IV		

List of Practicals

1. Junction Diode characteristics
2. Zener Diode characteristics
3. Transistor characteristics – CE Mode
4. Bridge Rectifier
5. Full Wave Rectifier
6. Zener voltage Regulation
7. Hartley Oscillator – Frequency and Inductance
8. Astable multivibrator using discrete components
9. Logic gates using discrete components
10. Single stage Amplifier
11. Clipper and Clamper
12. Active Filters

Programme	B.Sc	Programme Code	UPH
Course Code	20UPHC6R	Number of Hours/Cycle	2
Semester	VI	Max. Marks	100
Part	III	Credit	4
CORE PRACTICAL - V			
Course Title	Major Physics Practicals - V		

List of Practicals

1. Universal NAND Gate- IC
2. Universal NOR Gate- IC
3. Half Adder, Full Adder using NAND gate
4. Half Subtractor and Full Subtractor using NAND gate
5. Astable multivibrator using IC -555
6. Astable Multivibrator using IC 741
7. OP AMP- Adder and Subtractor
8. Shift Registers
9. BCD Adder and Subtractor
10. Counters
11. Encoder and Decoder
12. Flip-Flops

Programme	B.A / B.Sc / B.Com	Programme Code	CPHY
Course Code	20CPHY51	Number of Hours/Cycle	30
Semester	V	Max. Marks	50
Part		Credit	
Value Added Course - III			
Course Title	Optical Sensors		
Cognitive Level			

Preamble

To make the students to understand the basic concepts of Sensors and its applications in various fields.

Unit I	Introduction to Sensors	6 Hours
	Introduction to sensors and biosensors - Characteristics and components of optical biosensors - various transduction mechanisms - Optical probing parameters - Performance parameters - Fabrication and functionalization methods of optical biosensors	
Unit II	**Electromagnetic Waves In Matter Dielectrics**	**6 Hours**
	Electromagnetic waves in matter Dielectrics - Reflection and transmission at interface - Fresnel equations - Polarization by reflection – Brewster angle sensor - Electromagnetic waves in matter - Total internal reflection- TIR sensors - waveguide sensors using TIR	
Unit III	**Plasmonic Sensors**	**6 Hours**
	Electromagnetic waves in matter Absorption and dispersion – conductors - Drude model for the metal dielectric function and introduction to plasmons - Propagating versus localized plasmons - Optimized sensor configurations - plasmon enhanced sensors	
Unit IV	**Interference and diffraction**	**6 Hours**
	Interference and diffraction - Interference and interferometry - Airy function for single layer - Mach Zehnder Interferometer for sensing - Fabry Perot Interferometer for sensing	
Unit V	**Bio Sensors**	**6 Hours**
	Biomaterial Structures EM Waves Absorption in Tissue – Chirality - polarization rotation and dichroism, - Review of sensing applications: Scattering–Elastic (Rayleigh), – Inelastic (Raman) – Fluorescence - Some real life optical biosensors	

Text Book

1. Material prepared by Physics Department

Reference Books

1. Gupta. B.D, Srivastava. S.K and Verma. R, (2015), "Fiber Optic Sensors Based on Plasmonics" World Scientific Publications.
2. Narayanswamy.R, (2004) "Optical Sensors: Industrial, Environmental and Diagnostic Applications" Springer Publications.

Programme	B.A / B.Sc / B.Com	Programme Code	CPHY
Course Code	20CPHY61	Number of Hours/Cycle	30
Semester	VI	Max. Marks	50
Part		Credit	
Value Added Course - IV			
Course Title	Electrical Appliances		
Cognitive Level			

Preamble

To make the students to understand the basics of electrical devices

Unit I	**Resistance and Transformers**	**6 Hours**
	Resistance and its types – capacitance and its types – Colour codes-inductance and its units – Transformers – Electrical Charge – Current – Electrical Potential	
Unit II	**Detection of Current and Voltage**	**6 Hours**
	Ohm's law – Galvanometer, Ammeter, Voltmeter and Multimeter Analog and Digital - Electrical Energy – Power – Watt – KWh – Consumption and electrical power	
Unit III	**AC and DC Circuits**	**6 Hours**
	AC and DC – Single phase and three phase connections – RMS and peak values, House wiring – Star and delta connection – overloading – earthing – short circuiting – Fuses – Colour code for insulation wires	
Unit IV	**Inverter and Electrical Switches**	**6 Hours**
	Inverter – UPS – generator and motor – types – different types of windings – circuit breaker-Electrical switches and its types	
Unit V	**Electrical Appliances**	**6 Hours**
	Electrical bulbs – Fluorescent lamps – Street Lighting – Flood lighting – Electrical Fans – Wet Grinder – Mixer – Water Heater –electric iron box - microwave oven – Stabilizer	

Text Book

1. Materials Prepared by Department of Physics.

Reference Books

1. Louis A. Bloomfield, (2007), *How Everything Works Making Physics Out Of The Ordinary*, University of Virgina, ,John Willey & sons
2. Halliday.D, Resnick.R and Walker,(1960), *Fundamentals of Physics*, 6th Edition, John Wiley and Sons, Inc.

Programme	B.Sc	Programme Code	UPH
Course Code	20UPHC2P	Number of Hours/Cycle	2
Semester	II	Max. Marks	100
Part	III	Credit	3
CORE PRACTICAL - I			
Course Title	Major Physics Practicals - I		

LIST OF EXPERIMENTS

1. Young's Modulus – Uniform bending (Pin and Microscope)
2. Young's Modulus – Nom- Uniform bending (Pin and Microscope)
3. Acceleration due to gravity –Compound Pendulum
4. Moment of Inertia & Rigidity modulus – Torsion pendulum
5. Verification of Laws – Sonometer
6. Frequency of the tuning fork - Sonometer
7. Calibration of Voltmeter - Potentiometer
8. Potentiometer – Calibration of high range voltmeter
9. Young's Modulus - Uniform Bending Optic Lever and Telescope
10. Young's Modulus - Non - Uniform Bending Optic Lever and Telescope
11. Thermal conductivity of bad conductor using Lee's disc
12. Coefficient of Viscosity –Stoke's method

Programme	B.Sc	Programme Code	UPH
Course Code	20UPHC4P	Number of Hours/Cycle	2
Semester	IV	Max. Marks	100
Part	III	Credit	2
Core Practical - II			
Course Title	Major Physics Practicals - II		

List of Experiments

1. Thickness of the wire - Air wedge
2. Comparison of Capacitances - De Sauty's Bridge
3. Comparison of emf's - Potentiometer
4. Determination of BH - Axial coil
5. Refractive index of the prism – Spectrometer
6. Figure of merit - Table Galvanometer
7. Determination of R - Newton's Rings
8. Determination of m - Axial coil
9. Conversion of Galvanometer into Voltmeter
10. Conversion of Galvanometer into Ammeter
11. Figure of merit – Ballistic Galvanometer
12. Resistivity of a given coil – Carey Foster’s bridge