HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Uthamapalayam, Theni District. Pin Code: 625 533.

DEPARTMENT OF PHYSICS

BACHELOR OF SCIENCE – PHYSICS

SYLLABUS

Choice Based Credit System – CBCS

(As per TANSCHE/MKU Guidelines)

with

Outcome Based Education (OBE)

(Academic Year 2020 -2021 onwards)

HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai.)

Uthamapalayam, Theni District. Pin Code: 625 533.

Name of the Programme: B.Sc. Physics

Choice Based Credit System (CBCS)
(As per TANSCHE/MKU Guidelines)

with
Outcome Based Education (OBE)

(with effect from the Academic Year 2020 – 2021)

College Vision and Mission

Vision

Our vision is to provide the best type of higher education to all, especially to students hailing from minority Muslim community, rural agricultural families and other deprived, under privileged sections of the society, inculcating the sense of social responsibility in them. Our college is committed to produce talented, duty-bound citizens to take up the challenges of the changing times.

Mission

Our mission is to impart and inculcate social values, spirit of service and religious tolerance as envisioned by our beloved Founder President Hajee Karutha Rowther.

The Vision beckons..... the Mission continues forever.

Programme Educational Objectives (PEO)

Our graduates will be progressive, efficient, value based, academically excellent, creative, collaborative, empowered and globally competent literates with the skills required for societal change.

They will demonstrate

PEO1	Comprehensive knowledge and expertise, employability, the acumen of creative and critical thinking, the spirit of enquiry and professional attitude required for a successful career
PEO2	Accountability, linguistic competence and communication skills in the work environment and beyond
PEO3	Perseverance, effective collaboration, team spirit, leadership and problem solving skills
PEO4	Keen sense of civility, professional ethics, receptivity and moral righteousness
PEO5	Commitment to address social and environmental threats and to act as responsible service-minded, duty-bound global citizens

Department Vision and Mission

Vision

- To provide an ambient environment for learning and research in physical science with a focus on academic excellence.

Mission

- To apply conventional and non-conventional tools in physics in tune with emerging trends of science.
- To bridge the gap between curriculum based learning and carrier readiness, employability through competitive physics in the competitive world
- Ignite the students to pursue higher studies and research programs.
- To create a meticulous awareness among students about issues pertaining to welfare of society and environment

Programme Outcomes (PO)

On completion (after three years) of B.Sc. Physics programme, the students are able to

PO1	Identify key concepts, principles and fundamental laws that are central to the study of various areas of physics, define and describe them with clarity
PO2	Be able to communicate the physics contents effectively both in oral and written form.
PO3	Explain the mathematical foundation of the underlying physics principles, concepts and laws
PO4	Plan and execute an experiment through careful observations and precise measurements for the proper designing of the next level experimental physics
PO5	Recognize the need for and have an ability to present brief lecture, writing scientific reports, projects, dissertation and encage in debates and discussions

Programme Specific Outcomes (PSO)

A graduate of B.Sc. Physics after three years will

PSO1	Students will have successful professional careers in academics as well as in the public/ private sectors in the field of physics, mathematics and environmental sciences
PSO2	The students will be capable enough to acquire basic and specialist science skills, their use and incorporation to boost their confident and faith, for effective personal and professional development
PSO3	Student will be able to gain holistic knowledge about the environment, that is essential for being responsible citizen to protect nature
PSO4	Students will be equipped with lifelong learning process for self sustainability, employability and leadership roles in our dynamic society
PSO5	Students will be provided with value based ethical leadership in professional and social life

Programme Scheme

Eligibility

A pass in +2 examination conducted by the Board of Higher Secondary Education, Government of Tamil Nadu with Physics, Mathematics and Chemistry.

For Programme Completion

A Candidate shall complete:

- Part I - Language papers – Tamil/Arabic/Malayalam in semesters I, II, III and IV respectively
- Part II - Language papers - English in semesters I, II, III, IV respectively
- Part III - Core papers in semesters I, II, III, IV, V and VI respectively
- Part III - Allied papers in semesters I, II, III, and IV respectively
- Part III - Elective papers in semesters V and VI respectively
- Part IV - Non- Major Elective papers in semesters I and II respectively
- Part IV - Skill based Subject papers in semesters V and VI respectively
- Part IV - Value Education paper in semester I
- Part IV - Environmental Studies paper in semester II
- Part V - Extension activity in semester IV

Scheme of Examinations under Choice Based Credit System

Term End Examinations (TEE)	- 75 Marks
Continuous Internal Assessment Examinations (CIAE)	- 25 Marks
Total	- 100 Marks

Pattern of Continuous Internal Assessment Examinations (CIAE)

Average of Two Internal Tests (each 20 marks)	- 20 Marks
Assignment	- 05 Marks
Total	- 25 Marks

Pattern of Term End Examinations
(Max. Marks: 75 / Time: 3 Hours)

External Examinations Question Paper Pattern for Part I & III and Part IV (Non- Major Elective & Skill based Subject)

Section – A (10 X 1 = 10 Marks)
Answer ALL questions.

- Questions 1 - 10
- Two questions from each unit
- Multiple choice questions and each question carries Four choices

Section – B (5 X 7 = 35 Marks)
Answer ALL questions choosing either A or B.

- Questions 11 - 15
- Two questions from each unit (either…. or…. type)
- Descriptive Type

Section – C (3 X 10 = 30 Marks)
Answer any THREE out of five questions.

- Questions 16 - 20
- One question from each unit
- Descriptive Type

External Examinations Question Paper Pattern for Part IV (Environmental Studies and Value Education)

Section – A: (5 X 6 = 30 Marks)
Answer ALL questions choosing either A or B.

- Questions 1 - 5
- Two questions from each unit (either…. or…. type)
- Descriptive Type

Section – B (3 X 15 = 45 Marks)
Answer any THREE out of five questions.

- Questions 6 – 10
- One question from each unit
- Descriptive Type

Part V (Extension Activities)

- Internal Evaluation

Passing Marks

Minimum 27 for External Exam

Eligibility for the degree – passing minimum is **40%**

Practical Examination

Internal – 40 marks

External – 60 marks

Total – 100 marks

Passing minimum is **40%**

Weightage

Weightage for Bloom's Taxonomy	Percentage	Marks	
		CIAE	TEE
Knowledge (Remembering) – K1	40	10	30
Understanding – K2	40	10	30
Applying – K3	20	5	15
Gross Total	**100**	**25**	**75**

Assessment

Distribution of questions and marks for Continuous Internal Assessment Examinations

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	2 (2)	1 (a or b) (3)	1 (5)	**25 marks**
Understanding(K2)	2 (2)	1 (a or b) (3)	1 (5)	
Apply(K3)	**Assignment (5)**			

Distribution of questions and marks for Term End Examinations

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	2 (2)	4 (a or b) (28)	-------	**Total 75 Marks**
Understanding(K2)	3 (3)	1 (a or b) (7)	2 out of 3 (20)	
Apply(K3)	5 (5)	-------	1 out of 2 (10)	

Note: Figures in parenthesis are Marks

Credits Distribution

Part	Course Category	Courses	Credits	Total Marks
I	Tamil/ Arabic/ Malayalam	4	12	400
II	English	4	12	400
III	Core, Elective & Allied	25	98	2500
IV	Non- Major Elective	2	4	200
	Skill based Subject	4	8	400
	Value Education	1	2	100
	Environmental Studies	1	2	100
V	Extension Activities	1	2	100
		42	**140**	**4200**

Details of Course Category, Code, Credits & Title

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - I							
Part - I							
Language - I	20UTAL11/ 20UARL11/ 20UMLL11	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - I	20UENL11	English for Enrichment - I	6	25	75	100	3
Part – III (OBE)							
Core – I	20UPHC11	Mechanics and Relativity	5	25	75	100	4
Core – III	20UPHC2P	Major Practical – I	3	-	-	-	-
Allied – I	20UMAA11	Ancillary Mathematics – I	6	25	75	100	4
Part - IV							
NME – I	20UPHN11	Basic Physics – I	2	25	75	100	2
VED	20UVED11	Value Education	2	25	75	100	2
		Total	**30**			**600**	**18**
Semester - II							
Part - I							
Language - II	20UTAL21/ 20UARL21/ 20UMLL21	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - II	20UENL21	English for Enrichment - II	6	25	75	100	3
Part – III (OBE)							
Core – II	20UPHC21	Electricity & Electromagnetism	5	25	75	100	4
Core – III	20UPHC2P	Major Practical – I	3	40	60	100	4
Allied – II	20UMAA21	Ancillary Mathematics - II	4	25	75	100	4
Allied – III	20UMAA2P	Ancillary Mathematics Practical	2	40	60	100	4
Part - IV							
NME – II	20UPHN21	Basic Physics – II	2	25	75	100	2
EVS	20UEVS21	Environmental Studies	2	25	75	100	2
		Total	**30**			**800**	**26**

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - III							
Part - I							
Language- III	20UTAL31/ 20UARL31/ 20UMLL31	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - III	20UENL31	English for Enlightenment - I	6	25	75	100	3
Part – III (OBE)							
Core – IV	20UPHC31	Heat and Thermodynamics	5	25	75	100	4
Core – V	20UPHC32	Optics	4	25	75	100	4
Core – VIII	20UPHC4P	Major Practical -II	3	-	-	-	-
Allied - IV	20UCHA11	Organic, Inorganic & Physical Chemistry - I	4	25	75	100	3
Allied - VI	20UCHA2P	Volumetric Analysis	2	-	-	-	-
		Total	**30**			**500**	**17**
Semester – IV							
Part - I							
Language - IV	20UTAL41/ 20UARL41/ 20UMLL41	Tamil / Arabic / Malayalam	6	25	75	100	3
Part - II							
English - IV	20UENL41	English for Enlightenment - II	6	25	75	100	3
Part – III (OBE)							
Core – VI	20UPHC41	Mathematical Physics	5	25	75	100	5
Core - VII	20UPHC42	Modern Physics	4	25	75	100	4
Core - VIII	20UPHC4P	Major Practical -II	3	40	60	100	3
Allied - V	20UCHA21	Organic, Inorganic & Physical Chemistry - II	4	25	75	100	3
Allied - VI	20UCHA2P	Volumetric Analysis	2	40	60	100	2
Part - V							
EA		Extension Activities**	--	100	--	100	2
		Total	**30**			**800**	**25**

Part – V
Extension Activities**

S. No.	Course Code	Course Title	Max. Marks	Credits
1.	20UNCC41	National Cadet Corps (Army)	100	2
2.	20UNCC42	National Cadet Corps (Navy)	100	2
3.	20UNSS41	National Service Scheme	100	2
4.	20UPED41	Physical Education	100	2
5.	20UYRC41	Youth Red Cross	100	2
6.	20URRC41	Red Ribbon Club	100	2
7.	20UHRC41	Human Rights Club	100	2
8.	20UCOC41	Consumer Club	100	2
9.	20UYOC41	Yoga Club	100	2
10.	20UHFC41	Health and Fitness Club	100	2
11.	20UECC41	Eco Club	100	2
12.	20ULIC41	Library & Information Science Club	100	2
13.	20USCC41	Science Communication Club	100	2
14.	20UFAC41	Fine Arts Club	100	2

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester - V							
Part – III (OBE)							
Core - IX	20UPHC51	Nuclear Physics	4	25	75	100	4
Core - X	20UPHC52	Electronics - I	4	25	75	100	4
Core – XI	20UPHC53	Spectroscopy & Laser	4	25	75	100	4
Core – XV	20UPHC6P	Major Practical - III	3	-	-	-	-
Core – XVI	20UPHC6Q	Major Practical - IV	3	-	-	-	-
Core – XVII	20UPHC6R	Major Practical - V	3	-	-	-	-
Elective - I	20UPHE51	Medical Physics	5	25	75	100	5
	20UPHE52	Astrophysics – I					
	20UPHE53	Energy Physics					
Part - IV							
SBS - I	20UPHS51	Properties of Matter	2	25	75	100	2
SBS - II	20UPHS52	Competitive Exam in Physics-I	2	25	75	100	2
		Total	**30**			**600**	**21**
Semester - VI							
Part – III (OBE)							
Core –XII	20UPHC61	Classical and Statistical Mechanics	4	25	75	100	4
Core – XIII	20UPHC62	Electronics - II	4	25	75	100	4
Core - XIV	20UPHC63	Solid State Physics	4	25	75	100	4
Core – XV	20UPHC6P	Major Practical - III	3	40	60	100	4
Core - XVI	20UPHC6Q	Major Practical - IV	3	40	60	100	4
Core – XVII	20UPHC6R	Major Practical - V	3	40	60	100	4
Elective - II	20UPHE61	Applied Physics	5	25	75	100	5
	20UPHE62	Astrophysics					
	20UPHE63	Physics in The Arts					
Part - IV							
SBS – III	20UPHS61	Basic Instrumentation	2	25	75	100	2
SBS - IV	20UPHS62	Competitive Exam in Physics-II	2	25	75	100	2
		Total	**30**			**900**	**33**
		Grand Total	**180**			**4200**	**140**

Course Code	Course Title	Category	Total Hours	Credits
20UPHC11	Mechanics and Relativity	Core - I	75	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain in depth knowledge about Mechanics and Relativity in order to know about the laws of dynamic bodies, study of the analogy between linear and rotational motion, understanding the concepts of gravitation, principles of rocket motion, and concepts of special theory of relativity

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Explain the basic concept of motion of bodies through Newton's laws of motion and collision theory	**K1,K2,K3**
CO2	Utilize the theorems and its applications to rotational motion	**K1,K2,K3**
CO3	Apply Kepler's laws of planetary motion for the study of earth.	**K1,K2,K3**
CO4	Illustrate the applications of rocket principles and various frame of references	**K1,K2**
CO5	Describe various concepts and its applications of special theory of relativity	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**1**	**2**	**1**	**3**
CO2	**2**	**3**	**2**	**1**	**2**
CO3	**1**	**3**	**2**	**1**	**2**
CO4	**3**	**2**	**3**	**1**	**3**
CO5	**3**	**3**	**1**	**1**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	3
CO2	2	3	2	1	2
CO3	1	3	2	1	2
CO4	3	2	3	1	3
CO5	3	3	1	1	2

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 15 Hours

Equation of motion –Newton's law of motion, momentum and impulse–Law of conservation of linear momentum–collision–Elastic and inelastic collision–Newton's law of impact–Coefficient of restitution–Impact of smooth sphere on a fixed plane–Direct and oblique impact of moving two smooth spheres–Calculation of final velocity of spheres–Loss of kinetic energy.

UNIT II 15 Hours

Moment of inertia–Parallel axes theorem–Perpendicular axes theorem–Moment of inertia of circular disc, about an axis passing through its centre and perpendicular to its own axis–Moment of inertia of solid sphere about all axis–Angular momentum and torque–Kinetic energy of rotation–Expression for the acceleration of a body rolling down on an inclined plane.

UNIT III 15 Hours

Kepler's laws of planetary motion–Law of gravitation–Mass and density of Earth–Compound pendulum–Expression for period–Experiment to find g–Variation of g with latitude, altitude and depth–Gravitational potential and potential energy–Orbital velocity–Escape velocity-Stationary satellite–Uses of satellites.

UNIT IV 15 Hours

Rocket–Principle–Theory of Rocket–Velocity of Rocket at any instant–Rocket propulsion systems–Specific impulse–Multistage Rocket–Shape of the Rocket–Frames of reference–Inertial and non-inertial frame of reference–Galilean transformation–Newtonian relativity–Michelson-Morley experiment–Significance of negative result.

UNIT V 15 Hours

Postulates of Special theory of relativity–Lorentz transformation–Lorentz Fitzgerald contraction–Time dilation–Relativistic addition of velocities–Relativistic mass, relativistic momentum–Mass-Energy equivalence–Relation between total energy and momentum.

Text Book

R. Murugeshan, **Mechanics**, S. Chand & Co. Publishcations, 2002.

References

Narayanamoorthy, ***Mechanics Part I and II,*** National publishing company, 2001.

D. Hallidary, Resnick, Resnick and J.Walker, ***Fundamental of physics,*** Wiley, New York, 6th edition, 2001.

Pedagogy

Chalk and Talk, Lecture, Seminar, Group discussion, LMS & PPT

Teaching Aids

Black board & LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Equation of motion –Newton's law of motion, momentum and impulse	2	Chalk & Talk,
1.2	Law of conservation of linear momentum–collision–Elastic and inelastic collision	3	YouTube video,
1.3	Newton's law of impact–Coefficient of restitution–Impact of smooth sphere on a fixed plane	3	PPT
1.4	Direct and oblique impact of moving two smooth spheres–Calculation of final velocity of spheres	3	PPT
1.5	Loss of kinetic energy and problems	4	Discussions
	UNIT - II		
2.1	Moment of inertia–Parallel axes theorem–Perpendicular axes theorem	3	Discussion
2.2	Moment of inertia of circular disc, about an axis passing through its centre and perpendicular to its own axis	3	Chalk & Talk
2.3	Moment of inertia of solid sphere about all axis–	3	PPT
2.4	Angular momentum and torque–Kinetic energy of rotation	2	Videos

2.5	Expression for the acceleration of a body rolling down on an inclined plane and problems	4	PPT
UNIT - III			
3.1	Kepler's laws of planetary motion	2	YouTube video
3.2	Law of gravitation–Mass and density of Earth	2	Chalk & Talk
3.3	Compound pendulum–Expression for period–Experiment to find g	3	PPT
3.4	Gravitational potential and potential energy, Variation of g with latitude, altitude and depth	4	PPT
3.5	Orbital velocity–Escape velocity, Stationary satellite–Uses of satellites.	4	Videos and discussion
UNIT - IV			
4.1	Rocket–Principle–Theory of Rocket, Velocity of Rocket at any instant	3	PPT
4.2	Rocket propulsion systems–Specific impulse, Multistage Rocket–Shape of the Rocket	3	YouTube video
4.3	Frames of reference–Inertial and non-inertial frame of reference	3	Chalk & Talk
4.4	Galilean transformation – Newtonian relativity	3	PPT
4.5	Michelson - Morley experiment – Significance of negative result.	3	PPT
UNIT - V			
5.1	Postulates of Special theory of relativity	2	YouTube video
5.2	Lorentz transformation – Lorentz Fitzgerald contraction – Time dilation	4	PPT
3.5	Relativistic addition of velocities	3	PPT
5.4	Relativistic mass, relativistic momentum	3	Chalk & Talk
5.5	Mass - Energy equivalence – Relation between total energy and momentum.	3	PPT
	Total	**75**	

Course Designer
Dr. M. Charles Robert
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UMAA11	Ancillary Mathematics - I	Allied - I	90	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	✓
National	
Global	✓

Preamble

The course deals with mathematical methods used in various disciplines

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Find the nature of the roots of an equation	**K1, K2**
CO2	Solve higher degree equations using various methods	**K2,K2,K3**
CO3	Explain statistical data to find measures of central tendency, dispersion and location.	**K1, K2**
CO4	Solve the correlation coefficient for a Bivariate frequency distribution	**K1,K2,K3**
CO5	Apply Probability methods in real world problem	**K1,K2,K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**2**	**2**	**1**
CO2	**3**	**3**	**1**	**3**	**2**
CO3	**3**	**3**	**2**	**1**	**1**
CO4	**1**	**1**	**2**	**3**	**3**
CO5	**2**	**3**	**1**	**2**	**3**

1-Low **2-Medium** **3-Strong**

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**3**	**1**
CO2	**2**	**3**	**1**	**3**	**2**
CO3	**3**	**1**	**2**	**2**	**3**
CO4	**2**	**3**	**3**	**1**	**2**
CO5	**3**	**2**	**3**	**2**	**1**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 18 Hours

ALGEBRA: Theory of Equations – Imaginary roots – Irrational Roots Relation between the roots and co-efficient

UNIT II 18 Hours

ALGEBRA: Transformations of Equation - Rolle 's Theorem - Newton's Method - Horner's method

UNIT III 18 Hours

STATISTICS: Mean – Median – Mode - Standard Deviation - Coefficient of variation

UNIT IV 18 Hours

STATISTICS: Curve fittings – Correlation – Rank Correlation

UNIT V 18 Hours

STATISTICS: Probability - Conditional Probability

Text Books

ManicavachagomPilla .K, Natarajan. T. and Ganapathy K. S., ***Algebra, Volume I*** , S. Visvanathan (Printers & Publishers) Pvt. Ltd., Chennai.2010 (UNIT I &II)

Dr. Arumugam. S and Thangapandi Isaac. A. ***Statistics***, New Gamma Publishing House, Palayamkkottai.2011(UNIT III,IV&V)

UNIT 1: Chapter 6 (Page no:282 to 299)

UNIT II: Chapter 6 (Page no:355-357,370 to 380)

UNIT III: Chapter 2 (Page no:11 to 51,62-76)

UNIT IV: Chapter 5 (Page no: 95 to 104) & Chapter 6 (Page no: 106 to 126)

UNIT V: Chapter 11(Page no:274 to300)

Reference Books

Dr. Arumugam. S and Thangapandi Isaac. A., ***Algebra: Theory of Equations, Theory of Numbers and Trigonometry,*** New Gamma Publishing House, Palayamkottai. July 2011.

Gupta. S. C. and Kapoor. V. K., ***Fundamentals of Mathematical Statistics,*** Sultan Chand & sons, New Delhi. Eleventh edition, 2007.

Vittal. P.R., ***Mathematical Statistics***, Margham Publications, Chennai. 2013.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Theory of equations	**2**	Chalk & Talk
1.2	Imaginary root	**5**	E-Resources
1.3	Irrational Roots	**5**	Discussion
1.4	Relation between the roots and co-efficient	**6**	Chalk & Talk
UNIT - II			
2.1	Transformations of equation	**3**	Chalk & Talk
2.2	Rolle's theorem	**3**	Chalk & Talk
2.3	Newton's Method	**6**	E-Resources
2.4	Horner's Method	**6**	Chalk & Talk
UNIT - III			
3.1	Mean	**5**	E-Resources
3.2	Median	**5**	Chalk & Talk
3.3	Mode	**4**	Discussion
3.4	Standard deviation	**4**	Chalk & Talk

UNIT - IV			
4.1	Curve fittings – Fit a straight line	**4**	Chalk & Talk
4.2	Fit a parabola and other curve	**4**	E-Resources
4.3	Correlation	**6**	Chalk & Talk
4.4	Rank Correlation	**4**	Chalk & Talk
UNIT - V			
5.1	Probability	**4**	E-Resources
5.2	Conditional Probability	**4**	Chalk & Talk
3.5	Problems	**10**	Discussion
	Total	**90**	

Course Designer
Ms. H. Habeeb Rani
Assistant Professor of Mathematics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC21	Electricity & Magnetism	Core - II	75	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain in depth knowledge about the nature of electric charges, potential, method of storing electric charges, motion of electric charges, study of magnetic effects of electric current and magnetic effects of alternating currents

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Explain basic concept of charges and its field and potential	**K1,K2,K3**
CO2	Describe the methods of storing of electrical charges	**K1,K2,K3**
CO3	Discuss the motion of charges and its applications	**K1,K2,K3**
CO4	Explain the magnetic effects of moving charges	**K1,K2**
CO5	Apply various concepts and its applications of alternating currents	**K1,K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**1**	**2**	**1**	**3**
CO2	**2**	**3**	**2**	**1**	**2**
CO3	**1**	**3**	**2**	**1**	**2**
CO4	**3**	**2**	**3**	**1**	**3**
CO5	**3**	**3**	**1**	**1**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**1**	**2**	**1**	**3**
CO2	**2**	**3**	**2**	**1**	**2**
CO3	**1**	**3**	**2**	**1**	**2**
CO4	**3**	**2**	**3**	**1**	**3**
CO5	**3**	**3**	**1**	**1**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 15 Hours

Electric charges - Coulomb's law – Electric field – Flux of electric field - Gauss law and its proof –Applications of Gauss law – Electric field due to charged sphere (a) at a point outside (b) at a point inside (c) at a point on the surface of the sphere. Electric field due to infinite plane sheet of charges – Electric field at a point between two parallel plates charged conductors– Electric field near a conductor – Electric potential – Relation between electric field and potential – Potential due to charged spherical conductor at a point (a) outside (b) on the surface and (c) inside.

UNIT II 15 Hours

Capacitance – Principle of capacitor – Expression for capacitance – Spherical capacitor (both outer sphere earthed and inner sphere earthed) – Cylindrical capacitor - Parallel plate capacitor with and without partially filled dielectric – Capacitors in series and parallel combinations- Energy of a capacitor – Loss of energy, when two charged conductors share the charges – Types of capacitors, fixed capacitor, variable capacitor, electric capacitor and sliding capacitor.

UNIT III 15 Hours

Kirchhoff's laws – Application of Kirchhoff's laws to Wheatstone's networks – Carey Foster's bridge – Determination of the resistance of the given wire with the necessary theory –Temperature coefficient of resistance- determination of temperature coefficient using Carey Fosters bridge- Principle of potentiometer – Determination of internal resistance of the cell using potentiometer – Calibration of ammeter and voltmeter – low range.

UNIT IV 15 Hours

Biot-Savart's law – Its application – Long straight wire of infinite length – Ampere's circuital theorem – Magnetic field at the centre of a circular coil carrying current – Magnetic field along the axis of a coil carrying current – Solenoid – Ballistic Galvanometer Theory – Damping correction – Comparison between deadbeat and aperiodic galvanometer – Comparison of capacitance using B.G.(theory and experiment) – Comparison of e.m.f using B.G. (theory and experiment).

UNIT V 15 Hours

Faradays law of electromagnetic induction – Lenz's law – Self-inductance – Determination of self-inductance by Anderson's method – Growth and decay of current in LR circuit - Growth and decay of current in CR circuit – Alternating current – Peak value, mean value and rms value of current – AC circuit LCR series resonance and parallel resonance – acceptor and rejector circuits.

Text Books

Sehgal, Chopra & Sehgal, ***Electricity and Magnetism***, S. Chand & Co. publications, 1998.

Reference Books

R. Murugesan, ***Electricity*****,** S. Chand & Co. publications, 2004.

K. K. Tewari, ***Electricity and Magnetism*****,** S. chand & Co. publications**,** 2002.

D.N. Vasudeva, ***Electricity and Magnetism with Electronics*****,** S. Chand & Co. publications, 2002.

Pedagogy

Chalk and Talk, Lecture, Seminar, Group discussion, LMS, PPT

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Electric charges - Coulomb's law – Electric field – Flux of electric field	2	Chalk & Talk,

1.2	Gauss law and its proof –Applications of Gauss law – Electric field due to charged sphere (a) at a point outside (b) at a point inside (c) at a point on the surface of the sphere	4	YouTube video,
1.3	Electric field due to infinite plane sheet of charges – Electric field at a point between two parallel plate charged conductors	3	PPT
1.4	Electric field near a conductor – Electric potential – Relation between electric field and potential	3	PPT
1.5	Potential due to charged spherical conductor at a point (a) outside (b) on the surface and (c) inside.	3	Discussions
UNIT - II			
2.1	Capacitance – Principle of capacitor – Expression for capacitance	3	Discussion
2.2	Spherical capacitor (both outer sphere earthed and inner sphere earthed)	3	Chalk & Talk
2.3	Cylindrical capacitor - Parallel plate capacitor with and without partially filled dielectric	3	PPT
2.4	Capacitors in series and parallel combinations- Energy of a capacitor	2	Videos
2.5	Loss of energy, when two charged conductors share the charges,types of capacitors, fixed capacitor, variable capacitor, electric capacitor and sliding capacitor.	4	PPT
UNIT - III			
3.1	Kirchhoff's laws – Application of Kirchhoff's laws to Wheatstone's networks	3	YouTube video
3.2	Carey Foster's bridge – Determination of the resistance of the given wire with the necessary theory	3	Chalk & Talk
3.3	Temperature coefficient of resistance-determination of temperature coefficient using Carey Fosters bridge	3	PPT

3.4	Principle of potentiometer – Determination of internal resistance of the cell using potentiometer	3	PPT
3.5	Calibration of ammeter and voltmeter – low range.	3	Videos and discussion
UNIT - IV			
4.1	Biot - Savart's law – Its application – Long straight wire of infinite length	3	PPT
4.2	Ampere's circuital theorem	3	YouTube video
4.3	Magnetic field at the centre of a circular coil carrying current – Magnetic field along the axis of a coil carrying current	3	Chalk & Talk
4.4	Solenoid – Ballistic Galvanometer Theory – Damping correction	2	PPT
4.5	Comparison between deadbeat and aperiodic galvanometer, comparison of capacitance using B.G.(theory and experiment) – Comparison of e.m.f using B.G. (theory and experiment).	4	PPT
UNIT - V			
5.1	Faradays law of electromagnetic induction – Lenz's law	2	YouTube video
5.2	Self inductance – Determination of self inductance by Anderson's method	3	PPT
3.5	Growth and decay of current in LR circuit - Growth and decay of current in CR circuit	3	PPT
5.4	Peak value, mean value and rms value of current	3	Chalk & Talk
5.5	AC circuit LCR series resonance and parallel resonance – acceptor and rejector circuits.	4	PPT
	Total	**75**	

Course Designer
Dr. M. Charles Robert
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC2P	Major Practical – I	Core – III	90	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students to develop practical skills and verify the various basic concepts of Physics in mechanical, matter, electricity, optical experiments.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Estimate the value of Young's modulus of a given wooden scale, the value of Rigidity modulus of a given wire and determine acceleration due to gravity.	**K1, K2, K3**
CO2	Estimate the viscosity of a given liquid and Comparison of capacitances using B.G and Owen's bridge	**K1, K2, K3**
CO3	Calibration experiments using Potentiometer	**K1, K2, K3**
CO4	Experiments related to optics and sound	**K1, K2, K3**
CO5	Experiments related to heat transport phenomena	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**2**
CO2	**2**	**3**	**3**	**1**	**1**
CO3	**3**	**2**	**3**	**2**	**1**
CO4	**3**	**2**	**1**	**3**	**2**
CO5	**2**	**3**	**2**	**3**	**1**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**3**	**3**	**2**	**1**
CO2	**3**	**1**	**2**	**3**	**1**
CO3	**2**	**3**	**3**	**1**	**2**
CO4	**3**	**2**	**3**	**2**	**1**
CO5	**3**	**3**	**1**	**3**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

List of experiments (Any 12 experiments from the list)

Compound pendulum-Determination of g
Torsional pendulum-Determination of I and G
Young's modulus-Uniform bending –pin and microscope
Young's modulus- Non-uniform bending – optic lever
Young's modulus-Cantilever –pin and microscope
Potentiometer-Calibration of low range voltmeter
Potentiometer-Calibration of an ammeter
Potentiometer-Internal resistance of a cell
Carey Foster's bridge-Determination of resistance and resistivity
Spectrometer-Determination of refractive index of a prism
Thermal conductivity of cardboard-Lee's disc method
Sonometer-Verification of laws
Comparison of capacitances- Ballistic galvanometer
Young's modulus-Cantilever-Dynamic method
Coefficient of viscosity-Stoke's method
Determination of thermo emf-Potentiometer

Reference Books

R. Murugeshan, ***Mechanics Properties of Matter – Practical***, Shantha publications, 2002.

R. Murugeshan, M. Shantha Kiruthiga Sivaprasath, ***Practical Physics Paper I and II,*** S. Chand & Company Pvt. Ltd. New Delhi, Revised Edition, Reprint 2014.

Course designer:

Dr. T.K. Thirumalaisamy
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UMAA21	Ancillary Mathematics - II	Allied - II	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	✓
National	
Global	✓

Preamble

The course deals with the method of solving various ordinary and partial differential equations. Vector calculus help to study its changes.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Extend the concept of differential invector algebra	**K1, K2**
CO2	Find the complete solution of a differential equation with constant coefficients by variation of parameters	**K1, K2**
CO3	Solve linear differential equations with constant coefficients using Laplace transform.	**K1, K2**
CO4	Classify and appropriate methods to solve the first order non-linear partial differential equations.	**K1,K2,K3**
CO5	Explain Proposition and argument. To solve proportional connectives.	**K1,K2,K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Vector algebra – Differentiations of vectors – Gradient –Velocity and Acceleration – Divergence and Curl and theirs imple properties

UNIT II 12 Hours

Second order equation with righ than dside in formX^n, e^{ax}, Sinax, cosax, e^{ax}sinax, e^{ax}cosax , $e^{ax}X^n$

UNIT III 12 Hours

Laplace transforms – Inverse Laplace transforms - Solution of differential equations using Laplace transforms

UNIT IV 12 Hours

Partial Differential Equations – Formations – Standard form Pp+Qp=R.

UNIT V 12 Hours

Logic: Introduction – Proposition - Connectives – truth table - tautology and Contradiction - Logical equivalence and - Logical implication.

Text Books

Dr. Arumugam, S., and Issac, ***Ancillary Mathematics***, Volume–II Edition 2004

Subramanian, N., ***Discrete Mathematics***, June2007.

Reference Books

Arumugam, S., & Thangapandi, A., Isaac, ***Differential Equations***, New Gamma Publishing House, Palayamkottai. July 2011

Bala subrahmanyam, P., & Subramanian. G., ***Ancillary Mathematics,*** Volume – II Tata McGraw-Hill Publishing Company Limited, New Delhi.1996,

Manicavachagom Pillay. K., Natarajan, T., & Ganapathy, K. S., ***Calculus, Volume – II,,*** S. Viswanathan (Printers & Publishers) Pvt.Ltd.,Chennai. 2010.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board & LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Vector algebra	1	Chalk & Talk
1.2	Differentiations of vectors	2	E-Resources
1.3	Gradient	3	Chalk & Talk
1.4	Velocity and acceleration	3	Chalk & Talk
1.5	Divergence and Curl	3	Chalk & Talk
UNIT - II			
2.1	Methods of finding complementary Functions	1	Discussion
2.2	Type A	2	E-Resources
2.3	Type B	3	Chalk & Talk
2.4	Type C	3	Chalk & Talk
2.5	Type D	3	Chalk & Talk
UNIT - III			
3.1	Introduction	1	Discussion
3.2	Laplace transforms	3	E-Resources
3.3	Inverse Laplace transforms	4	Chalk & Talk
3.4	Solution of differential equations using Laplace transforms.	4	Chalk & Talk
UNIT - IV			
4.1	Partial differential equations Introduction	4	Discussion
4.2	Formation of partial differential equations	4	E-Resources
4.3	Standard form Pp+ Qp=R.	4	Chalk & Talk
UNIT - V			
5.1	Introduction & Logical Connectives	3	Discussion
5.2	Truth Table	3	E-Resources
3.5	Tautology	3	Chalk & Talk
5.4	Implication & Equivalence	3	Chalk & Talk
	Total	**60**	

Course Designer
Dr. S. Syedali Fathima
Assistant Professor of Mathematics

Course Code	Course Title	Category	Total Hours	Credits
20UMAA2P	Ancillary Mathematics Practical	Allied - III	30	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	✓
National	
Global	✓

Preamble

This course is designed for those students who wish to learn numerous advance MS Word, Excel, Power Point and Outlook features.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Create file and folders and select to save the document	**K1, K2**
CO2	Select spell for grammar check and save the document	**K1, K2**
CO3	Classify worksheet and analyzing data	**K1, K2**
CO4	Choose text using text effect and apply a graphic presentation	**K1, K2, K3**
CO5	Identify basic navigation tools used in browsers	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**1**	**2**	**3**	**1**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**1**	**2**	**3**	**1**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**1**	**2**	**3**	**1**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**1**	**2**	**3**	**1**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 6 Hours

1. Creating, editing, saving and printing text documents, Font and paragraph formatting, Simple character formatting
2. Inserting tables, smart art, page breaks, using lists and images and working with images

UNIT II 6 Hours

1. Using spelling and grammar check, Understanding document properties,
2. Spreadsheet basics, Creating, editing, saving and printing spreadsheets, Working with function and formulas,

UNIT III 6 Hours

1. Modifying worksheets with color and auto formats, graphically representing data: Charts, Graphs,
2. Speeding data entry: Using Data forms, analyzing data: Data menu, Subtotal, Filtering Data, Formatting worksheets

UNIT IV 6 Hours

1. Opening, viewing, creating and printing slides, Applying auto layouts,
2. Adding custom animation, Using slide transitions

UNIT V 6 Hours

1. Graphically representing data: Charts, Graphs, Creating professional slide for presentation,
2. Understanding how to search/Google.

Text Books

Nellaikannan. C, ***MS OFFICE***, Nels Publication, third edition, 2004.

Reference Books

Bittu Kumar ***Mastering MS Office***

Ramesh Bangia., Learning ***MS Office***

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Creating, editing, saving document	2	Chalk & Talk
1.2	Formatting	2	E-Resources
1.3	Inserting tables	2	E-Resources
UNIT - II			
2.1	Spelling and grammar check	2	Chalk & Talk
2.2	Understanding document properties	2	E-Resources
2.3	Spreadsheet basics.	2	E-Resources
UNIT - III			
3.1	Working with functions and formula	2	Chalk & Talk
3.2	Graphically representing data	2	E-Resources
3.3	Analyzing data	2	E-Resources
UNIT - IV			
4.1	Opening, viewing creating slides	2	Chalk & Talk
4.2	Applying auto layouts	2	E-Resources
4.3	Using slide transitions	2	E-Resources
UNIT - V			
5.1	Graphically representing data	2	Chalk & Talk
5.2	Understanding how to search Google	2	E-Resources
3.5	Using Internet	2	E-Resources
	Total	**30**	

Course Designer

Dr. P. Anitha
Assistant Professor of Mathematics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC31	Heat and Thermodynamics	Core - IV	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

This course deals with the study of kinetic theory of matter, transport phenomena in gases, heat flow and its transformation into energy in the form work in all the three states of matter, laws of thermodynamics, concept of entropy and thermo dynamical relations which form the basis of thermo dynamical behaviour of the three states matter.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Recall the basic knowledge on kinetic theory of gases	**K1, K2, K3**
CO2	Discuss the transport phenomena of the gases	**K1, K2, K3**
CO3	Categorize the fundamental laws of thermodynamics	**K1, K2, K3**
CO4	Survey the concept of Entropy and its physical significance	**K1, K2, K3**
CO5	Analyze the basic principles of thermodynamic potential and applications of Maxwell's thermo dynamical relations	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**1**	**3**	**3**	**3**	**2**
CO2	**3**	**2**	**3**	**1**	**3**
CO3	**3**	**3**	**2**	**2**	**3**
CO4	**3**	**3**	**3**	**3**	**3**
CO5	**2**	**1**	**3**	**2**	**3**

1-Low **2-Medium** **3-Strong**

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	3	2	3
CO2	3	3	1	3	2
CO3	3	3	2	3	3
CO4	2	1	3	2	3
CO5	2	2	3	3	3

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 15 Hours

Kinetic theory of matter – Three states of matter – Concept of ideal or perfect gas – Postulates of kinetic theory of gases – Expression for the Pressure exerted by a gas – Estimation of R.M.S speeds of Molecules – Kinetic energy per unit volume of a gas – kinetic interpretation of Temperature–Avogadro's Hypothesis – Graham's law of diffusion of gases–inter molecular attraction-Theory of porous plug experiment – porous plug experiment – Joule Kelvin effect–temperature of inversion.

UNIT II 15 Hours

Transport Phenomena in Gases – Mean free path – Expression for Mean free path – Transport Phenomena – Diffusion – Viscosity of Gases – Thermal conductivity of gases – Relation between K and temperature – Maxwell's law of distribution of velocity – Derivation of Maxwell's law of distribution of molecular velocities – Experimental verification of velocity distribution–Degrees of freedom and Maxwell's law of Equipartition of Energy–Atomicity of gases.

UNIT III 15 Hours

Thermodynamics – Zeroth law of thermodynamics – Concept of heat – Heat and Workpath dependent function – Comparison of Heat and work –First law of thermodynamics – First law of thermodynamics a change in state of a closed system – Application of first law of thermodynamics for specific heats of a gas – Isothermal, adiabatic, Isochoric and Isobaric process – Gas equation during adiabatic process–Second law of thermodynamics

UNIT IV 15 Hours

Entropy – Carnot's reversible engine and efficiency – Carnot's Theorem – Concept of Entropy – Change in Entropy in a reversible and irreversible process – Change in entropy in conversion of ice into steam – Third law of Thermodynamics – Temperature and Entropy (T-S) diagram – Entropy of a perfect gas – Zero point energy–Negative temperature.

UNIT V 15 Hours

Thermodynamical Relations – Maxwell's Thermodynamical relations – Derivation –Helmholtz function – Thermodynamical potential (Gibb's function) – Enthalpy – Relation between Cp, Cv and μ – Joule – kelvin Coefficient – Equillibrium between liquid and its vapour – First order phase transitions – Second order phase transitions –T-ds equations.

Text Books

Brijlal, Dr. N. Subrahmanyam, P. S. Hemne, ***Heat, Thermodynamics and Statistical Physics*** – ISBN 81-219-2813-3.

Reference Books

Nag, P. K. ***Basic and applied Thermodynamics***, Tata McGraw – Hill Company. Ltd., 2005.

Brijlal, N. Subrahmanyam, ***Heat and Thermodynamics,*** S. Chand & company Ltd., 1998.

Pedagogy

Chalk & Talk, E-Resources & Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Kinetic theory of matter – Three states of matter – Concept of ideal or perfect gas – Postulates of kinetic theory of gases – Expression for the Pressure exerted by a gas – Estimation of R.M.S speeds of Molecules	5	Chalk & Talk
1.2	Kinetic energy per unit volume of a gas– kinetic interpretation of Temperature – Avogadro's Hypothesis – Graham's law of diffusion of gases	5	E-Resources
1.3	Theory of porous plug experiment – porous plug experiment – Joule Kelvin effect – temperature of inversion.	5	PPT
UNIT - II			
2.1	Transport Phenomenain Gases – Mean freepath – Expression for Mean free path– Transport Phenomena – Diffusion – Viscosity of Gases – Thermal conductivity of gases	5	PPT
2.2	Relation between K and temperature – Maxwell's law of distribution of velocity – Derivation of Maxwell's law of distribution of molecular velocities	5	Chalk & Talk,
2.3	Experimental verification of velocity distribution–Degrees of freedom and Maxwell's law of Equipartition of Energy – Atomicity of gases.	5	Discussion
UNIT - III			
3.1	Thermodynamics – Zeroth law of thermodynamics – Concept of heat – Heat and Workpath dependent function	5	E-Resources
3.2	Comparison of Heat and work – First law of thermodynamics – First law of thermodynamics a change in state of a closed system	5	PPT

3.3	Application of first law of thermodynamics for specific heats of a gas – Isothermal, adiabatic, Isochoric and Isobaric process – Gas equation during adiabatic process – Second law of thermodynamics.	5	Chalk & Talk
UNIT - IV			
4.1	Entropy – Carnot's reversible engine and efficiency – Carnot's Theorem –Concept of Entropy	5	Chalk & Talk, E-Resources
4.2	Change in Entropy in a reversible and irreversible process – Change in entropy in conversion of ice into steam	5	Chalk & Talk, PPT
4.3	Third law of Thermodynamics – Temperature and Entropy (T-S) diagram – Entropy of a perfect gas – Zero point energy – Negative temperature	5	PPT
UNIT - V			
5.1	Thermodynamical Relations – Maxwell's Thermodynamical relations – Derivation – Helmholtz function	5	PPT
5.2	Thermodynamical potential (Gibb's function) – Enthalpy – Relation between Cp, Cv and μ – Joule-kelvin Coefficient	5	Chalk & Talk,
3.5	Equillibrium between liquid and its vapour – First order phase transitions – Second order phase transitions –T-ds equations	5	PPT
	Total	**75**	

Course Designer
Dr. M. Fathima Parveen
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC32	Optics	Core – V	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Ascertain macroscopic properties of the objects in terms of microscopic view.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Apply the properties of light in geometrical approach	**K1, K2**
CO2	Discuss the wave nature of light	**K1, K2**
CO3	Apply the interference methods in experiments	**K1, K2**
CO4	Acquire the knowledge of diffraction	**K1, K2, K3**
CO5	Apply the knowledge to understand Polarization	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Syllabus

UNIT I 12 Hours

Deviation produced by thin lens-Focal length of two thin lenses in and out of contact- Refraction through a thin prism – Dispersion-Dispersive power-Combination of thin prisms to produce a) Deviation without dispersion and b) Dispersion without deviation-Direct vision spectroscope-Chromatic aberration in lenses and its removal -Spherical aberration and its removal – Formation of Primary and secondary rainbows – Derivation.

UNIT II 12 Hours

Coherent sources – Interference due to reflected light – Interference due to transmitted light – Interference in thin films – Air wedge – Theory – Determination of thickness of wire - Newton's rings – Theory – Determination of wavelength.

UNIT III 12 Hours

Jamin's Interferometer – principle – applications - Refractive index of a gas - Michelson's Interferometer-Applications-Determination of wavelength – Resolution of spectral line – Fabrey – Perot interferometer – Theory – applications.

UNIT IV 12 Hours

Huygen's –Fresnel theory – Zone plate- Distinction between interference and diffraction – Fresnel, Fraunhofer offer types of diffraction-Theory of plane transmission grating (normal incidence only)-Experiment to determine wavelength. Fraumhofer diffraction pattern due to a straight edge-Fraunhofer diffraction due to a slit, circular aperture.

UNIT V 12 Hours

Polarization – Polarizer – Analyzer - Polaroid and its Applications - Double refraction - Nicol prism - Theory and applications - Huygens's explanation of double refraction - QWP and HWP - Production and analysis of plane, circularly and elliptically polarized light-Optical activity - Fresnel's explanation of optical activity - Specific rotation-Lorentz half shade polarimeter.

Text Books

R. Murugeshan, ***Optics and Spectroscopy***, S. Chand Publications (India) Pvt. Ltd, New Delhi, 2016, 18th edition.

Brijlal and Subrahmanyam, ***A Text Book of Optics***, S. Chand Publications (India) Pvt. Ltd, New Delhi, 2004, 9th edition.

Reference Books

Jenkins F.A., White H. E., ***Fundametals of Optics***, McGraw Hill Book company, New York, 1981, 4th edition.

Halliday and Resnick, ***Fundamentals of Physics***, John Wiley and Sons, Inc, New York, 2009, 6th edition.

Pedagogy

Chalk & Talk, E-Resources & Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Deviation produced by thin lens-Focal length of two thin lenses in and out of contact- Refraction through a thin prism – Dispersion-Dispersive power.	4	Chalk and Talk
1.2	Combination of thin prisms to produce a) Deviation without dispersion and b) Dispersion without deviation-Direct vision spectroscope.	4	E-Resources
1.3	Chromatic aberration in lenses and its removal -Spherical aberration and its removal – Formation of Primary and secondary rainbows – Derivation..	4	Discussion
	UNIT - II		
2.1	Coherent sources – Interference due to reflected light – Interference due to transmitted light.	4	Discussion
2.2	Interference in thin films – Air wedge-Theory - Determination of thickness of wire.	4	E-Resources
2.3	Newton's rings – Theory – Determination of wavelength.	4	Chalk and Talk

UNIT - III			
3.1	Jamin's Interferometer – principle – applications - - Refractive index of a gas.	4	E-Resources
3.2	Michelson's interferometer-Applications-Determination of wavelength.	4	Chalk and Talk
3.3	Resolution of spectral line – Fabrey – Perot interferometer – Theory – applications.	4	E-Resources
UNIT - IV			
4.1	Huygen's –Fresnel theory – Zone plate-Distinction between interference and diffraction - Fresnel, Fraunhofer offer types of diffraction.	4	E-Resources
4.2	Theory of plane transmission grating (normal incidence only)-Experiment to determine wavelength.	4	Discussion
4.3	Fraumhofer diffraction pattern due to a straight edge- Fraunhofer diffraction due to a slit, circular aperture.	4	E-Resources
UNIT - V			
5.1	Polarization-Polarizer-Analyzer-Polaroid and its applications-Double refraction - Nicol prism – Theory and applications.	4	Chalk and Talk
5.2	Huygens's explanation of double refraction-QWP and HWP-Production and analysis of plane, circularly and elliptically polarized light.	4	E-Resources
3.5	Optical activity- Fresnel's explanation of optical activity-Specific rotation-Lorentz half shade polarimeter.	4	Discussion
	Total	**60**	

Course Designer
Dr. A. Mujiber Rahman.
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UCHA11	**Organic, Inorganic and Physical Chemistry - I**	**Allied-IV**	**60**	**3**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To recognize the properties of hydrogen, oxides, water, colloids carbohydrates, stereoisomerism, amino acids, proteins and dyes.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	List the preparation and properties of hydrides, oxides, hardness of water and its implications.	**K1**
CO2	Classify the colloidal states of matter and its applications	**K1, K2**
CO3	Demonstrate the reactions of glucose, fructose and sucrose and relate their uses	**K1, K2**
CO4	Explain the concept of enantiomers, diastereoisomers and geometrical isomers	**K1, K2**
CO5	Identify the properties, classification and functions of proteins and dyes	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**2**
CO4	**3**	**2**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**2**
CO4	**3**	**2**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Hydrogen: Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen – hydrides – definition – classification – examples - Oxides – Definition – classification – examples. Water: Hardness of water – types of hardness – removal of hardness – industrial implications of hardness in water – estimation by EDTA method (outline only) - Units of hardness of water.

UNIT II 12 Hours

Colloids: Colloidal states of matter – various types – classification - Sols – dialysis – electro osmosis – electrophoresis – stability of colloids – protective action – Hardy Schulze law – gold number - Emulsion: Types of emulsions – emulsifier with examples - Gels: Classification, preparation - Applications of colloids.

UNIT III 12 Hours

Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose – Haworth structure (glucose only) – conversion of glucose to fructose and vice versa, mutarotation - Disaccharides: Sucrose – structure – distinction between sucrose, glucose and fructose - Polysaccharides: Starch and cellulose (Structure only) – cellulose derivatives.

UNIT IV 12 Hours

Stereoisomerism – chiral center – optical activity of compounds containing one or two chiral centers (lactic and tartaric acid) – R-S notation – enantiomers – diastereoisomers – racemization – resolution - Geometrical isomerism of maleic and fumaric acids - E-Z notation of geometrical isomers.

UNIT V 12 Hours

Amino acids and proteins: Classification – synthesis – properties of amino acids – action of heat, dipolar ion, iso-electric point, and Ruhemann's purple - polypeptides – proteins – classification and biological functions.

Dyes: Definition – theory of colour and constitution – classification based on structure and applications – preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo.

Reference Book

B. S. Bahl & Arun Bahl, ***Advanced Organic Chemistry***, S. Chand & Company, New Delhi, 2009.

B.R. Puri and L.R. Sharma and Madan S. Pathania, ***Principles of Physical Chemistry***, Vishal Publishing Co., Jalandhar, 2005.

R.D. Madan, ***Modern Inorganic Chemistry***, S. Chand, 2013, revised edition,

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Isotopes of hydrogen – preparation, properties and uses of heavy hydrogen	2	Chalk & Talk
1.2	Hydrides – definition – classification – examples	2	E-Resources
1.3	Oxides – Definition – classification – examples	2	E-Resources
1.4	Hardness of water – types of hardness	2	Chalk & Talk
1.5	Removal of hardness - industrial implications of hardness in water	2	E-Resources
1.6	Estimation by EDTA method - Units of hardness of water.	2	E-Resources

UNIT - II			
2.1	Colloidal states of matter – various types – classification	2	E-Resources
2.2	Sols – dialysis – electro osmosis – electrophoresis	2	Chalk & Talk
2.3	Stability of colloids – protective action – Hardy Schulze law – gold number	2	E-Resources
2.4	Types of emulsions – emulsifier with examples	3	E-Resources
2.5	Classification, preparation - Applications of colloids	3	E-Resources
UNIT - III			
3.1	Carbohydrates: Definition – classification – monosaccharides – properties and uses of glucose and fructose	4	E-Resources
3.2	Haworth structure of glucose mutarotation	2	E-Resources
3.3	Conversion of glucose to fructose and vice versa,	2	Chalk & Talk
3.4	Sucrose – structure – distinction between sucrose, glucose and fructose	2	E-Resources
3.5	Starch and cellulose – cellulose derivatives	2	Chalk & Talk
UNIT - IV			
4.1	Stereoisomerism – chiral center – optical activity of compounds containing one or two chiral centers (lactic and tartaric acid)	4	E-Resources
4.2	R-S notation – enantiomers – diastereoisomers – racemization – resolution	4	Chalk & Talk
4.3	Geometrical isomerism of maleic and fumaric acids	2	Chalk & Talk
4.4	E-Z notation of geometrical isomers	2	E-Resources

UNIT - V			
5.1	Amino acids and proteins: Classification – synthesis	2	E-Resources
5.2	Properties of amino acids – action of heat, dipolar ion, iso-electric point, and Ruhemann's purple	3	Chalk & Talk
5.3	Polypeptides – proteins – classification and biological functions	2	E-Resources
5.4	Dyes: Definition – theory of colour and constitution – classification based on structure and applications	2	E-Resources
5.5	Preparation of methyl orange – Bismark brown, malachite green – vat dye – indigo	3	Chalk & Talk
	Total	**60**	

Course Designer
Dr. S. Sivakumar
Assistant Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UPHC41	**Mathematical Physics**	**Core - VI**	**75**	**5**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain knowledge in differential equations which are essential to solve advanced problems in physics, to understand special functions in mathematical methods and to learn the essentials of matrices, concept and principles in vector calculus, determine eigenvalue and eigenvectors in physics, importance of linear and partial differential equations, Fourier series and integrals calculus using some standard functions.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the mathematical basis of vectors and their application in physics problems	**K1, K2, K3**
CO2	Determine the Eigen vectors, Eigen values and to learn the essentials of matrices	**K1, K2, K3**
CO3	Describe the importance of linear and partial differential equations and applications.	**K1, K2, K3**
CO4	Describe differential and integrals calculus using some standard functions and applications	**K1, K2, K3**
CO5	Prove the theorems and study the properties in Fourier series and integral transforms in solving problems associated with physics	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	1	1
CO2	2	2	3	3	2
CO3	2	3	2	3	1
CO4	3	3	3	1	3
CO5	3	1	3	3	3

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	1	3
CO2	3	1	3	3	2
CO3	2	3	3	2	1
CO4	3	3	3	1	3
CO5	3	2	2	3	3

1-Low 2-Medium 3-Strong

Syllabus

UNIT I 15 Hours

Vector Calculus - Addition of vectors - Multiplication of vector – Scalar - Triple product of vectors - Reciprocal system of vectors - Differentiation and integration of vectors - Partial derivative of vectors – Gradient – Divergence –Curl - Laplace operators - Applications of vectors - Work done - Dipole moment - Angular momentum - IR and Raman Spectroscopy.

UNIT II 15 Hours

Matrices - Introduction to matrices - Square, diagonal and constant matrices -real, Symmetric and Hermitian matrices - Normal matrix - Triangular matrix - Inverse matrix - Inverse transformation - Orthogonal matrix - Unitary matrix and their transformations - Cramer‟s rule - Eigen values - Eigen vectors -Simple Applications.

UNIT III 15 Hours

DIFFERENTIAL EQUATIONS-Differential equations of First order and degree-Variable separable-Homogeneous equations- Linear differentiable equation-Exact differential equations-Linear equations with constant coefficients-Solutions of homogeneous and non-homogeneous linear equations-Partial differential equations-Applications- Zeroth, First order of thermodynamics-Particle in one and three dimensional box.

UNIT IV 15 Hours

DIFFERENTIAL AND INTEGRAL CALCULUS: Types of functions – Limits - Continuity-Discontinuity-Differential coefficient of some standard functions-Sum, Product, Quotient of two functions- Applications- Euler's theorem-Thermodynamic equations of state –Law of thermodynamics-Differential Heat of solution- Free Energy-Kirchoff's law-Schrodinger wave equation

UNIT V 15 Hours

FOURIER SERIES AND INTEGRALS TRANSFORM: Fourier series - Dirichlet's theorem - Fourier coefficient cosine and sine series - Fourier Complex form of Fourier series - Applications of Fourier series - Square and Rectangular wave – Fourier transform - Sine and Cosine transform - Parseval's identities – Fourier transform of Derivatives - Evaluation of integrals - Simple problems.

Text Book

B.D. Gupta, ***Mathematical Physics,*** Vikas Publishing House. (ISBN: 0-7069-76-4), 1993., II Edition.

Reference Book

Satya Prakash, ***Mathematical physics with classical mechanics***, Sultan Chand & sons (ISBN: 81-7014- 925-8)

Charlie Harper, ***Introduction to Mathematical Physics***, PHI Learning Pvt. Ltd., 2012.

Gupta, A.B., ***Fundamentals of Mathematical Physics***, Books and allied private limited (ISBN: 81-87134-23-2), 2014

K. Chattopadhyay, ***Mathematical Physics***, New Age International, 2013.

Pedagogy

Chalk and Talk, E-Resources, Group discussion,

Teaching Aids

Black board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Introduction- Addition of vectors-Multiplication of vector-Scalar-Triple product of vectors -Reciprocal system of vectors	5	Chalk and Talk
1.2	Differentiation and integration of vectors-Partial derivative of vectors-Gradient-Divergence-Curl-	5	PPT
1.3	The line integral- Gauss divergence theorem Laplace operators-Applications of vectors-Work done-Dipole moment-Angular momentum-IR and Raman Spectroscopy.	5	E resources
	UNIT - II		
2.1	Introduction to matrices- Square , diagonal and constant matrices-real symmetric and Hermitian matrices	5	Chalk and Talk
2.2	Normal matrix- triangular matrix- the inverse matrix-inverse transformation	5	Chalk and Talk
2.3	Orthogonal matrix- unitary matrix and their transformations- Crame'srule-Eigen values -Eigen vectors; Diagonalizing a matrix	5	E resources
	UNIT - III		
3.1	Differential equations of First order and degree-Variable separable-Homogeneous equations- Linear differentiable equation	5	Chalk and Talk
3.2	Exact differential equations-Linear equations with constant coefficients-Solutions of homogeneous and non-homogeneous linear equations	5	PPT
3.3	Partial differential equations-Applications- Zeroth, First order of thermodynamics-Particle in one and three dimensional box.	5	Chalk and Talk

UNIT - IV			
4.1	Types of functions-Limits-Continuity-Discontinuity-Differential coefficient of some standard functions-Sum, Product, Quotient of two functions.	5	Chalk and Talk, Discussion
4.2	Applications- Euler's theorem-Thermodynamic equations of state –Law of thermodynamics-gular functions.	5	Chalk and Talk
4.3	Differential Heat of solution- Free Energy-Kirchoff's law-Schrodinger wave equation.	5	PPT
UNIT - V			
5.1	Fourier series- Dirichlet's theorem-Fourier coefficient cosine and sine series-Fourier Complex form of Fourier series	5	Chalk and Talk
5.2	Applications of Fourier series-Square and Rectangular wave –Fourier transform-Sine and Cosine transform	5	Chalk and Talk
3.5	Parseval's identities –Fourier transform of Derivatives-Evaluation of integrals-Simple problems.	5	E resources
	Total	**75**	

Course Designer
Dr. M. Fathima Parveen
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC42	Modern Physics	Core – VII	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Ascertain macroscopic properties of the objects in terms of microscopic view.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Students will understand various atomic models	**K1, K2**
CO2	Appraise various properties of X-rays	**K1, K2**
CO3	Describe the wave particle duality	**K1, K2**
CO4	Acquire the knowledge of Quantum Mechanics	**K1, K2, K3**
CO5	Apply the knowledge to various potential fields	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Introduction- Atom model – Bohr atom model- Somerfield relativistic atom model- Elliptical orbits- Relativistic variation of atomic mass- Limitations of Sommerfield atom model - Vector atom model - spatial quantization and spinning electron hypothesis – Quantum numbers - Stern and Gerlach experiment - coupling schemes-Pauli's exclusion principle-Electronics structure of atoms - Zeeman effect – quantum theory of Normal Zeeman effect.

UNIT II 12 Hours

X-rays-characteristics and continuous X-rays – its properties-Applications-Duane and Hunt law -Mosley's law and its importance - Compton Effect – Theory and experimental verification.

UNIT III 12 Hours

Introduction-Blackbody radiation – Planck's hypothesis - Dual nature of matter and radiation-De Broglie's hypothesis of matter waves- de Broglie's wavelength - Davission's and Germer experiment - G. P. Thomson's experiment with relativistic correction. Concept of wave packets for a quantum particle - group velocity and wave velocity and their relations – Heisenberg's uncertainty principle through experiment - illustration. Diffraction of electron through a single slit Experiment.

UNIT IV 12 Hours

Limitations of classical theory- Basic postulates of wave Mechanics-Derivation of time dependent and time independent Schrodinger wave equation- wave function– Physical significance of wave function – Probability density and expression for probability current density – Expectation value – Normalization of wave function of simpler types.

UNIT V 12 Hours

Application of Schrodinger wave equation- Schrodinger equation for a free particle in one dimensional potential well - Eigen function and Eigen values – Particle in one dimensional box–Barrier penetration problem(potential step).

Text Books

R. Murugeshan, ***Modern Physics***, S. Chand Publications (India) Pvt. Ltd, New Delhi, 2016, 18th edition.

D.L. Seghal, K.L. Chopra and N.K. Seghal, ***Modern Physics***, S. Chand Publications (India) Pvt. Ltd, New Delhi, 2004, 9th edition.

Reference Books

G. Aruldhas, P. Rajagopal ***Modern Physics***, Prentice Hall (India) Pvt. Ltd., New Delhi, 2005, 2nd edition.

Arthur Beiser, ***Concepts of Modern Physics***, McGraw Hill Publications, New Delhi, 2009, 6th edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Introduction- Atom model – Bohr atom model- Somerfield relativistic atom model- Elliptical orbits - Relativistic variation of atomic mass.	4	Chalk & Talk
1.2	Limitations of Sommerfield atom model - Vector atom model - spatial quantization and spinning electron hypothesis – Quantum numbers.	4	E-Resources
1.3	Stern and Gerlach experiment - coupling schemes-Pauli's exclusion principle- Electronics structure of atoms - Zeeman effect – quantum theory of Normal Zeeman effect.	4	Discussion

UNIT - II			
2.1	X-rays-characteristics and continuous X-rays.	4	Discussion
2.2	Properties of X- rays -Applications-Duane and Hunt law -Mosley's law and its importance.	4	Chalk & Talk
2.3	Compton effect – Theory and experimental verification.	4	E-Resources
UNIT - III			
3.1	Introduction-Blackbody radiation – Planck's hypothesis - Dual nature of matter and radiation-De Broglie's hypothesis of matter waves.	4	E-Resources
3.2	de Broglie's wavelength - Davission's and Germer experiment - G.P.Thomson's experiment with relativistic correction.	4	Chalk & Talk
3.3	Concept of wave packets for a quantum particle- group velocity and wave velocity and their relations – Heisenberg's uncertainty principle through experiment-illustration. Diffraction of electron through a single slit Experiment.	4	Discussion
UNIT - IV			
4.1	Limitations of classical theory- Basic postulates of wave Mechanics-Derivation of time dependent and time independent Schrodinger wave equation.	4	Discussion
4.2	Wave function– Physical significance of wave function – Probability density and expression for probability current density.	4	E-Resources
4.3	Expectation value – Normalization of wave function of simpler types.	4	Chalk & Talk

UNIT - V			
5.1	Application of Schrodinger wave equation - Schrodinger equation for a free particle in one dimensional potential well.	4	E-Resources
5.2	Eigen function and Eigen values –Particle in one dimensional box.	4	Chalk & Talk
3.5	Barrier penetration problem (potential step).	4	Discussion
	Total	**60**	

Course Designer
Dr. A. Mujiber Rahman.
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC4P	Major Practical - II	Core - VIII	90	3

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students to develop the practical skills, analyze the link between theory and practical and verify the various basic concepts of physics in optics, sound and Electromagnetic theory

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Determine the thickness of a very thin materials and Radius of curvature of Plano convex lens due to the interference by reflected light	**K1 K2 K3**
CO2	Find out the value of λ , μ and Dispersive power of prism by Spectrometer	**K1 K2 K3**
CO3	Analyse the Frequency of A.C mains - Sonometer instrument	**K1 K2 K3**
CO4	Compare the capacitances and e.m.f s of a given cells using B.G,Table Galvanometer, Desauty's Bridge and Owen's bridge	**K1 K2 K3**
CO5	Determine B_H and M value using some experiments related to Electromagnetic theory	**K1 K2 K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**3**	**2**	**2**
CO2	**3**	**3**	**2**	**3**	**3**
CO3	**3**	**1**	**3**	**2**	**3**
CO4	**2**	**2**	**2**	**3**	**3**
CO5	**3**	**3**	**1**	**3**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**2**	**3**	**3**	**2**	**1**
CO2	**3**	**1**	**2**	**3**	**1**
CO3	**2**	**3**	**3**	**1**	**2**
CO4	**3**	**2**	**3**	**2**	**1**
CO5	**3**	**3**	**1**	**3**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

Experiments:

List of experiments (Any 12 experiments from the list)

Air wedge - determination of thickness of a wire.
Newton's rings - determination of Radius of curvature.
Spectrometer - grating – Normal incidence method- determination of λ.
Spectrometer – i-d curve- determination of μ.
Spectrometer – Dispersive power of a prism
Sonometer – determination of ac frequency mains.
B. G - determination of charge sensitiveness of BG.
Table galvanometer - determination of Figure of merit.
B.G – comparison of emf of the two cells.
De Sauty's bridge - comparison of capacitances.
Owen's bridge (AC) - comparison of capacitances.
Determination of B_H- Axial coil method.
Potentiometer- High range voltmeter.
Determination of M- Axial coil method.
Figure of merit –BG.
Determination of M & B_H by Tan C method.

Reference Books

R. Murugeshan, M. Shantha Kiruthiga Sivaprasath, ***Practical Physics Paper I and II*** S. Chand & Company Pvt. Ltd. New Delhi, Revised Edition, Reprint 2014.

Course designer

Dr. M. Fathima Parveen
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UCHA21	**Organic, Inorganic and Physical Chemistry - II**	**Allied-V**	**60**	**3**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To identify the concept of photochemistry, coordination compounds, chromatographic technique, chemotherapy and thermodynamic concepts.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the physical concepts of photochemistry	**K1**
CO2	Explain the basic terms, isomerism and theories involved in coordination compound	**K1, K2**
CO3	Apply the column, thin layer and paper chromatographic techniques to separate and identify the components present in a mixture	**K1,K2, K3**
CO4	classify the chemotherapy drugs such as sulpha, antimalarials, antibiotics and arsenical drugs	**K1, K2**
CO5	Identify the concepts of thermodynamics and its significance	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**2**
CO4	**3**	**2**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**3**	**2**
CO2	**3**	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**2**
CO4	**3**	**2**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 13 Hours

Photochemistry**:** Comparison of thermal and photochemical reactions – definition of photochemical reactions – laws of photochemistry – Grotthus-Draper law – Einstein law – quantum efficiency – reasons for low and high quantum yield with examples – consequence of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence photosensitization – chemiluminescence – bioluminescence – applications of photochemistry.

UNIT II 10 Hours

Coordination compounds: Definition – nomenclature – definition of various terms involved in coordination chemistry – classification of ligands-Werner's theory, EAN rule – VB theory – Nickel carbonyl – chelates.

UNIT III 10 Hours

Chromatographic technique: Principle – classification -adsorption and partition Chromatography- thin layer chromatography – column chromatography (adsorption) – paper Chromatography – gas-solid and gas-liquid chromatography- applications of each type- ion exchange chromatography.

UNIT IV 15 Hours

sulphadiazine – sulphanilamide –preparation and applications. Antimalarials: chloroquine and plasmoquine. Arsenical drugs: Salvarasan – 606 and neosalvarasan. Antibiotics: Definition – classification – penicillin - amoxicillin – ampicillin – tetracyclin– streptomycin – mode of application – uses only.

UNIT V 12 Hours

Definition of thermodynamic terms-system and surrounding – isolated, closed and open systems -intensive and extensive properties**-** Thermodynamic processes – reversible and irreversible, isothermal and adiabatic – state and path functions - Second law of thermodynamics - need for second law–Concept of entropy – physical significance of entropy -Gibbs free energy and its significance.

Reference Book

B. S. Bahl & Arun Bahl, ***Advanced Organic Chemistry***, S. Chand & Company, New Delhi, 2009.

B.R. Puri and L.R. Sharma and Madan S. Pathania, ***Principles of Physical Chemistry***, Vishal Publishing Co., Jalandhar, 2005.

R.D. Madan, ***Modern Inorganic Chemistry***, S. Chand, 2013, revised edition,

J. Ghosh, ***Fundamental concepts of Applied Chemistry***, S. Chand & Co. Publishing.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Comparison of thermal and photochemical reactions – definition of photochemical reactions	2	Chalk & Talk
1.2	Laws of photochemistry – Grotthus-Draper law – Einstein law	2	E-Resources
1.3	Quantum efficiency – reasons for low and high quantum yield with examples	3	E-Resources
1.4	Consequence of light absorption by atoms and molecules – Jablonski diagram – fluorescence – phosphorescence	3	Chalk & Talk
1.5	Photosensitization – chemiluminescence – bioluminescence – applications of photochemistry	3	E-Resources
	UNIT - II		
2.1	Coordination compounds: nomenclature – definition of various terms involved in coordination chemistry	3	E-Resources
2.2	Classification of ligands-Werner's theory, EAN rule	3	Chalk & Talk
2.3	Valence Bond theory – Nickel carbonyl – chelates	4	E-Resources

UNIT - III			
3.1	Chromatographic technique: Principle – classification -adsorption and partition Chromatography	3	E-Resources
3.2	Thin layer chromatography – column chromatography (adsorption) – paper Chromatography	3	E-Resources
3.3	Gas-solid and gas-liquid chromatography-applications of each type- ion exchange chromatography	4	Chalk & Talk
UNIT - IV			
4.1	Sulpha drugs – sulphadiazine – sulphanilamide –preparation and applications	4	E-Resources
4.2	Antimalarials: chloroquine and plasmoquine –preparation and applications	3	Chalk & Talk
4.3	Arsenical drugs: Salvarasan – 606 and neosalvarasan-preparation and applications	3	Chalk & Talk
4.4	Antibiotics: Definition – classification – penicillin - amoxicillin – ampicillin – tetracyclin– streptomycin – mode of application – uses only	5	E-Resources
UNIT - V			
5.1	Definition of thermodynamic terms-system and surrounding – isolated, closed and open systems -intensive and extensive properties	4	E-Resources
5.2	Thermodynamic processes – reversible and irreversible, isothermal and adiabatic – state and path functions	4	Chalk & Talk
5.3	Second law of thermodynamics - need for second law–Concept of entropy – physical significance of entropy -Gibbs free energy and its significance	4	E-Resources
	Total	**60**	

Course Designer

Dr. M. Jannathul Firdhouse

Assistant Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UCHA2P	Volumetric Analysis	Allied-VI	60	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To enable the students to acquire the quantitative skills in volumetric analysis and to calibrate burette, pipette and standard flask.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Build basic quantitative skills in volumetric analysis with the use of burette, pipettes and standard flasks	**K1,K2, K3**
CO2	Apply acidimetric and alkalimetric method for the quantitative volumetric estimation of acids and bases	**K1,K2, K3**
CO3	Estimate the amount of inorganic compounds permanganometrically	**K1,K2, K3**
CO4	Demonstrate the quantitative estimation of Potassium dichromate iodometrically	**K1, K2**
CO5	Plan the laboratory hygiene and safety	**K1, K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**1**	**3**	**3**	**1**	**2**
CO2	**1**	**3**	**3**	**1**	**2**
CO3	**1**	**3**	**3**	**2**	**2**
CO4	**1**	**3**	**3**	**2**	**2**
CO5	**1**	**3**	**3**	**2**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	1
CO2	2	3	3	1	1
CO3	2	2	3	1	1
CO4	2	2	3	1	1
CO5	2	1	1	1	1

1-Low **2-Medium** **3-Strong**

Syllabus

A double titration involving making up of the solution to be estimated or single titration involving making up of the solution to be estimated and the preparation of a primary standard.

I. Acidimetry and Alkalimetry

1. Titrations between a strong acid and strong base.
2. Titrations between a strong acid and weak base.
3. Titrations between a weak acid and strong base.

II. Permanganimetry

1. Titrations between potassium permanganate and oxalic acid, ferrous ammonium sulphate (Mohr's salt)

III. Iodometry (Demonstration Only)

1. Titrations of sodium thiosulphate with potassium permanganate and potassium dichromate.

Reference Book

Sundaram, Krishnan, Raghavan, ***Practical Chemistry (Part II),*** S. Viswanathan Co. Pvt., 1996.

B.S. Furniss, A.J. Hannaford, P.W. G. Smith, A.R. Tatchell, ***Vogel's Text Book of Practical Organic Chemistry***. 5th Edn., Pearson Education, 2005.

Course Designer

Dr. M. Kamal Nasar
Associate Professor of Chemistry

Course Code	Course Title	Category	Total Hours	Credits
20UPHC51	Nuclear Physics	Core - IX	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The course enables the students to gain knowledge about the characteristic features of atomic nuclei, properties nucleons, radioactive decay, nuclear reactions, applications and the principles of nature and interaction between elementary particles.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Explain the characteristic properties of nuclei, nuclear decay and summarize the various nuclear models and their successes and failures.	**K1, K2,K3**
CO2	Describe the properties of Radioactivity, range of alpha, particles, α, β, ϒ decays and its disintegration energy.	**K1,K2,K3**
CO3	Classify the various types of particle accelerators and detectors.	**K1, K2,K3**
CO4	Apply their knowledge to nuclear transmutations and energy produced in nuclear fission and fusion, Nuclear reactors and its features.	**K1,K2,K3**
CO5	Illustrate the characteristic features of fundamental particles with their interactions.	**K1,K2,K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	1	1
CO2	3	3	3	3	3
CO3	2	2	3	2	3
CO4	3	2	2	3	3
CO5	3	1	3	3	2

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	2
CO2	2	3	3	3	3
CO3	1	2	3	3	3
CO4	3	3	3	3	3
CO5	2	1	2	2	2

1-Low 2-Medium 3-Strong

Syllabus

UNIT I 12 Hours

Nuclear Properties: Constituent of nuclei–Classification of nuclei–properties of nucleus–mass defect– Nuclear binding energy –Packing fraction –Stability of nucleus – Semi-emprical mass formula–Existence of magic numbers–theories of nuclear composition - nuclear forces –Yukawa's theory (no derivation) and meson theory of nuclear forces– models of nuclear structure.

UNIT II 12 Hours

Discovery of Radioactivity- properties of α-rays, β-rays and γ-rays – Law of radioactive disintegration– half-life and mean life – law of successive disintegration transient and secular equilibrium–radioactive dating–range of α-rays–Geiger Nuttal law–and its experimental determination by Geiger and Nuttal–Theory of alpha, beta and Gamma decay – Radioisotopes – Applications.

UNIT III 12 Hours

Particle accelerators–Linear accelerator–Cyclotron–Synchrocyclotron–betatron–Nuclear radiation detectors–Ionisation chamber–Geiger-Muller counter–Wilson cloud chamber– Photographic emulsion technique– Spark chamber.

UNIT IV 12 Hours

Nuclear transmutations by α particles–Protons–deuterons –Neutrons and electrons–Nuclear fission–Nuclear fusion- Explanation for energy release–Fusion reaction in Stars – principle and action of Atom bomb–Hydrogen bomb – transuranic elements –Nuclear reactors – General features of nuclear reactors –Different types of nuclear reactors –PWR and BWR.

UNIT V 12 Hours

Origin of Cosmic rays – Primary –Secondary – Latitude, Azimuthal and Altitude effect –Pair production and annihilation – Van Allen belt. Classification of elementary particles –Particles and antiparticles- – Fundamental interactions –conservation laws and symmetry.

Text Books

Aruldhas G, RajagopalP, ***Modern Physics***, PHI Learning Private Limited, Delhi, 2005,7th print.

Reference Books

D. C.Tayal, ***Nuclear Physics***, Himalaya Publishing House, Mumbai, 2017,

Herald Enge, ***Introduction to nuclear physics***, McGraw Hill,1981.

H.S Hans, ***Nuclear Physics***, New Age International publishers,2001.

R. RRoyand B. P. Nigam, ***NuclearPhysics***, NewAgeInternationalLtd,2001.

S. B. Patel, ***Nuclear Physics an Introduction***, Wiley Eastern Ltd,2012

Seghal, chopra & seghal, ***Modern Physics***, Sultan chand 1998.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Classification of nuclei–Isotopes–isotones –isobars–isomers and mirror nuclei–general properties of nucleus–mass defect–nuclear binding energy–stability of nucleus.	4	Chalk & Talk,

1.2	Packing fraction–Semi empirical mass formula-theories of nuclear composition - proton-electron and proton-neutron hypothesis- nuclear forces.	4	PPT
1.3	Yukawa's theory (no derivation) and meson theory- models of nuclear structure -the liquid drop model - shell model.	4	Discussion
UNIT - II			
2.1	Discovery of Radioactivity- properties of α-rays, β-rays and γ-rays – Law of radioactive disintegration– half and mean life	4	YouTube
2.2	Law of successive disintegration transient and secular equilibrium – radioactive dating – range of a-rays– Geiger nuttal law–and its experimental determination by Geiger and Nuttal.	4	PPT
2.3	Theory of alpha, beta and Gamma decay – Radioisotopes – Applications.	4	Discussion
UNIT - III			
3.1	Particle accelerators - linear accelerator-cyclotron - synchro cyclotron	4	E-Resources
3.2	Betatron–nuclear radiation detectors – ionisation chamber–Geiger-muller counter	4	PPT
3.3	Wilson cloud chamber–photographic emulsion technique– Spark chamber	4	Chalk & Talk
UNIT - IV			
4.1	Nuclear transmutations by α particles– protons–deuterons–neutrons and electrons	4	Chalk & Talk
4.2	Nuclear fission–nuclear fusion-Explanation for energy release–Fusion reaction in Stars – principle and action of Atom bomb–hydrogen bomb –	4	PPT

4.3	Transuranic elements –Nuclear reactors – general features of nuclear reactors – Different types of nuclear reactors –PWR and BWR.	4	Discussion
UNIT - V			
5.1	Origin of Cosmic rays–primary–secondary– Latitude effect, Azimuthal.	4	You Tube
5.2	Altitude effect–pair production and annihilation–Van Allen belt. Classification of elementary particles -	4	Chalk & Talk,
5.3	Particles and antiparticles – fundamental interactions–conservation laws and symmetry	4	PPT
	Total	**60**	

Course Designer
Dr. M. Fathima Parveen
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC52	Electronics - I	Core - X	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To characterize the function of semiconductors and its contribution to various electronic devices. Understanding, analysis and application of networks, semiconductor devices, amplifier and feedback circuits and operational amplifiers.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Explain the network theory in electronics	**K1, K2**
CO2	Recognize the Diode function and applications of Diode circuits	**K1, K2, K3**
CO3	Describe the structure of transistors	**K2, K3**
CO4	Utilization of transistors in small signal devices and Operational amplifiers	**K1, K3**
CO5	Determine and manipulate the basic principles of feedback circuits and its device applications	**K2, K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**1**	**2**	**1**	**3**
CO2	**2**	**3**	**2**	**1**	**2**
CO3	**1**	**3**	**2**	**1**	**2**
CO4	**3**	**2**	**3**	**1**	**3**
CO5	**3**	**3**	**1**	**1**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	2	1	3
CO2	2	3	2	1	2
CO3	1	3	2	1	2
CO4	3	2	3	1	3
CO5	3	3	1	1	2

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Energy sources - Constant voltage source –Constant current source-Linear and nonlinear circuit elements – Active and Passive devices - Voltage divider and Current branching circuits- Thevenin's theorem - Norton's theorem - Maximum power transfer theorem- Two port network analysis - Z, Y, h parameter analysis.

UNIT II 12 Hours

Semiconductors - PN junction theory – Junction diodes - V-I characteristics of a PN junction diode - Half wave rectifier - Bridge rectifier – Efficiency-filters - Shunt capacitor filter – Pi filter - Zener diode - Equivalent circuit - Voltage regulator - Voltage doubler – Clippers – its types.

UNIT III 12 Hours

Junction transistor structure (BJT)–Transistor action - Transistor as an amplifier– Transistor connections and characteristics : CB, CE, CC - Comparison- basic CE amplifier - Relation between α, β, γ – d.c and a.c load line - Operating point – biasing- Stabilization - Requirements of a biasing circuit –Stability factor-fixed resistor bias – Emitter feedback bias - Voltage divider bias method.

UNIT IV 12 Hours

Small signal single stage transistor CE amplifier- Biasing – Choosing an operating point – Analysis of CE amplifier using h- parameters - Expression for voltage gain, current gain, power gain, input and output impedances frequency response- small signal multistage amplifier – Two stage RC coupled amplifier – Frequency response and gain - Power amplifiers-Classification of power amplifiers – Single ended class A power amplifier – Calculation of power and efficiency.

UNIT V 12 Hours

OP amplifiers characteristics – Inverting and Non-inverting amplifiers- application as adder, sub tractor, integrator and differentiator – IC 741 pin configuration - Function using block diagram - Feedback principles- Positive and negative feedbacks- effects of negative feedback on gain of the amplifier - Barkhausen's criterion- Transistor oscillators - Hartley, Colpitt's and phase shift oscillator with mathematical analysis.

Text Book

G. Jose Robin and A. Ubald Raj, ***Analog Electronics and Digital Electronics***, Indira Publications, 2008, first edition.

Reference Books

Bhargava N.N, Kulshreshtha D.C and S.C Gupta, ***Basic electronics and linear circuits,*** Tata McGraw Hill Publishing Company Limited, 2007.

J.J. Bophy, ***Basic Electronics***, McGraw Hill Book Company, 1983, **Fourth Edition.**

Paul Horowitz, ***Art of Electronics***, Winfield Hill, Cambridge University Press, 2015, **third edition.**

Salivahanan, Sureshkumar, Vallavaraj, ***Electronic Devices & Circuits,*** Tata McGraw Hill, 2004.

V.K. Mehta and Rohit Mehta, ***Principles of Electronics,*** S. Chand & Co. Ltd, New Delhi, 2016.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
	UNIT - I		
1.1	Energy sources - Constant voltage source –Constant current source-linear and nonlinear circuit elements – Active and passive devices - Voltage divider and Current branching circuits.	4	Chalk & Talk,
1.2	Thevenin's theorem - Norton's theorem.	4	YouTube video,

1.3	Maximum power transfer theorem- Two port network analysis -Z, Y, h parameter analysis.	4	PPT
UNIT - II			
2.1	Semiconductors - PN junction theory – junction diodes - V-I characteristics of a PN junction diode	4	Discussion
2.2	Half wave rectifier - Bridge rectifier - Efficiency - Filters - Shunt capacitor filter – pi filter -	4	Chalk & Talk
2.3	Zener diode - Equivalent circuit - Voltage regulator - Voltage doubler - clippers and clampers	4	PPT
UNIT - III			
3.1	Junction transistor structure (BJT)– Transistor action - Transistor as an amplifier– Transistor connections and Characteristics	4	YouTube video
3.2	CB, CE, CC - Comparison- basic CE amplifier - Relation between α, β, γ- d.c and a.c load line - operating point	4	Chalk & Talk
3.3	Biasing- Stabilization - Requirements of a biasing circuit –Stability factor-fixed resistor bias – emitter feedback bias - Voltage divider bias method	4	PPT
UNIT - IV			
4.1	Small signal single stage transistor CE amplifier- biasing – Choosing an operating point	4	PPT
4.2	Analysis of CE amplifier using h-parameters - Expression for voltage gain, current gain, power gain, input and output impedances frequency response- Small signal multistage amplifier –Two stage RC coupled amplifier – Frequency response and gain	4	YouTube video

4.3	Power amplifiers- classification of power amplifiers – Single ended class A power amplifier – Calculation of power and efficiency	4	Chalk & Talk
UNIT - V			
5.1	OP amplifiers characteristics – Inverting and non-inverting amplifiers- application as adder, sub tractor, integrator and differentiator	4	YouTube video
5.2	IC 741 pin configuration - Function using block diagram - Feedback principles- positive and negative feedbacks- Effects of negative feedback on gain of the amplifier - Barkhausen's criterion	4	PPT
5.3	Transistor oscillators - Hartley, Colpitt's and phase shift oscillator with mathematical analysis.	4	PPT
	Total	**60**	

Course Designer
Dr. M. Charles Robert
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC53	Spectroscopy and Laser	Core - XI	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

The course is designed to enable students to understand emission and absorption spectra. In most branches of spectroscopy the system interacts with the electric field and in some case magnetic resonance spectroscopy it interacts with the magnetic field.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the basics of spectroscopy	**K1,K2,K3**
CO2	Describe the concepts of Microwave spectroscopy	**K1,K2,K3**
CO3	Explain the basics of Infrared spectroscopy	**K1,K2,K3**
CO4	Determine the basics of Raman and NMR spectroscopy	**K1,K2,K3**
CO5	Explain the knowledge of Laser	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**2**	**2**	**3**	**3**
CO2	**2**	**3**	**2**	**1**	**2**
CO3	**1**	**3**	**2**	**3**	**2**
CO4	**2**	**2**	**3**	**1**	**3**
CO5	**3**	**3**	**2**	**1**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**2**	**2**	**3**	**3**
CO2	**2**	**3**	**2**	**1**	**2**
CO3	**1**	**3**	**2**	**3**	**2**
CO4	**2**	**2**	**3**	**1**	**3**
CO5	**3**	**3**	**2**	**1**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Interaction of radiant energy and matter – Electromagnetic spectrum - atomic absorption spectroscopy – Principle – Components and operation of atomic absorption spectrometer – Applications- principle of emission spectroscopy- sources – electrodes – Sample handling- Monochromators – Detectors- constant deviation spectroscopic – Hartmann formula and determination of wavelength – Spectroscopic identification of elements – Principle and procedure – Application of emission spectroscopy.

UNIT II 12 Hours

Types of molecular energy – Rotation and classification of molecules- theory of pure rotational spectra of rigid diatomic molecule- non-rigid rotator- Microwave components – Stark effect – Stark modulated Microwave spectrometer – application of Microwave spectroscopy.

UNIT III 12 Hours

IR spectral range – Requirements for absorption of IR radiation- Types of vibrations- Theory of Vibrational spectra of diatomic molecule – Anharmonic vibrations of diatomic molecule- Theory and nature of Vibrational rotational spectra of diatomic molecule- IR radiation sources – Sample cells and sampling of substances- Detectors-Spectrophotometer-Applications.

UNIT IV 12 Hours

Raman effect- criterion – Quantum theory- rotational Raman spectra of diatomic molecule-Vibration Raman spectra of diatomic molecule - Sources –filters – sample containers-spectrograph- Rule of mutually exclusion – Comparison between Raman spectra and IR spectra. Principle and theory of NMR spectra- NMR spectrometer qualitative ideas of chemical shift – Simple applications- basic principle- instrumentation and applications of Nuclear Spin Resonance and Electron Spin Resonance spectra.

UNIT V 12 Hours

Basic ideas of Lasers- Stimulated emission and population inversion – Derivation of Einstein's Coefficients - He-Ne laser –Semiconductor laser - Advantages of Laser light - NH_3 maser – Laser Raman Spectroscopy- Holography- Principle and requirements- Applications.

Text Book

Gurudeep. R. Chatwal and sham K. Anand, ***Spectroscopy***, Himalayan Publishing House, Mumbai, 1992.

Reference Books

Gupta, Kumar and Sharma, ***Spectroscopy,*** Pragathi Publishers,

S.N.ThakurRai , Atom***, Laser and Spectroscopy*** , PHI private Ltd. Publishers

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Interaction of radiant energy and matter – electromagnetic spectrum - atomic absorption spectroscopy – principle – components and operation of atomic absorption spectrometer – applications.	4	Chalk & Talk,
1.2	principle of emission spectroscopy- sources – electrodes – sample handling- monochromators –detectors	4	PPT
1.3	Constant deviation spectroscopic Hartmann formula and determination of wavelength – spectroscopic identification of elements - principle and procedure – application of emission spectroscopy	4	PPT

UNIT - II			
2.1	Types of molecular energy – rotation and classification of molecules-	4	PPT
2.2	Theory of pure rotational spectra of rigid diatomic molecule- non-rigid rotator	4	Chalk & Talk
2.3	MW components – stark effect – Stark modulated MW spectrometer – application of MW spectroscopy	4	PPT
UNIT - III			
3.1	IR spectral range – requirements for absorption of IR radiation- types of vibrations- theory of vibrational spectra of diatomic molecule –	4	PPT
3.2	anharmonic vibrations of diatomic molecule- theory and nature of vibrational rotational spectra of diatomic molecule- IR radiation sources	4	Chalk & Talk
3.3	Sample cells and sampling of substances-detectors-spectrophotometer-applications.	4	PPT
UNIT - IV			
4.1	Raman effect- criterion – quantum theory-rotational Raman spectra of diatomic molecule-vibration Raman spectra of diatomic molecule-	4	PPT
4.2	rotational vibrational spectra of diatomic molecule- techniques and instrumentation- sources –filters – sample containers-spectrograph- rule of mutually exclusion.	4	PPT
4.3	Comparison between Raman spectra and IR spectra. Principle and theory of NMR spectra- NMR spectrometer qualitative ideas of chemical shift – simple applications- basic principle-instrumentation and applications of NSR and ESR spectra.	4	Chalk & Talk

UNIT - V			
5.1	Basic ideas of Lasers- stimulated emission and population inversion	4	Discussion
5.2	NH_3 maser – He-Ne laser advantages of Laser light- Laser Raman spectroscopy	4	Discussion
5.3	Holography- Principle and requirements- applications	4	Discussion
	Total	**60**	

Course Designer
Mr. M. Mohamed Ismail
Head & Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHE51	Medical Physics	Elective - I	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The aim of this course is to understand the basics about the biological systems in our body, their behavior, and the diagnostic services.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe biological systems	**K1, K2**
CO2	Express the function of Ear	**K2**
CO3	Describe the dual nature of Eye	**K1, K2**
CO4	Apply the knowledge on X-ray applications	**K1,K2,K3**
CO5	Apply the medical instruments in various areas	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 15 Hours

Introduction – Basic Anatomical Terminology – Modeling and Measurement – Forces on and in the body – Physics of the skeleton – Heat and Cold in Medicine – Energy, Work and Power of the body – Physics of Cardiovascular system – Derivation for work of the Heart – Transmural Pressure across blood vessels – The blood flow conditions in the cardiovascular system – Turbulent flow.

UNIT II 15 Hours

Electricity within the body – Electricity and Magnetism in Medicine - Physics of the Ear and Hearing – Configuration of Ear – The outer ear – Eardrum – Derivation of reflection and transmission at the eardrum – The middle ear – The inner ear - Light in Medicine – Applications of UV, IR and Laser in medicine.

UNIT III 15 Hours

Physics of the Eye and vision – General structure of the eye – Derivation of refracting and focusing of the eye system – Geometrical optics of the eye – Structure of the receptor system – Optical aberrations of eye – Eye defects – Myopia and Hyperopia

UNIT IV 15 Hours

X-rays - Instrumentation for diagnostic X-rays – X-ray machines – Special techniques – Instrumentation for medical radio isotopes – Biotelemetry – introduction – The components of a biotelemetry system – Radio telemetry system - Block diagram of a biotelemetry transmitter.

UNIT V 15 Hours

Electrocardiography (ECG) – ECG lead configuration – Bipolar limb leads - Augmented unipolar limb leads – ECG recording setup – Electroencephalography (EEG) – Origin of EEG –Electromyography (EMG) – Recording setup – Computer Tomography – principle – mathematical basis of image construction – Block diagram of CT – Applications of CT scan.

Text Book

A. MujiberRahman, ***Medical Physics***, Scitech Publications (India) Pvt. Ltd, Chennai, 2019, 1st edition.

Reference Books

John R. Cameron, James G. Skofronick, ***Medical Physics***, John Wiley & Sons, UK, 1987, 2nd edition.

M. Arumugram, ***Biomedical Instrumentation***, Auradha Publications, Chennai, 2001, 2nd edition.

Mackay, Stuart & John Wiley, ***Biomedical Telemetry: Sensing and transmitting*** Wiley EEE Press, 2nd edition, 1988.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction – Basic Anatomical Terminology – Modeling and Measurement – Forces on and in the body.	5	Chalk & Talk
1.2	Physics of the skeleton – Heat and Cold in Medicine – Energy, Work and Power of the body – Physics of Cardiovascular system	5	E-Resources
1.3	Derivation for work of the Heart – Transmural Pressure across blood vessels – The blood flow conditions in the cardiovascular system – Turbulent flow.	5	Discussion

UNIT - II			
2.1	Electricity within the body – Electricity and Magnetism in Medicine -Physics of the Ear and Hearing.	5	Discussion
2.2	Configuration of Ear – The outer ear – Eardrum – Derivation of reflection and transmission at the eardrum.	5	Chalk & Talk
2.3	The middle ear – The inner ear - Light in Medicine – Applications of UV, IR and Laser in medicine.	5	E-Resources
UNIT - III			
3.1	Physics of the Eye and vision – General structure of the eye – Derivation of refracting and focussing of the eye system.	5	E-Resources
3.2	Geometrical optics of the eye – Structure of the receptor system.	5	Chalk & Talk
3.3	Optical aberrations of eye – Eye defects – Myopia and Hyperopia.	5	Discussion
UNIT - IV			
4.1	Generation of ionising radiation – Detection of radiation – Instrumentation for diagnostic X-rays.	5	Discussion
4.2	X-ray machines – Special techniques – Instrumentation for medical radio isotopes – Biotelemetry.	5	E-Resources
4.3	Introduction – The components of a biotelemetry system – Radio telemetry system - block diagram of a biotelemetry transmitter.	5	Chalk & Talk

UNIT - V			
5.1	Electrocardiography (ECG) – ECG lead configuration – Bipolar limb leads - Augmented unipolar limb leads – ECG recording setup – Electrode – Electrode Paste – Types of electrodes	5	E-Resources
5.2	Electroencephalography (EEG) – Origin of EEG –Electromyography (EMG) – Recording setup.	5	Chalk & Talk
3.5	Computer Tomography – principle – mathematical basis of image construction – block diagram of CT – Applications of CT scan.	5	Discussion
	Total	**75**	

Course Designer
Dr. A. Mujiber Rahman
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHE52	Astrophysics – I	Elective - I	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

One should have a broader understanding and appreciation of the intellectual and cultural benefits gained through astronomy as a science.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the birth of Astronomy and its evolution	**K1, K2**
CO2	Discuss the spectroscopy in astronomy	**K2**
CO3	Describe the various types of telescopes	**K1, K2**
CO4	Acquire the knowledge about the Earth	**K1,K2,K3**
CO5	Apply the knowledge to study planets	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 15 Hours

Birth of Modern Astronomy – Geocentric and Heliocentric theories – Celestial sphere – Coordinate systems – Horizontal and equatorial systems – Kepler's laws – Newtonian gravitation – Constellations and nomenclature of stars – stellar distance – stellar magnitude – spectral classification – Colour index.

UNIT II 15 Hours

Spectroscopy in astronomy –Simple Spectroscopy - Atoms and matter model of the atom – Conservation of energy – Electromagnetic spectrum – sunlight and spectroscopy – Sun's continuous spectrum – Solar absorption line spectrum – Band spectrum – Electromagentic spectrum.

UNIT III 15 Hours

Elements of the telescope – Properties of images – Aberrations of telescopes – Different types of Optical telescopes – Refracting and Reflecting telescopes – Schmidt telescope - Radio telescope – Hubbles Telescope – Advantages and disadvantages – Spectrograph - Limitations – Photographic photometry – Photoelectric photometry – Spectrophotometry – Detectors and image processing.

UNIT IV 15 Hours

History of the Earth – Derivation for Temperature of a Planet - The atmosphere - Derivation for Temperature distribution – Derivation for Pressure distribution - The magnetosphere - The orientation of Earth in space – Precession of the Earth - Arc and time units – Time keepers – Sidereal time – local time -Standard time.

UNIT V 15 Hours

Planets – Terrestrial and Jovian planets (Planets individual description is not required in detail) – Satellites– Asteroids - Meteoroids – Comets - The Moon - The lunar surface - The lunar interior – Eclipses – Lunar eclipse – Solar eclipse.

Text Books

A. Mujiber Rahman, ***Concepts of Astrophysics***, SCITECH Publications, Chennai, 2019, 1st edition.

A. Mujiber Rahman, ***Introduction to Astrophysics***, SCITECH Publications, Chennai, 2018, 1st edition.

Reference Books

Abell, Morrison and Wolf, 1987, ***Exploration of the Universe***, Saunders College Publication, 5thedition.

Carrol and Ostlie, ***Introduction to Modern Astrophysics***, Pearson International, 2007, 2nd edition.

Marc. L. Klutner, ***Astronomy A physical perspective***, Cambridge University, 2003, 2nd edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Birth of Modern Astronomy – Geocentric and Heliocentric theories – Celestial sphere.	5	Chalk & Talk
1.2	Coordinate systems – Horizontal and equatorial systems – Kepler's law – Newtonian gravitation.	5	E-Resources
1.3	Constellations and nomenclature of stars – stellar distance – stellar magnitude – spectral classification – Colour index.	5	Discussion

UNIT - II			
2.1	Spectroscopy in astronomy –Simple Spectroscopy - Atoms and matter model of the atom.	5	Discussion
2.2	Conservation of energy – Electromagnetic spectrum – sunlight and spectroscopy.	5	Chalk & Talk
2.3	Sun's continuous spectrum – Solar absorption line spectrum, Band spectrum- Electromagnetic spectrum.	5	E-Resources
UNIT - III			
3.1	Elements of the telescope – Properties of Images – Aberrations of telescopes – Different types of Optical telescopes – Refracting and Reflecting telescopes	5	E-Resources
3.2	Schmidt telescope - Radio telescope – Hubble's Telescope - Advantages and disadvantages – Spectrograph - Limitations.	5	Chalk & Talk
3.3	Photographic photometry – Photoelectric photometry – Spectrophotometry – Detectors and image processing.	5	Discussion
UNIT - IV			
4.1	History of the Earth – Derivation for Temperature of a Planet - The atmosphere - Derivation for Temperature distribution – Surface temperature of the sun.	5	Discussion
4.2	Derivation for Pressure distribution - The magnetosphere - The orientation of Earth in space – Precession of the Earth.	5	E-Resources
4.3	Arc and time units – Time keepers – Sidereal time – local time - Standard time.	5	Chalk & Talk

UNIT - V			
5.1	Planets – Terrestrial and Jovian planets (Planets individual description is not required in detail) – Satellites	5	E-Resources
5.2	Asteroids - Meteoroids – Comets - The Moon - The lunar surface.	5	Chalk & Talk
3.5	The lunar interior – Eclipses – Lunar eclipse –Solar eclipse.	5	Discussion
	Total	**75**	

Course Designer
Dr. A. Mujiber Rahman
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHE53	Energy Physics	Elective - I	75	5

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

One should have a broader understanding and appreciation of the applications of non-conventional energy sources.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Identify various energy resources	**K1, K2**
CO2	Discuss various uses of solar energy	**K2**
CO3	Describe the various types of solar collectors	**K1, K2**
CO4	Explain the knowledge about geothermal energy	**K1,K2,K3**
CO5	Apply the knowledge to study biomass energy	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 15 Hours

Introduction – Various forms of energy – Classification of energy resources – primary and secondary energy resources - Renewable and non-renewable energy systems – Merits and demerits of renewable energy sources – Merits and demerits of non-renewable energy sources – Environmental implications

UNIT II 15 Hours

Solar heater – Various types of solar water heater – Crop dryers – Open solar drying – Direct solar drying – Indirect solar drying – Space cooling – Solar cooling systems – Solar ponds – Convecting and non-convecting solar ponds – salt gradient ponds – Solar cookers – Box type solar cooker – Merits and demerits – water desalination.

UNIT III 15 Hours

Solar energy collectors – Physical principles of the conversion of solar radiation into heat – Flat plate collector – Types of flat plate collector – Solar concentrating collectors – Advantages and Disadvantages of concentrating collectors – Concentrating collectors over flat plate collectors – Difference between flat plate and concentrating collectors – Solar selective coatings.

UNIT IV 15 Hours

Geothermal energy – Principle – Advantages and disadvantages – Wind energy – Advantages and disadvantages – Expression of power from the wind – Ocean Thermal Electric Conversion (OTEC) – Principle – methods and working principles of OTEC power generation plants – Wave and tidal energy – Wave energy technologies – Merits and demerits of tidal energy – Merits and demerits of wave energy.

UNIT V 15 Hours

Introduction to biomass energy – Classification – Biomass gasification – photo synthesis – Biogas conversion – Gobar gas plants – Ethanol from wood – enzymatic hydrolysis process – Biofuels.

Text Books

A. MujiberRahman, ***Solar Energy***, SCITECH Publications (India) Pvt. Ltd, Chennai, 2019, 1st edition.

A.K. Raja, Manish Dwidei & AmitPrakash, ***Introduction to Non-Conventional Energy Resources***, SCITECH Publications (India) Pvt. Ltd, Chennai, 2005, 1st edition.

Reference Books

G.D. Rai, ***Solar Energy Utilization***, Khanna Publishers, New Delhi, 1988, 2nd edition.

G.N. Tiwari, ***Solar Energy Fundamentals, design, Modeling and applications***, Narosa Publications, New Delhi, 2002, 3rd edition.

B.H. Khan, ***Non-conventional energy resources***, Tata-McGraw Hill Publishing Company, New Delhi, 1992, 2nd edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction – various forms of energy – Classification of energy resources – primary and secondary energy resources.	5	Chalk & Talk
1.2	Renewable and non-renewable energy systems – Merits and demerits of renewable energy sources.	5	E-Resources
1.3	Merits and demerits of non-renewable energy sources – Environmental implications	5	Discussion

UNIT - II			
2.1	Solar heater – various types of solar water heater – crop dryers – open solar drying – direct solar drying – indirect solar drying.	5	Discussion
2.2	Space cooling – solar cooling systems – solar ponds – convecting and non-convecting solar ponds – salt gradient ponds.	5	Chalk & Talk
2.3	Solar cookers – box type solar cooker – merits and demerits – Water desalination – Photo voltaic basics – Solar cells – merits and demerits of solar cells.	5	E-Resources
UNIT - III			
3.1	Solar energy collectors – Physical principles of the conversion of solar radiation into heat – Flat plate collector – Types of flat plate collector.	5	E-Resources
3.2	Solar concentrating collectors – advantages and disadvantages of concentrating collectors.	5	Chalk & Talk
3.3	Concentrating collectors over flat plate collectors – difference between flat plate and concentrating collectors – Solar selective coatings.	5	Discussion
UNIT - IV			
4.1	Geothermal energy – principle – advantages and disadvantages – wind energy – advantages and disadvantages.	5	Discussion
4.2	Expression of power from the wind – Ocean Thermal Electric Conversion (OTEC) – principles – methods and working principles of OTEC power generation plants.	5	E-Resources
4.3	Close type OTEC system – open cycle OTEC system – Wave and tidal energy – wave energy technologies – merits and demerits of tidal energy – merits and demerits of wave energy.	5	Chalk & Talk

UNIT - V			
5.1	Introduction to biomass energy – classification – biomass gasification	5	E-Resources
5.2	Photo synthesis – biogas conversion - gobar gas plants – ethanol from wood.	5	Chalk & Talk
3.5	Enzymatic hydrolysis process – biofuels – biopower – biodiesel.	5	Discussion
	Total	**75**	

Course Designer
Dr. A. Mujiber Rahman
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHS51	Properties of Matter	SBS - I	30	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

This course deals with the theoretical and experimental aspects of basic properties of matter such as elasticity, viscosity, surface tension and diffusion. This deals with the laws of motion, concepts of system of particles, dynamics of rigid bodies and oscillations. The course is designed to enable students to measure physical quantities associated with the above properties through experiments during laboratory sessions. This course deals the knowledge about the properties of sound waves.

Syllabus

UNIT I 6 Hours

Expression for Stress, Strain – Poisson's ratio – Hook's law – Young's modulus – Bending of beam – Expression for bending moment – Uniform and Non – Uniform bending (Theory).

UNIT II 6 Hours

Definition of surface tension – Angle of contact – Capillary rise - Excess of pressure inside a bubble and spherical drop – Experimental determination of Surface Tension by Capillary rise method.

UNIT III 6 Hours

Viscosity –Coefficient of viscosity – Streamline and turbulent motion – Critical velocity – Capillary flow Bernoulli's theorem – Coefficient of viscosity of a viscous liquid by Stokes' method – Venturimeter – Pitot's tube.

UNIT IV 6 Hours

Simple harmonic motions – Progressive wave properties – Composition of two S.H.M. and beats stationary waves – Properties – Melde's experiment for the frequency of electrical maintained tuning fork – Transverse and longitudinal modes – AC frequency Sonometer – Tuning fork.

UNIT V 6 Hours

Acoustics – Requisites for good acoustics – Ultrasonics – Production and detection – Properties and applications – Reverbration formula.

Text Book

R. Murugesan, ***Properties of matter***, S. Chand & Co., 2004.

Reference Books

Brijlal and Subramanian S, ***Properties of matter***, Chand & Co., 2004.

D.S. Mathur, ***Elements of properties of matter***, S. Chand & Co., 2004.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Basic forces in nature, Types of forces, gravitational force, Electromagnetic force and nuclear forces	1	Chalk & Talk
1.2	Conservative and Non conservative forces	1	E-Resources
1.3	Laws of Friction, Limiting, Coefficient and Angle of friction	1	Discussion
1.4	Motion of bodies along an inclined plane	1	E-Resources
1.5	Work, work done by varying force	1	Chalk & Talk
1.6	Expression for kinetic energy and potential energy, Power	1	E-Resources

UNIT - II			
2.1	Angular velocity, Normal acceleration(no derivation), Centrifugal and centripetal forces	1	E-Resources
2.2	Torque and angular momentum	1	Discussion
2.3	Expression for Torque in rotational motion	1	Chalk & Talk
2.4	Expression for angular momentum of a rotating rigid body	1	Discussion
2.5	K.E of rotation-work and power rotational motion	1	E-Resources
2.6	Moment of inertia, Laws of parallel and perpendicular axes theorems, M.I of ring, circular discs, solid cylinder and solid sphere	1	Discussion
UNIT - III			
3.1	Kepler's laws of planetary motion	1	Chalk & Talk
3.2	Law of gravitation	1	E-Resources
3.3	Mass and density of Earth-	1	Discussion
3.4	Boy's method for G, Compound pendulum, expression for period, Experiment to find g	1	E-Resources
3.5	Variation of g with latitude, altitude and depth	1	Discussion
3.6	Satellites, orbital and escapevelocity, Period of revolution, Polar and Geo-stationary satellites	1	Chalk & Talk
UNIT - IV			
4.1	Elastic moduli, Poisson's ratio	1	Chalk & Talk
4.2	Beams, expression for bending moment	1	E-Resources
4.3	Determination of Young's modulus by uniform and non-uniform bending, I section of girders, Torsion	1	Discussion
4.4	Expression for couple per unit twist–work done in twisting	1	E-Resources

4.5	Torsional pendulum, Derivation of Poisiuille's formula (analytical method)	1	Chalk & Talk
4.6	Bernoulli's theorem proof, applications, Venturimeter, Pitot tube	1	Discussion
UNIT - V			
5.1	Simple harmonic motions	1	Chalk & Talk
5.2	Progressive waves properties	1	E-Resources
5.3	Composition of two S.H.M	1	Discussion
5.4	Beats stationary waves, Properties	1	E-Resources
5.5	Melde's experiment for the frequency of electrical maintained tuning fork Transverse and longitudinal modes	1	Discussion
5.6	Acoustics, Ultrasonic, Properties and application	1	Chalk & Talk
	Total	**30**	

Course Designer
Dr. T. K. Thirumalaisamy
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHS52	**Physics for Competitive Exams - I**	**SBS - II**	**30**	**2**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	✓
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

Prepare the students to gain knowledge in solving problems in physics to success in competitive exam.

Syllabus

UNIT I 6 Hours

Number systems - H.C.F and L.C.M- Decimal fractions- Profit and Loss – Percentage - simple and compound interest.

UNIT II 6 Hours

Logical Venn diagram - Mathematical operations – Direction sense test – complete the incomplete pattern-odd man out

UNIT III 6 Hours

Mechanics and Relativity – Properties of Matter and sound

UNIT IV 6 Hours

Electricity - Heat and Thermodynamics

UNIT V 6 Hours

Electromagnetic - Optics and Laser

Text Books

T. S. Jain, ***Upkar's Book Clerical Cadre***, Upkar's Prakashan Publishers, Code No. 1727.

NEET Crash Course 2021 Physics, Pearson Publishers, 2021.

Reference Books

A to Z Physics for NEET – XI, Cengage Learning India Pvt.Ltd., Cengage series 2021.

A to Z Physics for NEET – XII, Cengage Learning India Pvt.Ltd., Cengage series 2021.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Number systems - H.C.F and L.C.M	2	Chalk & Talk,
1.2	Decimal fractions- Profit and Loss	2	PPT,
1.3	Percentage -simple and compound interest.	2	YouTube video
UNIT - II			
2.1	Logical Venn diagram	2	Discussion
2.2	Mathematical operations – Direction sense test	2	Chalk & Talk
2.3	complete the incomplete pattern-odd man out	2	PPT
UNIT - III			
3.1	Mechanics and Relativity	3	YouTube video
3.2	Properties of Matter and sound	3	PPT
UNIT - IV			
4.1	Electricity	3	PPT
4.2	Heat and Thermodynamics	3	Chalk and Talk
UNIT - V			
5.1	Electromagnetic	3	PPT
5.2	Optics and Laser	3	YouTube video
Total		**30**	

Course Designer

Mr. J. Hakim

Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC61	Classical and Statistical Mechanics	Core - XII	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

One should have a broader understanding and appreciation of the applications of non-conventional energy sources.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Define the Mechanics of system of Particles	**K1, K2**
CO2	Explain the phenomena generalized co-ordinates and generalized velocities	**K2**
CO3	Describe the various equations of motion of particles	**K1, K2**
CO4	Develop the knowledge on thermodynamic properties of matter with statistical approach	**K1,K2,K3**
CO5	Apply the basic concepts of statistical Mechanics	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	3
CO2	3	3	1	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Mechanics of a particle – conservation of linear momentum- conservation of angular momentum- conservation of energy –Mechanics of a system of particles- conservation of linear momentum- conservation of angular momentum- conservation of energy- Work Energy Theorem – Degrees of freedom - Conservative forces – examples.

UNIT II 12 Hours

Constraints –holonomic and non-holonomic constraints - Degrees of freedom under constraints - Forces of constraints -Generalized co-ordinates – Generalized velocities - Generalized momentum - principle of virtual work-D'Alembert's principle - Lagrangian equation of motion from D'Alembert's principle (Derivation)-Simple applications - (simple pendulum, compound pendulum, Atwood's machine) -Superiority of Lagrangian approach over Newton's approach.

UNIT III 12 Hours

Introduction - Cyclic coordinates - Hamiltonian Function H- Physical Significance-Hamilton's equation of motion (derivation) -Hamilton's principle- Lagrangian's equation of motion from Hamilton's principle - Simple applications (Linear harmonic oscillator, compound pendulum, Motion of a particle in a central force field).

UNIT IV 12 Hours

Microscopic and Macroscopic systems -Ensembles-Phase Space-Probability-Basic postulates of statistical Mechanics-Definition of mathematical Probability-Thermodynamic Probability-Boltzmann's theorem on entropy and Probability-Statistical Equilibrium-Maxwell Boltzmann statistics- Maxwell Boltzmann energy distribution law- Maxwell Boltzmann velocity distribution law.

UNIT V 12 Hours

Bose-Einstein statistics- Bose-Einstein distribution Law-Photon Gas- Planck's law of Black body radiation (derivation)-Deduction of Wien's and Rayleigh Jean's law of black body Radiation-Fermi Dirac statistics- Fermi Dirac distribution law -Electron gas- Comparison between three statistics.

Text Books

Gupta, Kumar and Sharma, ***Classical Mechanics***, Pragatiprakashan Publication, Meerut,1992, 2nd edition.

Gupta & Kumar, ***Elements of Statistical Mechanics***, Macmillan Publication, Bombay, 1993, 2nd edition.

Reference Books

R. Murugeshan, ***Modern Physics***, S. Chand& Publication, New Delhi, 2002, 1st edition.

S. Agarwal, **Statistical physics and Thermodynamics**, S. Chand and Co. Ltd., New Delhi. 3rd edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Mechanics of a particle – conservation of linear momentum- conservation of angular momentum- conservation of energy	4	Chalk & Talk
1.2	Mechanics of a system of particles- conservation of linear momentum- conservation of angular momentum- conservation of energy	4	E-Resources
1.3	Work Energy Theorem – Degrees of freedom - Conservative forces – examples.	4	Discussion

UNIT - II			
2.1	Constraints –holonomic and non-holonomic constraints - Degrees of freedom under constraints - Forces of constraints.	4	Discussion
2.2	Generalized co-ordinates – Generalized velocities - Generalized momentum - principle of virtual work-D'Alembert's principle - Lagrangian equation of motion from D'Alembert's principle (Derivation)	4	Chalk & Talk
2.3	Simple applications - (simple pendulum, compound pendulum, Atwood's machine) -Superiority of Lagrangian approach over Newton's approach.	4	E-Resources
UNIT - III			
3.1	Introduction - Cyclic coordinates - Hamiltonian function H- Physical significance-Hamilton's equation of motion (derivation)	4	E-Resources
3.2	Hamilton's principle- Lagrangian's equation of motion from Hamilton's principle.	4	Chalk & Talk
3.3	Simple applications(Linear harmonic oscillator, compound pendulum, Motion of a particle in a central force field).	4	Discussion
UNIT - IV			
4.1	Microscopic and Macroscopic systems-Ensembles-Phase space-Probability-Basic postulates of statistical mechanics.	4	Discussion
4.2	Definition of mathematical probability-Thermodynamic probability-Boltzmann's theorem on entropy and probability	4	E-Resources
4.3	Statistical equilibrium-Maxwell Boltzmann statistics- Maxwell Boltzmann energy distribution law- Maxwell Boltzmann velocity distribution law.	4	Chalk & Talk

UNIT - V			
5.1	Bose-Einstein statistics- Bose-Einstein distribution law-Photon gas-Planck's law of Black body radiation (derivation).	4	E-Resources
5.2	Deduction of Wien's and Rayleigh Jean's law of black body radiation-Fermi Dirac statistics.	4	Chalk & Talk
5.3	Fermi Dirac distribution law-Electron gas-Comparison between three statistics.	4	Discussion
	Total	**60**	

Course Designer
Dr. A. Mujiber Rahman
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC62	Electronics - II	Core-XIII	60	4

Nature of Course	
Knowledge Oriented	
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Studying the function of electronic digital systems and its contribution to various electronic devices. To understand, analyse and apply the number systems and logic gates, Boolean algebra and K mapping, Binary adders and other circuits, IC 555 Timer and Flip Flops and the function of counters and registers.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe and manipulate various number systems and logic circuits	**K1, K3**
CO2	Experiment with digital systems with Boolean algebra and K mapping	**K2,K3**
CO3	Illustrate the Binary adders and subtractor	**K1, K2**
CO4	Compute the function of IC 555 as timer and flip flops	**K2, K3**
CO5	Explain the function of flip flops as counters, Registers and interfacing circuits	**K2**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**1**	**3**	**2**	**3**	**3**
CO2	**2**	**3**	**2**	**1**	**2**
CO3	**2**	**3**	**2**	**1**	**2**
CO4	**1**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**1**	**1**	**2**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	3	3
CO2	2	3	2	1	2
CO3	2	3	2	1	2
CO4	1	2	3	3	3
CO5	3	3	1	1	2

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Introduction to digital systems - Number system – Binary, decimal, octal, hexadecimal - Conversion from one another – Binary coded decimals (BCD) – ASCII code - Binary addition, subtraction, multiplication, division – Binary addition and subtraction by 1's and 2's complement – Logic gates – OR, AND, NOT, NOR, NAND and EX-OR- Universal gates – Logic families – Diode Resistor logic (DRL) – OR gate, AND gate – RTL NOT gate.

UNIT II 12 Hours

Basic laws of Boolean Algebra – Boolean functions – Properties of Boolean Algebra – De Morgan's theorems - their proof. – Sum of products(SOP) – Product of Sum (POS) - Expression from a truth table - Karnaugh map – 2 variables, 3 variables and 4 variables – Simplification using K-map – pairs, quads and Octets

UNIT III 12 Hours

Half adder – Full adder – 4-bit binary adder – Half Sub tractor – Full Subtractor – 4 bit parallel subtractor – Multiplexer(MUX) – 4 to 1 MUX, D Multiplexer(DMUX) – 1 to 4 DMUX – Encoder - 8 to 3 Encoder – Decimal to BCD Encoder – Decoder – 3 to 8 decoder, BCD to Decimal Decoder – BCD to 7 segment Decoder.

UNIT IV 12 Hours

Timer – IC 555 – Explanation of IC 555 using block diagram – IC 555 monostable multivibrator with derivation of it output pulse – IC 555 astable (free running) multi vibrator and expression for period – Bistable multivibrator - Frequency divider using IC 555 - Flip Flops - R-S flip flops – Clocked R-S flip flops - J-K flip flop – J-K master Slave flip flop – D flip flop – D flip flop as frequency divider - Applications of flip flop.

UNIT V 12 Hours

Counters – Binary counters using JK Flip flop - 4 bit binary counter – Decade counter – Modulo - n counter - Ring counter - Register – Shift register – Classification – Serial in – Serial out (SISO) shift register – Interfacing – R-2R resistive ladder network - Digital to Analog converter (D/A) – Analog to Digital converter (A/D).

Text Book

G. Jose Robin and A. Ubald Raj, ***Analog Electronics and Digital Electronics,*** Indira Publications, 2008, first edition.

Reference Books

Thomas L. Floyd, ***Digital Fundamentals***, 2015, 11th edition.

Malvino, Leech, ***Digital principles and applications,*** Tata Mc-Graw Hill, 6th edition.

Paul Horowitz, ***Art of Electronics***, Winfield Hill, Cambridge University Press, 2015, third edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction to digital systems - Number system – Binary, decimal, Octal, hexadecimal - Conversion from one another – Binary coded decimals – ASCII code	4	Chalk & Talk,
1.2	Binary addition, subtraction, multiplication, division – Binary addition and subtraction by 1's and 2's complement	4	YouTube video,

1.3	Logic gates – OR, AND, NOT, NOR, NAND and EX-OR- Universal gates – Logic families – Diode Resistor logic (DRL) – OR gate, AND gate – RTL NOT gate	4	PPT
UNIT - II			
2.1	Basic laws of Boolean Algebra – Boolean Addition – Properties of Boolean Algebra – De Morgan's theorems - their proof	4	Discussion
2.2	Sum of products(SOP) – Product of Sum (POS) - expression from a truth table	4	Chalk & Talk
2.3	Karnaugh map – 2 variables, 3 variables and 4 variables – simplification using K-map – pairs, quads and Octets	4	PPT
UNIT - III			
3.1	Half adder – Full adder – 4-bit binary adder – Half Sub tractor – Full Subtractor – 4 bit parallel subtractor	4	YouTube video
3.2	Multiplexer (MUX) – 4 to 1 MUX, D Multiplexer (DMUX) – 1 to 4 DMUX – Encoder - 8 to 3 Encoder – Decimal to BCD Encoder	4	Chalk & Talk
3.3	Decoder – 3 to 8 decoder, BCD to Decimal Decoder – BCD to 7 segment Decoder	4	PPT
UNIT - IV			
4.1	Timer – IC 555 – Explanation of IC 555 using block diagram – IC 555 mono stable multivibrator with derivation of it output pulse	4	PPT
4.2	IC 555 astable (free running) multi vibrator and expression for period – Bistable multivibrator - Frequency divider using IC 555 -	4	YouTube video
4.3	Flip Flops - R-S flip flops – clocked R-S flip flops - J-K flip flop – J-K master Slave flip flop – D flip flop – D flip flop as frequency divider - applications of flip flop.	4	Chalk & Talk

UNIT - V			
5.1	Counters – Binary counters using J-K Flip flop - 4 bit binary counter – Decade counter – Modulo - n counter	4	YouTube video
5.2	Ring counter - Register – Shift register – Classification – Serial in – Serial out (SISO) shift register	4	PPT
5.3	Interfacing – R-2R resistive ladder network - Digital to Analog converter (D/A) – Analog to Digital converter (A/D).	4	PPT
	Total	**60**	

Course Designer
Dr. M. Charles Robert
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC63	Solid State Physics	Core - XIV	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain the knowledge about crystal structures, various diffraction techniques. It also deals with the theory of crystal binding and understand the electronic structure of solids especially metals semiconductors and dielectrics. It also discuss the magnetic and dielectric materials.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Determine the of structure factors of fundamental crystal lattices , crystal structures and analyse the X-ray diffraction patterns of simple crystal structures	**K1, K2,K3**
CO2	Classify the different crystal binding forces and study the conductivity in solids and Gain a complete idea about superconductors, some theories involved in super conductivity and its applications	**K1, K2,K3**
CO3	Describe the quantum theories of energy bands, Carrier concentration of both intrinsic and Extrinsic semiconductors and their consequences	**K1, K2,K3**
CO4	Classify the magnetic materials and its theoretical studies.	**K1, K2,K3**
CO5	What are the basics of dielectric materials, different types of polarization and their properties.	**K1, K2,K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	1	3	3	3	2
CO2	3	2	3	3	3
CO3	2	3	2	2	3
CO4	3	3	3	3	3
CO5	2	1	3	2	3

1-Low **2-Medium** **3-Strong**

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	2	3
CO2	3	1	1	2	2
CO3	3	1	2	1	2
CO4	1	3	2	2	3
CO5	2	1	2	3	2

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Crystal Structure–Periodic arrays of atoms – Fundamental types of lattice – Unit cell – Packing fraction – Bravais lattices –Miller indices –Relation between the interplanar and interatomic distance – Simple crystal structures – Structure factor of SC, BCC, FCC and HCP –X-rayDiffraction– Brag'sLaw–determination of crystal structures by Laue method, Rotating crystal method and powder method.

UNIT II 12 Hours

Chemical Bonds and Free electron theory- Ionic crystals – Covalent crystals–Metals–Hydrogen bonds–Classical free electron theory of solids – Electrical conduction– classification of conducting materials–Expression for electrical and thermal conductivity–Widemann Franz law–Super conductivity – General properties of super conducting materials – Types of superconductors –BCS theory – Applications.

UNIT III 12 Hours

Semiconducting materials– Introduction–Band gap – Silicon and germanium – Classification of materials into insulator, semiconductor and conductor on the basis of energy band theory–Carrier concentration in an intrinsic semiconductor–Carrier concentration in an extrinsic semiconductor–Donar states-Acceptor states– Hall effect–Determination of Hall coefficient.

UNIT IV 12 Hours

Magnetic materials–Different types of magnetism –dia – para - ferro– antiferro and ferrimagnetism- Langevin's theory of dia and para magnetism–Concept of domain–Weiss theory of ferromagnetism –Types of Magnetic materials – Properties and applications of soft and hard magnetic materials – Magnetostriction materials – Ferrites and hysteresis.

UNIT V 12 Hours

Dielectric materials–Introduction–Fundamental definitions in dielectrics– Different types of polarization– Frequency and temperature effects on polarization–Dielectric loss–Local field or Internal field–ClausiusMosotti relation–Determination of dielectric constant–Dielectric loss–Dielectric breakdown and properties.

Text Book

S.O. Pillai, ***Solid State physics***, New age international (P) limited (1997).

R. Murugesan ***Modern Physics*** - S. Chand & Co.

Reference Books

Charles Kittel ***Introduction to Solid State Physics***,Wiley-India, , (2011) 7th edition.

Ali Omar, ***Elementary Solid State Physics***, Pearson Education India, (1993).

V. Rajendran and A. Marikani , ***Materials science*** ,Tata McGraw-Hill

Arumugam, ***Material Science,*** Anuradha Agencies-1997.

R. K. Puri & V. K Babbar, ***Solid state physics,*** Chand & co.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Periodic arrays of atoms – Fundamental types of lattice – Unit cell – Packing fraction – Bravais lattices –Miller indices – Relation between the interplanar and interatomic distance	4	PPT
1.2	Simple crystal structures – Structure factor of SC, FCC and HCP –X-ray Diffraction–Brag's Law.	4	Chalk & Talk,
1.3	Determination of crystal structures by Laue method, Rotating crystal method and powder method.	4	Discussion
UNIT - II			
2.1	Ionic crystals – Covalent crystals – Metals – Hydrogen bonds – Classical free electron theory of solids.	4	You Tube Video
2.2	Electrical conduction– classification of conducting materials–Expression for electrical and thermal conductivity– Widemann Franz law.	4	Chalk & Talk
2.3	Super conductivity – general properties of super conducting materials – types of Superconductors –BCS theory – applications.	4	Discussion
UNIT - III			
3.1	Introduction–Band gap – Silicon and germanium – Classification of materials into insulator, semiconductor and conductor on the basis of energy band theory.	4	Chalk & Talk, PPT
3.2	Carrier concentration in an intrinsic semiconductor–Carrier concentration in an extrinsic semiconductor.	4	PPT
3.3	Donor states–Acceptor states – Hall effect–Determination of Hall coefficient.	4	Discussion

UNIT - IV			
4.1	Different types of magnetism –diapara - ferro– antiferro and ferrimagnetism.	4	Chalk & Talk,
4.2	Langevin's theory of dia and para magnetism –Concept of domain – Weiss theory of ferromagnetism	4	PPT
4.3	Types of Magnetic materials – properties and applications of soft and hard magnetic materials – Magnetostriction materials – Ferrites and hysteresis.	4	You Tube Video
UNIT - V			
5.1	Introduction–Fundamental definitions in dielectrics– Different types of polarization.	4	Chalk & Talk,
5.2	Frequency and temperature effects on polarization–Dielectric loss–Local field or Internal field–Clausius Mosotti relation	4	PPT
5.3	Determination of dielectric constant–Dielectric loss–Dielectric breakdown and properties.	4	PPT
	Total	**60**	

Course Designer
Dr. M. Fathima Parveen
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHE61	Applied Physics	Elective-II	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To understand the basic knowledge on fiber optic communication, Optoelectronic devices, describe the various optical Sources and Photo Detectors, understand the conditions for propagation of light in optical fiber.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Discuss the principle of detector and sources.	**K1, K2,K3**
CO2	Describe of the properties of Fiber transmission.	**K1, K2,K3**
CO3	Identify the attenuation and dispersion loss in fiber optical communication.	**K1, K2,K3**
CO4	Discuss the working principle of modulators.	**K1, K2,K3**
CO5	Classify the properties of optical amplifiers and networks.	**K1, K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Introduction – P-N junction as a light source – construction and working of LED – LED materials – LED advantages – semiconductor lasers – Introduction to Photo detector – characteristics of Photo detectors- PN junction Photo detector - PIN photo diode – Avalanche Photo diode – Photo transistor.

UNIT II 12 Hours

Introduction – principle of optical fiber – light transmission in a optical fiber – acceptance angle – critical angle - Numerical aperture – Fiber index profiles- modes of Propagation –single mode –multi mode-TE and TM modes - step index- Graded index fiber.

UNIT III 12 Hours

Attenuation– Attenuation units- absorption losses - scattering losses- Bending losses- core and cladding losses- signal dispersion in fibers- overview of dispersion origins –factors contributing to dispersion-Material Dispersion –Waveguide dispersion – dispersion in single mode fibers.

UNIT IV 12 Hours

Analog and Digital modulation -Modulation of Light by Polarization – optical polarization – Birefringence – wave plates – Optical activity – Modulation of Light by Induced Polarization – Electro optic effect - Electro –optic amplitude modulator-kerr modulators-magneto optic effect - Optical switching – Optical Logic gates.

UNIT V 12 Hours

Components of fiber optic communication - Semiconductor amplifier – Rare earth doped fiber amplifiers –filter-coupler and splitters – Wavelength division multiplexing(WDM) - optical Networking - SONET & SDH – active and passive networks.

Text Books

P. K. Palanisamy, ***Semiconductor Physics and Optoelectronics,*** SCITECH Publication, 2010, First edition.

S. Mohan, V. Arjunan and Sujin P. Jose, ***Fiber Optics and Optoelectronics devices***, MJP Publication,2015

Reference Books

Gerd Keiser, ***Optical Fiber communications***, McGraw Hill, 2013.

Govind P. Agrawal, ***Fiber Optics communication Systems***, John Wiley & Sons Publications, 2004, Third edition.

Khare R. P, ***Fiber Optics and Optoelectronics***, Oxford University Press, 2007.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Introduction – P-N junction as a light source – construction and working of LED	4	PPT
1.2	LED materials – LED advantages – semiconductor lasers – Introduction to Photo detector – characteristics of Photo detectors-	4	YouTube
1.3	PN junction Photo detector - PIN photo diode – Avalanche Photo diode – Photo transistor.	4	Chalk & Talk
UNIT - II			
2.1	Introduction – principle of optical fiber – light transmission in an optical fiber.	4	YouTube
2.2	Acceptance angle – critical angle - Numerical aperture – Fiber index profiles- modes of Propagation –single mode –	4	PPT

2.3	Multi-mode - TE and TM modes - step index- Graded index fiber.	4	Chalk & Talk
UNIT - III			
3.1	Attenuation– Attenuation units- absorption losses - scattering losses- Bending losses- core and cladding losses- signal dispersion in fibers-overview of dispersion origins –factors contributing to dispersion-Material Dispersion – Waveguide dispersion – dispersion in single mode fibers.	4	PPT
3.2	core and cladding losses- signal dispersion in fibers-overview of dispersion origins –factors contributing to dispersion	4	Chalk & Talk
3.3	Material Dispersion –Waveguide dispersion – dispersion in single mode fibers.	4	YouTube
UNIT - IV			
4.1	Analog and Digital modulation - Modulation of Light by Polarization – optical polarization – Birefringence.	4	YouTube
4.2	– wave plates – Optical activity – Modulation of Light by Induced Polarization – Electro optic effect - Electro –optic amplitude modulator-kerr modulators-magneto optic effect	4	PPT
4.3	Optical switching – Non-linear Fabry Perot resonator – self electro - optic effect devices(seed) - Optical Logic gates- Liquid crystal as light value (LCLV).	4	Chalk & Talk

UNIT - V			
5.1	Components of fiber optic communication - Semiconductor amplifier	4	YouTube
5.2	Rare earth doped fiber amplifiers – Raman and Brillouin amplifier- advantages and difficulties –filter-coupler and splitters	4	Chalk & Talk
5.3	Wavelength division multiplexing(WDM) - optical Networking - SONET & SDH – active and passive networks .	4	PPT
	Total	**60**	

Course Designer
Mr. J. Hakkim
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHE62	Astrophysics	Elective-II	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To understand the properties of degenerate matter and the outcome of stellar evolution for stars.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the Physical nature of the Sun	**K1, K2**
CO2	Express the phenomena of Stellar dimensions.	**K2**
CO3	Describe the Physical nature of Black holes and Neutron Stars	**K1, K2**
CO4	Develop the knowledge on various types of Galaxies	**K1,K2,K3**
CO5	Build the basic concepts of origin of the Universe	**K1,K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Sun - Physical properties – Composition – Photosphere – Chromosphere – Corona – Sunspots - Sunspot groups - Sunspot cycle –Coronal Mass Ejections (CMEs) - Solar Prominences - Solar Flares - Solar Wind - Communication disturbances - Auroras.

UNIT II 12 Hours

Stellar Parallax - Distance units - Stellar motions - Star light measurements - luminosity and brightness of Star- Colours of Star-Spectra of Stars – Hertzsprung-Russell diagram -Luminosity classification – Stellar diameters.

UNIT III 12 Hours

Nuclear energy for stars – Thermo Nuclear reactions – Stellar evolution - birth of Star - Main Sequence stars –Cepheid variables - Planetary nebulae - white dwarfs - origin of red giants - Colour Magnitude diagram - Neutron stars - Black holes – The Schwarzschild radius - Stellar black holes - Non-Stellar black holes -Physics of a black hole.

UNIT IV 12 Hours

Identifying Galaxies - Galaxy nomenclature - Types of Galaxies - Spiral-Elliptical - irregular galaxies - Milky Way Galaxy and its structure - Properties of Galaxies - Visual binaries- Mass of a binary system - Mass luminosity relationship- Star clusters - Galactic clusters -Pulsars – Quasars.

UNIT V 12 Hours

Cosomology – the scale of the universe – the expansion of the universe – Hubble's law - Olber's Paradox - Cosmological models – Steady state theory - Big bang theory – Origin of the cosmic background radiation.

Text Books

A. Mujiber Rahman, ***Concepts of Astrophysics***, Scitech Publications (India) Pvt. Ltd, Chennai, 2019, 1st edition.

A. Mujiber Rahman, ***Introduction to Astrophysics***, Scitech Publications (India), Pvt. Ltd, Chennai, 2018, 1st edition.

Reference Books

Abell, Morrison and Wolf, ***Exploration of the Universe,*** Saunders College Publications, UK, 1987, 5thed.,

Carrol and Ostlie, ***Introduction to Modern Astrophysics,*** Pearson International, UK, 2007, 2nd ed.,

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Sun - Physical properties – Composition – Photosphere – Chromosphere – Corona.	4	Chalk & Talk
1.2	Sunspots - Sunspot groups - Sunspot cycle –Coronal Mass Ejections (CMEs) - Solar Prominences	4	E-Resources
1.3	Solar Flares - Solar Wind -Communication disturbances - Auroras.	4	Discussion
UNIT - II			
2.1	Stellar Parallax - Distance units - Stellar motions - Star light measurements - luminosity and brightness of Star.	4	Discussion
2.2	Colours of Star-Spectra of Stars – Hertzsprung-Russell diagram.	4	Chalk & Talk
2.3	Luminosity classification – Stellar diameters.	4	E-Resources
UNIT - III			
3.1	Nuclear energy for stars - Thermo Nuclear reactions – Stellar evolution - birth of Star - Main Sequence stars.	4	E-Resources
3.2	Cepheid variables - Planetary nebulae - white dwarfs - origin of red giants - Colour Magnitude diagram.	4	Chalk & Talk

3.3	Neutron stars - Black holes – The Schwarzschild radius - Stellar black holes - Non-Stellar black holes -Physics of a black hole.	4	Discussion
UNIT - IV			
4.1	Identifying Galaxies - Galaxy nomenclature - Types of Galaxies - Spiral-Elliptical - irregular galaxies.	4	Discussion
4.2	Milky Way Galaxy and its structure - Properties of Galaxies - Visual binaries.	4	E-Resources
4.3	Mass of a binary system - Mass luminosity relationship- Star clusters-Galactic clusters-Pulsars – Quasars.	4	Chalk & Talk
UNIT - V			
5.1	Cosomology – the scale of the universe – the expansion of the universe – Hubble's law	4	E-Resources
5.2	Olber's Paradox - Cosmological models – Steady state theory.	4	Chalk & Talk
5.3	Big bang theory – Origin of the cosmic background radiation.	4	Discussion
	Total	**60**	

Course Designer
Dr. A. Mujiber Rahman
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHE63	Physics in the Arts	Elective-II	60	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

One should have a broader understanding for visualizing abstract aspects of the physical world

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the basic of optical properties	**K1, K2**
CO2	Discuss the principle of optical photography.	**K2**
CO3	Illustrate the color and color visions.	**K1, K2**
CO4	Build the knowledge of color mixing.	**K1, K2, K3**
CO5	Prepare the color generating mechanism.	**K1, K2, K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**1**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low **2-Medium** **3-Strong**

Syllabus

UNIT I 12 Hours

Light and Light Waves: Electromagnetic Spectrum, Polarization – Reflection and Refraction: Specular Reflection of Light, Refraction of Light – Lenses: Converging and Diverging Lenses, Focal Length, The Lens Formula – Lens Aberrations.

UNIT II 12 Hours

Accommodation – Eyeglasses – Nearsighted Eye – Farsighted Eye – Astigmatic Eye – The Camera - Principle – Focusing the Camera – Choosing the Exposure Time – Choosing the Aperture – Types of camera. – Depth of Field – The Film – Digital Photography.

UNIT III 12 Hours

Color – Color Sensitivity of the Eye – Physical and Psychological Color – Color: Hue, Saturation, and Brightness – Light Interaction with other Objects.

UNIT IV 12 Hours

Primary Colors – Adding Primary Colors – The Color Triangle – Low Intensity Colors – Spectral Colors – Non-Spectral Colors – Filters Subtractive Primary Colors – Color Photography – Pigments – Change in Saturation – Why do Blue and Yellow Make Green – Change in Hue.

UNIT V 12 Hours

Illuminating Light – Pigments – Structural Color: Iridescence – More Color-Generating Mechanisms Due to Iridescence – Color in Gemstones – Mineral Color Due to Charge Transfer – Mineral Color Due to ColorCenters – Color in Gems Due to Band Gap Absorption of Light.

Text Book

P.U.P.A. Gilbert & W. Haeberli, ***Physics in the Arts***, Elsevier Academic Press, UK, 2018, 1st edition.

Reference Books

R. R. Gulati, ***Monochrome and Colour Television***, New Age Publication, New Delhi, 2006. 3rd edition.

Kennedy, ***Electronic communication***, Tata McGraw Hill, New Delhi, 2006. 1st edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Light and Light Waves: Electromagnetic Spectrum, Polarization – Reflection	4	Chalk & Talk
1.2	Refraction: Specular Reflection of Light, Refraction of Light	4	E-Resources
1.3	Lenses: Converging and Diverging Lenses, Focal Length, The Lens Formula – Lens Aberrations.	4	Discussion
UNIT - II			
2.1	Accommodation – Eyeglasses – Nearsighted Eye – Farsighted Eye – Astigmatic Eye.	4	Discussion
2.2	The Camera - Principle – Focusing the Camera – Choosing the Exposure Time – Choosing the Aperture – Types of camera.	4	Chalk & Talk
2.3	Depth of Field – The Film – Digital Photography.	4	E-Resources
UNIT - III			
3.1	Color – Color Sensitivity of the Eye – Physical and Psychological Color	4	E-Resources
3.2	Color: Hue, Saturation, and Brightness	4	Chalk & Talk
3.3	Light Interaction with other Objects.	4	Discussion

UNIT - IV			
4.1	Primary Colors – Adding Primary Colors – The Color Triangle – Low Intensity Colors	4	Discussion
4.2	Spectral Colors – Non-Spectral Colors – Filters Subtractive Primary Colors – Color Photography – Pigments	4	E-Resources
4.3	Change in Saturation – Why do Blue and Yellow Make Green-Change in Hue.	4	Chalk & Talk
UNIT - V			
5.1	Illuminating Light – Pigments – Structural Color: Iridescence – More Color-Generating Mechanisms Due to Iridescence – Color in Gemstones	4	E-Resources
5.2	Mineral Color Due to Charge Transfer – Mineral Color Due to Color Centers	4	Chalk & Talk
3.5	Color in Gems Due to Band Gap Absorption of Light.	4	Discussion
	Total	**60**	

Course Designer
Dr. A. Mujiber Rahman
Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC6P	Major Practical- III	Core-XV	90	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students to develop practical skills and verify the various basic concepts of Physics in electricity and optical instruments.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the behavior of electricity.	**K1, K2,K3**
CO2	Examine the properties of light.	**K1, K2,K3**
CO3	Describe the self-inductance of coil.	**K1, K2,K3**
CO4	Determine the experiments related to spectroscopy.	**K1, K2,K3**
CO5	Express the working principle of various optical tools.	**K1, K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**2**	**3**	**3**	**2**	**3**
CO2	**2**	**3**	**2**	**3**	**3**
CO3	**2**	**3**	**2**	**3**	**2**
CO4	**2**	**3**	**3**	**2**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**3**	**2**	**2**	**3**
CO2	**1**	**3**	**3**	**3**	**3**
CO3	**2**	**2**	**3**	**2**	**2**
CO4	**2**	**3**	**2**	**3**	**3**
CO5	**2**	**3**	**3**	**3**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

Any Twelve Experiments

1. Spectrometer- determination of Cauchy's constants.
2. Spectrometer- Hartmann's interpolation formula.
3. Spectrometer – i-i' curve.
4. LCR Series resonance- determination of self-inductance.
5. LCR parallel resonance- determination of self-inductance.
6. BG –High resistance by leakage method.
7. Maxwell's bridge-self-inductance.
8. Spectrometer – Small angled prism.
9. B.G. – Comparison of Mutual Inductance.
10. Anderson's Bridge – Self Inductance.
11. Impedance and power factor – LR circuit.
12. Impedance and power factor – CR circuit.
13. B.G – Determination of mutual inductance.
14. Rayleigh's bridge – Self-inductance.
15. Resolving power of a prism.
16. B.G. – Absolute capacity of a condenser.

Reference Books

C. C Ouseph, U. J. Rao & V. Vijayendran, ***Practical Physics and Electronis***.

S. Viswanathan, ***Practical Physics,*** Printers & Publishers pvt Ltd, 2007.

Pragathi Prakashan, ***Practical Physics***, Pragathi Prakashan publications.

Course Designer

Mr. M. Mohamed Ismail

Head & Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC6Q	Major Practical- IV	Core XVI	90	4

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students to develop practical skills and verify the various basic concepts of Physics with electronics.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the working principle of π filter.	**K1, K2,K3**
CO2	Examine the V-I response of diodes.	**K1, K2,K3**
CO3	Describe the Characterize transistor in various modes.	**K1, K2,K3**
CO4	Explain and Construct the frequency response and gain of transistors.	**K1, K2,K3**
CO5	Express the output response of various types of oscillators.	**K1, K2,K3**

K1-Knowledge K2-Understand K3-Apply

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	**2**	**3**	**3**	**2**	**3**
CO2	**2**	**3**	**2**	**3**	**3**
CO3	**2**	**3**	**2**	**3**	**2**
CO4	**2**	**3**	**3**	**2**	**3**
CO5	**3**	**3**	**2**	**3**	**3**

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**1**	**3**	**2**	**2**	**3**
CO2	**1**	**3**	**3**	**3**	**3**
CO3	**2**	**2**	**3**	**2**	**2**
CO4	**2**	**3**	**2**	**3**	**3**
CO5	**2**	**3**	**3**	**3**	**2**

1-Low **2-Medium** **3-Strong**

Syllabus

Any Twelve Experiments

1. Bridge rectifier – π filter.
2. Single stage amplifier – Determination of gain and frequency response.
3. Two stage amplifier- with feedback- Determination of gain and frequency response.
4. Two stage amplifier- without feedback- Determination of gain and frequency response.
5. Hartley oscillator- Determination of self-inductance.
6. Colpitt's oscillator- Determination of self-inductance.
7. Dual power supply using IC7805 and IC7905.
8. Transistor characteristics-CE mode.
9. Astable Multivibrator - Discrete components.
10. Zener diode – Characteristics.
11. FET – Characteristics in CE mode.
12. IC 7805 – Regulated power supply.
13. Zener diode – Voltage regulator.
14. Logic gates – Discrete components.
15. Full wave rectifier - π filter.
16. Clipper and Clamper – Discrete components.
17. Differentiating and Integrating circuits by discrete components.

Reference Books

C. C Ouseph, U. J. Rao & V. Vijayendran, ***Practical Physics and Electronis***.

S. Viswanathan, ***Practical Physics,*** Printers & Publishers pvt Ltd, 2007.

Pragathi Prakashan, ***Practical Physics***, Pragathi Prakashan publications.

Course Designer

Mr. M. Mohamed Ismail

Head & Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHC6R	**Major Practical- V**	**Core XVII**	**90**	**4**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

To enable the students to develop practical skills and verify the various basic concepts of physics with digital electronic circuits.

- Understand the experimental idea of Digital electronics.
- Enhance comprehension capabilities by understanding electronic devices.
- Know the basic building blocks of integrated circuits.
- Understand the working principle of shift registers.
- Understanding of operational amplifier and its importance.

Course Outcomes (CO)

On the successful completion of the course the students will be able to

No.	Course Outcome	Knowledge Level
CO1	Describe the basic of Concepts of logic gates.	**K1, K2,K3**
CO2	Explain the frequency response of timer circuits using IC 555.	**K1, K2,K3**
CO3	Describe the basic applications of Op – Amp.	**K1, K2,K3**
CO4	Discuss the knowledge of digital counters.	**K1, K2,K3**
CO5	Describe and Construct the digital circuits to do various mathematical operations.	**K1, K2,K3**

K1-Knowledge **K2-Understand** **K3-Apply**

Mapping of CO with PO

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	2	3
CO2	2	3	2	3	3
CO3	2	3	2	3	2
CO4	2	3	3	2	3
CO5	3	3	2	3	3

1-Low **2-Medium** **3-Strong**

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	3
CO2	1	3	3	3	3
CO3	2	2	3	2	2
CO4	2	3	2	3	3
CO5	2	3	3	3	2

1-Low **2-Medium** **3-Strong**

Syllabus

Any Twelve Experiments

1. Logic gates- using IC.
2. Universal gates-NAND gate – IC.
3. Universal gate-NOR gate –IC.
4. Astable multivibrator-IC 555.
5. Astable multivibrator-IC 741.
6. OP-amp - Integrator differentiator.
7. OP-amp - Adder and subtractor.
8. Half and Full Adder using IC.
9. Four bit binary Adder using IC.
10. Four-bit binary counter using IC.
11. BCD counter using IC.
12. Ring counter using IC.
13. BCD to seven segment decoder using IC.
14. Schmitt trigger- IC 555.
15. Modulo- n-counter.
16. 4 Bit binary subtractor.
17. Shift - Register using IC.

Reference Books

C. C Ouseph, U. J. Rao & V. Vijayendran, ***Practical Physics and Electronis***.

S. Viswanathan, ***Practical Physics,*** Printers & Publishers pvt Ltd, 2007.

Pragathi Prakashan, ***Practical Physics***, Pragathi Prakashan publications.

Course Designer

Mr. M. Mohamed Ismail

Head & Associate Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHS61	Basic Instrumentation	SBS-III	30	2

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

The course content should be taught and implemented with the aim to develop different types of skills related to the various instrumentation devices.

Syllabus

UNIT I 6 Hours

Functional elements of measuring systems, Classification of instruments, static performance parameters, Accuracy, Precision, Resolution, Threshold, Static sensitivity, linearity, Hysteresis, Impedance loading and matching.

UNIT II 6 Hours

Analog transducers, electro mechanical, optoelectrical. Digital transducers.

UNIT III 6 Hours

Relative motion measuring devices, electro mechanical, optical, pneumatic, force measurements – Balance, Hydraulic load cell – pneumatic load cell.

UNIT IV 6 Hours

Moderate pressure, High pressure and low pressure measurements, measurement of temperature – non electrical, electrical and radiation methods.

UNIT V 6 Hours

Characteristics of sound, sound pressure, power levels, loudness, Typical sound measuring systems, microphone.

Text Book

B.C. Nakra and K.K.Chaudhry, ***Instrumentation Measurement and Analysis***, Tata McGraw Hill, NewDelhi (1985)

Reference Book

Albert D. Helfrick and William D. Cooper, ***Modern Electronic Instrumentation and Measurement Techniques***, Prentice Hall of India, Delhi (1995)- 3rd edition.

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Functional elements of measuring systems	2	Chalk & Talk
1.2	Classification of instruments, static performance parameters, Accuracy,	2	E-Resources
1.3	Precision, Resolution, Threshold, Static sensitivity, linearity, Hysteresis, Impedance loading and matching	2	Discussion
UNIT - II			
2.1	Analog transducers	2	Discussion
2.2	electro mechanical transducer.	2	Chalk & Talk
2.3	optoelectrical. Digital transducers.	2	E-Resources
UNIT - III			
3.1	Relative motion measuring devices, electro mechanical measurements	2	E-Resources
3.2	optical, pneumatic, force measurements –	2	Chalk & Talk
3.3	Balance, Hydraulic load cell - pneumatic load cell.	2	Discussion
UNIT - IV			
4.1	Moderate pressure measurements	2	Discussion
4.2	High pressure and low pressure measurements	2	E-Resources
4.3	measurement of temperature – non electrical, electrical and radiation methods	2	Chalk & Talk

UNIT - V			
5.1	Characteristics of sound, sound pressure	2	E-Resources
5.2	power levels, loudness, Typical sound measuring systems	2	Chalk & Talk
5.3	microphones	2	Discussion
	Total	**30**	

Course Designer
Mr. J. Hakim
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20UPHS62	**Physics for Competitive Exam - II**	**SBS-IV**	**30**	**2**

Nature of Course	
Knowledge Oriented	✓
Skill Oriented	
Employability Oriented	✓
Entrepreneurship Oriented	

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

Prepare the students to gain knowledge in solving problems in physics to success in competitive exam.

Syllabus

UNIT I 6 Hours

Arithmetic reasoning: Time and work- Time and distance – problems on Age Problems on trains - Area – Volume and Surface area.

UNIT II 6 Hours

Verbal and Non Verbal reasoning: Blood relations - Puzzle test - Assertion and Reason - Analytical reasoning – Spotting the embedded figures

UNIT III 6 Hours

Atomic Physics and Quantum mechanics - Nuclear and Particle physics.

UNIT IV 6 Hours

Electronics-I (Analog) – Classical and Statistical Mechanics.

UNIT V 6 Hours

Electronics-II (Digital) – Condensed Matter physics

Text Books

R. S. Aggarwal, ***Quantitative Aptitude for competitive Examinations***, S. Chand & Co. New Delhi, 2019.

R. S. Aggarwal ***Verbal and Nonverbal reasoning***, S. Chand & Co. New Delhi, 2018.

Reference Books

R. Murugasen, ***Modern Physics***, S. Chand & Co New Delhi, 2019.

B. L. Theraja, ***Basic Electronics***, S. Chand & Co New Delhi, 2006.

V. K. Metha, ***Fundamentals of Electronics***, S. Chand & Co New Delhi, 2019.

Arthur Beiser, ***Modern Physics***, McGrawHill, London, 2009.
Uphadyaya, ***Introduction to Classical mechanics***, Himalayan Publishers, 2010.
S.O. Pillai, ***Solid State Physics,*** New Age International, New Delhi, 2020.
G. Joes Robin & A. Ubald Raj, ***Analog and Digital Electronics.***

Pedagogy

Chalk & Talk, E-Resources, Group Discussion

Teaching aids

Black Board, LCD Projector

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	Content Delivery Methods
UNIT - I			
1.1	Time and work- Time and distance	2	Chalk & Talk,
1.2	problems on Age - Problems on trains	2	PPT,
1.3	Area – Volume and Surface area.	2	YouTube video
UNIT - II			
2.1	Blood relations - Puzzle test	2	Discussion
2.2	Assertion and Reason- Analytical reasoning	3	Chalk & Talk
2.3	Spotting the embedded figures	1	PPT
UNIT - III			
3.1	Atomic Physics and Quantum mechanics	3	YouTube video,
3.2	Nuclear and Particle physics.	3	PPT
UNIT - IV			
4.1	Electronics-I(Analog)	3	PPT
4.2	Classical and Statistical Mechanics.	3	Chalk and Talk
UNIT - V			
5.1	Electronics-II(Digital)	3	PPT
5.2	Condensed Matter physics.	3	YouTube video
Total		**30**	

Course Designer
Mr. J. Hakim
Assistant Professor of Physics