HAJEE KARUTHA ROWTHER HOWDIA COLLEGE

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

Uthamapalayam, Theni District. Pin Code: 625 533.

DEPARTMENT OF PHYSICS

MASTER 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: M.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 thrive for the truth of nature in terms of agreements of theory with practice and stand firm even if ideas fail till new notions are formed. Physics portraits the landscape of life and this department look forward to explore the physics lying beneath our observations.

Mission

The mission of this department is to teach and learn physics in a collaborative, performance – based pathway; we look to encourage the students towards observation and analysis of the natural world and to provide the tools and skills to the students to be torch bearers of physics by contributing effectively to the existing laws of nature.

Programme Outcomes (PO)

On the successful completion of M. Sc., Physics programme, the students will be able to

PO1	Acquire knowledge of physics.
PO2	Understand the usage of physics in applied sectors.
PO3	Apply skills through Practical's in laboratories, lab visits in research institution and field visits in industries.
PO4	Analyse motivated for pursuing higher education & research.
PO5	Evaluate skilled either to suit with employment opportunities or to make self-employments.

Program Specific Outcomes (PSO)

A graduate of M. Sc. Physics after two years will

PSO1	Impart quality education in physics to students so as they become globally competitive physicist.
PSO2	Make the students to accept the challenges in physics and can effectively disseminate the physics knowledge to coming generations.
PSO3	Create strong interest in physics so as students can further develop themselves through self-study.
PSO4	Create a sense of ethical responsibilities among students.
PSO5	Participate and succeed in various state, national and international level competitive examinations to get suitable employment in government and global research sectors.

Programme Scheme

Eligibility

A candidate who has passed B.Sc., as the Major subject with Mathematics & Chemistry Ancillary is eligible for the Master of Science – Physics Degree.

Duration of the Course: M.Sc., Physics – 2 years (4 Semesters).

Medium of instruction: English.

For Programme Completion

A Candidate shall complete:

- Part III - Core papers in semesters I, II, III and IV respectively
- Part III - Elective papers in semesters I, II, III and IV respectively
- Part IV - Non- Major Elective papers in semester III

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
Seminar / Quiz / Assignment	- 05 Marks
Total	- 25 Marks

Pattern of Term End Examinations

(Max. Marks: 75 / Time: 3 Hours)

External Examinations Question Paper Pattern

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

Passing Marks

Minimum 34 for External Exam

Eligibility for the degree – passing minimum is **50%**

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	10	2	7
Understanding – K2	10	3	8
Applying – K3	20	5	15
Analyzing – K4	20	5	15
Evaluating – K5	40	10	30
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)	3 (3)	1 (a or b) (4)	-----	**40 Marks**
Understanding(K2)	3 (3)	1 (a or b) (4)	-----	
Apply(K3)	1 (1)	1 (a or b) (4)	1 (8)	
Analyzing (K4)	1 (1)	1 (a or b) (4)	1 (8)	
CIA Examinations conducted for 40 marks and converted to 20 marks				**40/2 = 20**
Evaluating (K5)	Seminar, Quiz/Assignments			**10/2 = 5**

Distribution of questions and marks for Term End Examinations

Bloom's Taxonomy	Section A	Section B	Section C	Total
Knowledge(K1)	7 (7)	-------	-------	**Total** **75 Marks**
Understanding(K2)	1 (1)	1 (a or b) (7)	-------	
Apply(K3)	1 (1)	2 (a or b) (14)	-------	
Analyzing (K4)	1 (1)	2 (a or b) (14)	-------	
Evaluating (K5)	-------	-------	3 out of 5 (30)	

Note: Figures in parenthesis are Marks

Details of Course Category, Code, Credits & Title

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester – I							
Part – III (OBE)							
Core – I	20PPHC11	Mathematical Physics - I	5	25	75	100	4
Core – II	20PPHC12	Classical Dynamics	5	25	75	100	4
Core – III	20PPHC13	Advanced Electronics	5	25	75	100	4
Core – IV	20PPHC1P	Practical - I	10	40	60	100	4
Elective - I	20PPHE11	Crystal Growth and Thin Film Techniques	5	25	75	100	4
	20PPHE12	Fiber Optics Communication					
		Total	**30**			**500**	**20**
Semester – II							
Part – III (OBE)							
Core – V	20PPHC21	Mathematical Physics- II	5	25	75	100	4
Core – VI	20PPHC22	Electromagnetic Theory	5	25	75	100	4
Core – VII	20PPHC23	Quantum Mechanics -I	5	25	75	100	4
Core – VIII	20PPHC2P	Practical - II	10	40	60	100	4
Elective - II	20PPHE21	Quantitative Aptitude and Reasoning	5	25	75	100	4
	20PPHE22	Microprocessor					
		Total	**30**			**500**	**20**

Course Category	Course Code	Course Title	Hrs	CIAE	TEE	Max. Marks	Credits
Semester – III							
Part – III (OBE)							
Core – IX	20PPHC31	Quantum Mechanics -II	6	25	75	100	5
Core – X	20PPHC32	Condensed Matter Physics -I	6	25	75	100	5
Core – XI	20PPHC3P	Practical-III	10	40	60	100	5
Elective -III	20PPHE31	Thermodynamics and Statistical Mechanics	5	25	75	100	5
	20PPHE32	Cosmo Physics					
Part – IV							
NME	20PPHN31	Medical Physics and Opto Electronics	3	25	75	100	3
		Total	**30**			**500**	**23**
Semester – IV							
Part – III (OBE)							
Core – XII	20PPHC41	Condensed Matter Physics -II	5	25	75	100	6
Core – XIII	20PPHC42	Nuclear, Particle and Astrophysics	5	25	75	100	6
Core – XIV	20PPHC4D	Project	5	-	100	100	5
Core – XV	20PPHC4P	Practical-IV	10	40	60	100	4
Elective - IV	20PPHE41	Molecular Spectroscopy	5	25	75	100	6
	20PPHE42	Computer Oriented Numerical Methods					
		Total	**30**			**500**	**27**
		Grand Total	**120**			**2000**	**90**

Course Code	Course Title	Category	Total Hours	Credits
20PPHC11	Mathematical Physics - I	Core - I	75	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Enable the students to enhance problem solving skills and to expertise in mathematical techniques required in physics.

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 basic of vectors and their application in physics problems.	**K1,K2,K3,K4,K5**
CO2	Explain the concept of vectors and Eigen values and their physical meaning.	**K1,K2,K3,K4,K5**
CO3	Explain the beta gamma and special functions.	**K1,K2,K3,K4,K5**
CO4	Solve the basic concepts on Fourier transform.	**K1,K2,K3,K4,K5**
CO5	Evaluate the differential equations.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Gradient of a scalar field – Line, surface & volume integrals – Curl of a vector function & its physical significance – Gauss divergence theorem - Gauss law in differential form – Poisson's Equation – Laplace Equation – Stokes's theorem – Green's theorem – Green's theorem in a plane – Orthogonal curvilinear coordinates – Spherical polar coordinates (Gradient, Divergence, Laplacian).

UNIT II 15 Hours

Review of Algebraic operations on matrices – Special types of matrices – Transpose of a matrix & its properties – The conjugate of a matrix – Symmetric & Antisymmetric matrices – Hermitian & Skew Hermitian – Solutions of Linear Equations – Linear Transformations – Orthogonal & Unitary transformations – Similarity transformations – Eigen values ,Eigen vectors ,Characteristic Equation of a matrix – Cayley-Hamilton theorem.

UNIT III 15 Hours

Definitions - Symmetry property of Beta function - Evaluation of Beta functions- Transformation of Beta functions - Evaluation of Gamma functions - Transformation of Gamma functions - Relation between Beta and Gamma functions - Evaluation of miscellaneous integrals - Miscellaneous important preposition.

UNIT IV 15 Hours

Fourier's transform – Infinite Fourier sine & cosine transform – Properties of Fourier's transform – Modulation theorem – Convolution theorem – Parsevali's theorem – Derivative of Fourier transform – Fourier Sine & Cosine transforms of derivative – Fourier finite sine and cosine transform – Application – Solution of boundary value of the problem.

UNIT V 15 Hours

Partial Differential Equations in physics – Solution of partial Differential Equations by the method of separation of two variables – Solution of Laplace Equation in Cartesian coordinates – Fourier equation of heat flow – Solution of heat flow.

Text Books

Sathyaprakash, ***Mathematical Physics***, Sulthan chand & sons, New Delhi, 2006.

Reference Books

A.K. Ghatak, I.C. Goyal & S.J. Chua, ***Mathematical Physics***, Laxmi Publications, 2019, Second edition.

B.D. Gupta, ***Mathematical Physics***, Vikas Publishing house pvt Ltd, New Delhi ,2006, Fourth edition.

H. K. Dass, ***Mathematical physics***, S CHAND company Ltd, 2010, First edition.

L.A. Pipes and L.R, Harvill, ***Applied Mathematics for Engineers and Physicists***, McGraw-Hill Book Company,1946, First 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	Gradient of a scalar field - Line, surface & volume integrals - Curl of a vector function & its physicalsignificance.	3	Chalk & Talk
1.2	Gauss divergence theorem - Gauss law in differential form	3	PPT
1.3	Poisson's Equation - Laplace Equation - Stokes's theorem.	3	PPT
1.4	Green's theorem - Green's theorem in a plane.	3	Chalk & Talk
1.5	Orthogonal curvilinear coordinates - Spherical polar coordinates (Gradient, Divergence, Laplacian)	3	Chalk & Talk

UNIT – II			
2.1	Review of Algebraic operations on matrices - Special types of matrices - Transpose of a matrix & its properties - The conjugate of a matrix	4	Chalk & Talk
2.2	Symmetric & Antisymmetric matrices – Hermitian & Skew Hermitian.	3	PPT
2.3	Solutions of Linear Equations - Linear Transformations - Orthogonal & Unitary Transformations – Similarity transformations.	4	PPT
2.4	Eigen values, Eigen vectors, Characteristic Equation of a matrix - Cayley-Hamilton theorem.	4	Chalk & Talk
UNIT – III			
3.1	Definitions - Symmetry property of Beta function.	1	PPT
3.2	Evaluation of Beta functions - Transformation of Beta functions.	4	Chalk & Talk
3.3	Evaluation of Gamma functions – Transformation of Gamma functions.	4	Chalk & Talk
3.4	Relation between Beta and Gamma functions - Evaluation of miscellaneous integrals.	3	PPT
3.5	Miscellaneous important preposition.	3	Discussion
UNIT – IV			
4.1	Fourier's transform - Infinite Fourier sine & cosine transform	2	Chalk & Talk
4.2	Properties of Fourier's transform	1	PPT
4.3	Modulation theorem	1	PPT
4.4	Convolution theorem - Parsevali's theorem	1	Discussion
4.5	Derivative of Fourier transform	2	Chalk & Talk
4.6	Fourier Sine & Cosine transforms of derivative	3	Chalk & Talk
4.7	Fourier finite sine and cosine transform, Application.	3	Discussion
4.8	Solution of boundary value of the problem	2	PPT

UNIT – V			
5.1	Partial Differential Equations in physics	3	PPT
5.2	Solution of partial Differential Equations by the method of separation of two variables	4	Discussion
5.3	Solution of Laplace Equation in Cartesian coordinates	4	PPT
5.4	Fourier equation of heat flow - Solution of heat flow.	4	Discussion
	Total	**75**	

Course Designer
Mr. A. Ansar Ahamed
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC12	Classical Dynamics	Core - II	75	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Enable the students to emphasize the mathematical formulation of mechanics problems and to physically interpret the solution and Gain knowledge on canonical transformation, Poisson and Lagrange brackets.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Gain solid foundation in the mechanics of particles and its extension to Lagrangian function	**K1,K2,K3,K4,K5**
CO2	Analyse the concept of Hamiltonian equation and its physical significance	**K1,K2,K3,K4,K5**
CO3	Apply the concept of canonical transformation and to gain knowledge on Lagrange and poison brackets	**K1,K2,K3,K4,K5**
CO4	Evaluate the moment of inertia of rigid bodies	**K1,K2,K3,K4,K5**
CO5	Analyse the concept of Hamiltonian equation its physical significance	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Basic concepts - Coordinate systems – Degrees of freedom - Constraints - Generalised co- ordinates - Principle of virtual work - D'Alembert's Principle - Lagrangian equations of motion from D'Alembert's principle - Applications - Motion under central force - Bead sliding on a uniformly rotating wire.

UNIT II 15 Hours

Hamiltonian Formulation - Deduction of Hamilton's principle from the D'Alembert's principle – Modified Hamilton's principle - Hamilton's canonical equation of motion from modified Hamilton's principle - Applications - Motion of a particle in a central force field - Charged particle moving in an electromagnetic field - principle of least action-Other forms of principle of least action.

UNIT III 15 Hours

Canonical Transformation – Generating Functions – Applications – Poisson's Brackets – Properties of Poisson Bracket – Lagrange Brackets – Relation between Poisson and Lagrange Bracket - Invariance of Poisson Bracket with respect to canonical transformation.

UNIT IV 15 Hours

Dynamics of Rigid Body – Euler's anlges – Angular momentum and Inertia tensor – Principal axes Transformation – Rotational kinetic energy of a Rigid Body – Eulers Equation of motion of Rigid Body - Torque-free motion of Rigid Body - Geometrical description of therigid body motion.

UNIT V 15 Hours

Hamilton-Jacobi Theory – Hamilton Jacobi equation – Solution of harmonic oscillator problem – Hamilton's characteristic function (conservative systems) – Kepler's problem (Hamilton Jacobi method) – Action and Angle variables – Problem of harmonic oscillator using Action and Angle variables – Kepler's problem in Action and angle variables.

Text Books

Gupta Kumar & Sharma, ***Classical Mechanics***, Pragati Prakashan, New Delhi, 2003, second edition.

J.C. Upadhyaya, ***Classical Mechanics***, Himalaya publishing house, Mumbai, 2005, second edition.

Reference Books

A. K. Raychaudri, ***Classical mechanics***, Oxford University Press, Calcutta, 1983, First edition.

T.G. Takwale & P.S. Purnaik, ***Introduction to classical mechanics***, Tata McGraw Hill, New Delhi, 2018, First 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	Coordinate systems - Degrees of freedom – Constraints.	4	PPT
1.2	Generalised co-ordinates - Principle of virtual work - D'Alembert's Principle.	4	PPT
1.3	Lagrangian equations of motion from D'Alembert's principle – Applications.	4	PPT
1.4	Motion under central force – Bead sliding on a uniformly rotating wire.	3	Chalk & Talk
UNIT – II			
2.1	Hamiltonian Formulation - Deduction of Hamilton's principle from the D'Alembert's principle - Modified Hamilton's principle	4	Discussion
2.2	Hamilton's canonical equation of motion from modified Hamilton's principle - Application	3	Chalk & Talk
2.3	Motion of a particle in a central force field	2	Chalk & Talk

2.4	Charged particle moving in an electromagnetic field	3	PPT
2.5	principle of least action - Other forms of principle of least action	3	PPT
UNIT – III			
3.1	Canonical Transformation	3	PPT
3.2	Generating Functions - Applications	3	PPT
3.3	Poisson's Brackets - Properties of Poisson Bracket	3	Chalk & Talk
3.4	Lagrange Brackets - Relation between Poisson and Lagrange Bracket	3	Chalk & Talk
3.5	Invariance of Poisson Bracket with respect to canonical transformation	3	Chalk & Talk
UNIT – IV			
4.1	Dynamics of Rigid Body - Euler's anlges - Angular momentum and Inertia tensor.	3	PPT
4.2	Principal axes Transformation - Rotational kinetic energy of a Rigid Body.	3	PPT
4.3	Eulers Equation of motion of Rigid Body	3	PPT
4.4	Torque-free motion of Rigid Body	3	Chalk & Talk
4.5	Geometrical description of the rigid body motion	3	Chalk & Talk
UNIT – V			
5.1	Hamilton-Jacobi Theory - Hamilton Jacobi Equation - Solution of harmonic oscillator problem	4	Discussion
5.2	Hamilton's characteristic function (conservative systems)	3	Discussion
5.3	Fourier equation of heat flow - Solution of heat flow - Kepler's problem (Hamilton Jacobi method)	4	Discussion
5.4	Action and Angle variable, Problem of harmonic oscillator using Action and Angle variables - Kepler's problem in Action and angle variables	4	Discussion
	Total	**75**	

Course Designer
Mr. A. Ansar Ahamed
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC13	Advanced Electronics	Core - III	75	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Enable the students to understand the characteristics of semiconducting devices and expertise in Programmable logic devices.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Analyse the performance of semiconductor devices	**K1,K2,K3,K4,K5**
CO2	Analyse performance of IC 741 and IC555 and able to design oscillator circuit using IC741	**K1,K2,K3,K4,K5**
CO3	Design Binary counters and registers	**K1,K2,K3,K4,K5**
CO4	Classify different memory and storage devices	**K1,K2,K3,K4,K5**
CO5	Analyse different Programmable logic devices	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Transistor – Basic ideas, Transistor as amplifier (CE), switch, series pass regulator, field effect transistor – Ideal voltage controlled current source, The junction field effect transistor, V-I characteristics, transfer characteristics, MOSFET – Volt-ampere characteristics, MOSFET as a resistance, switch, amplifier and CMOS – Basic devices.

UNIT II 15 Hours

Internal structure and function of IC 741 – IC555 – Bistable multivibrator – Schimitt trigger – Nonlinear applications of OP amp, log, antilog amplifiers, regenerative comparators and active filters – OP amp based self-oscillators, phase shift, Wien bridge and Non-sinusoidal oscillators, Voltage regulator – series voltage regulator, IC regulator, switching regulators – Solving simultaneous equation using OP amp.

UNIT III 15 Hours

Basics of Logic gates – Timing diagrams and their design of practical applications - Digital integrated circuits – Performance characteristics and parameter of digital IC's 74series - Sequential logic – SR, JK, Master slave, D and T flip flop – Level triggering and edge triggering – Two, three, four, sixteen bit counters using JK flip flop – Asynchronous and synchronous type – Decade and modulo n counter – UP/DOWN synchronous counter – Ring counter – Shift registers – Serial in – Serial out – Serial in parallel out – Parallel in serial out – Parallel in parallel out.

UNIT IV 15 Hours

Memory Basics – Random Access Memory – Static Ram (SRAMs) – Dynamic RAM (DRAMs) - Read Only Memory – The Mask ROM – Programmable ROM's – The Flash Memory – Basic Flash Memory Operation – Comparison of Flash Memories with other Memories - Memory Expansion – Special type Of Memories – FIFO – LIFO – CCD Memories - Magnetic and optical Storage – Testing Memory Chips.

UNIT V 15 Hours

Programmable Logic – Programmable Link Process Technologies - Describing Logic with an HDL – Combinational Logic with VHDL – Structural approach to VHDL Programming – VHDL Components - Programmable Logic : SPLDs and CPLDs – SPLD: The PAL – SPLD: The GAL – Altera CPLDs – Xilinx CPLDs - Macrocells - Programmable Logic : FPGAs – Altera FPGAs – Xilinx FPGAs – Programmable Logic Software.

Text Books

Thomas L. Floyd, ***Digital fundamentals***, Pearson Prentice Hall England, London, 2012, 10th Edition.

Thomas L. Floyd, ***Analog Electronics***, Pearson Prentice Hall England, London, 2011, 9th Edition.

Reference Books

Doebelin E.O and Manik. D.N, ***Measurement systems – Application and design***, Tata McGraw Hill Pvt. Ltd, 2007, special Indian Edition.

MillmanJ & Grabel A, ***Micro Electronics***, Tata McGraw Hill, 2001, 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	Transistor – Basic ideas, Transistor as amplifier (CE), switch, series pass regulator	4	Chalk & Talk
1.2	field effect transistor – Ideal voltage controlled current source,	3	PPT
1.3	The junction field effect transistor, V-I characteristics transfer characteristics	3	Chalk & Talk
1.4	MOSFET – Volt-ampere characteristics	2	Chalk & Talk
1.5	MOSFET as a resistance, switch, amplifier and CMOS – Basic devices	3	PPT

UNIT – II			
2.1	Internal structure and function of IC 741, IC555	4	PPT
2.2	Bistable multivibrator, Schimitt trigger	2	PPT
2.3	Non - linear applications of OP amp, log, antilog amplifiers, regenerative comparators and activefilters	2	PPT
2.4	OP amp based Self oscillators, phase shift, Wien bridge and non-sinusoidal oscillators	3	PPT
2.5	Voltage regulator – Series voltage regulator, IC regulator, switching regulators	2	PPT
2.6	Solving simultaneous equation using OP amp.	2	Discussion
UNIT – III			
3.1	Basics of Logic gates, timing diagrams and their design of practical applications	2	PPT
3.2	Performance characteristics and parameter of digital IC's 74series	2	PPT
3.3	Sequential logic – SR, JK, master slave, D and T flip flop, Level triggering and edge triggering	3	PPT
3.4	Asynchronous and synchronous type two, three, four, sixteen Bit counters using JK flip flop	2	PPT
3.5	UP/DOWN synchronous counter	2	PPT
3.6	Ring counter, Decade and modulo n counter	2	PPT
3.7	shift registers – Serial in Serial out, Serial in parallel out, Parallel in serial out, Parallel in parallel out	2	PPT
UNIT – IV			
4.1	Memory Basics, Random Access Memory	2	Discussion
4.2	Read Only Memory, The Mask ROM – Programmable ROM's	3	Discussion
4.3	The Flash Memory, Basic Flash Memory Operation, Comparison of Flash Memories with other Memories	3	Discussion

4.4	Memory Expansion, Special type of Memories, FIFO, LIFO, CCD Memories.	3	Discussion
4.5	Magnetic and optical Storage	2	PPT
4.6	Testing Memory Chips.	2	PPT
UNIT – V			
5.1	Programmable Logic Programmable Link Process Technologies	1	PPT
5.2	Describing Logic with an HDL, Combinational Logic with VHDL	2	PPT
5.3	Structural approach to VHDL Programming	2	PPT
5.4	VHDL Components - Programmable Logic: SPLDs and CPLDs	2	PPT
5.5	SPLD: The PAL, SPLD: The GAL	2	Discussion
5.6	Altera CPLDs, Xilinx CPLDs, Macrocells	2	Discussion
5.7	Programmable Logic: FPGAs – Altera FPGAs – Xilinx FPGAs	2	Discussion
5.8	Programmable Logic Software	2	Discussion
	Total	**75**	

Course Designer
Ms. M. Aabitha Rahman
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC1P	Practical - I	Core-IV	75	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Enable the students to develop practical skills and verify the various basic concepts of Physics in mechanical, optical experiments and electronics.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Understand the basic applications of Op-Amp	**K1,K2,K3,K4,K5**
CO2	Analyze the characteristics of Transistors	**K1,K2,K3,K4,K5**
CO3	Experiments related to heat and light	**K1,K2,K3,K4,K5**
CO4	Estimate the Self-inductance of coil using Anderson's bridge	**K1,K2,K3,K4,K5**
CO5	Analyze the characteristics of Solar cell and LDR	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

Any 10 Experiments

1. Phase Shift Oscillator – IC741
2. Wien Bridge Oscillator – IC741
3. Emitter Follower – Discrete component
4. Two stage RC coupled amplifier with & without feedback
5. Refractive index of liquid - hollow prism
6. Anderson's Bridge – self-inductance of coil
7. Thermistors – Temperature of coefficients of resistance
8. Twin T – Notch filter – IC741
9. Hydrogen Spectrum – Rydberg constant
10. Solar Cell and LDR Characteristic
11. Optic bench Grating – Determination of wavelength of monochromatic source
12. UJT - Relaxation Oscillator

Course Designer

Ms. M. Aabitha Rahman
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE11	Crystal Growth and Thin Film Techniques	Elective - I	75	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

Enable the students to understand the theories involves in crystal growth nucleation process and solution, melt and vapor growth techniques and Characterization tools and theoretical concepts involved in crystal growth and thin film sciences.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Understand the nucleation mechanisms and the various factors of nucleation for crystal growth	K1,K2,K3,K4,K5
CO2	Acquire the knowledge on the concepts of various growth techniques	K1,K2,K3,K4,K5
CO3	Understand the different thin film deposition techniques.	K1,K2,K3,K4,K5
CO4	Familiarize with physics and techniques involved in the measurement and characterization of thin films.	K1,K2,K3,K4,K5
CO5	Analyze the crystal structure and morphology using different characterization techniques.	K1,K2,K3,K4,K5

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Introduction – Nucleation – Energy forming of nuclei – Spherical and cylindrical nuclei – Gibbs Thomson equation – Solvents – Solution – Solubility – Super Solubility – Expression for super saturation – Growth mechanism and classification – Solution growth – Low and high temperature solution growth – Slow cooling – Solvent evaporation method – Temperature gradient method.

UNIT II 15 Hours

Principle of gel technique – Various types of gel – Structure and importance of gel – Methods of gel growth and advantages – Hydrothermal growth – Melt technique – Czochralski growth – Bridgemen method – Flux growth.

UNIT III 15 Hours

Nature of thin films – Emission conditions – distribution of deposits from point, surface and cylindrical sources – Deposition techniques: Vacuum evaporation – Pulsed laser deposition – Cathodic sputtering – Reactive sputtering – RF sputtering – Spray pyrolysis Electro deposition – Substrate cleaning.

UNIT IV 15 Hours

Theories of thin film nucleation – Film growth – Incorporation of defects, impurities in thin film – deposition parameters and grain size - Interferometry – Fringes of equal chromatic order (FECO) – Ellipsometry – Vibrating quartz crystal method – Gravimetric balance method.

UNIT V 15 Hours

X-ray diffraction – Powder and single crystal – Fourier transform infrared analysis Elemental dispersive X-ray analysis – Transmission and scanning electron microscopy – UV- Vis-NIR spectrometer.

Text Books

A.Goswami, ***Thin Film Fundamentals***, New Age, New Delhi, 2008.

P. Santhanaragavan & P. Ramasamy, ***Crystal Growth Process and Methods***, KRU Publications, Kumbakonam, 2001.

Reference Books

E.N.Kaufmann and John Wiley, ***Characterization of Materials***, Volume-I, New Jersey, 2012.

M. Ohring, ***Materials Science of Thin Films***, Academic Press, Boston, 2002, 2nd edition.

S. Zhang, L. Li and A. Kumar, ***Materials Characterization Techniques***, CRC Press, Bota Racon2009.

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	Nucleation , Energy forming of nuclei , Sphericaland cylindrical nuclei	3	Chalk & Talk
1.2	Gibbs Thomson equation	2	Chalk & Talk
1.3	Solvents, Solution, Solubility, Super Solubility	2	Chalk & Talk
1.4	Expression for super saturation	2	Chalk & Talk
1.5	Growth mechanism and classification	2	Chalk & Talk
1.6	Solution growth, Low and high temperaturesolution growth	2	Chalk & Talk
1.7	Slow cooling, Solvent evaporation method, Temperature gradient method.	2	PPT
	UNIT – II		
2.1	Principle of gel technique, Various types of gel	4	Chalk & Talk
2.2	Structure and importance of gel	2	Chalk & Talk
2.3	Methods of gel growth and advantages	3	Chalk & Talk
2.4	Hydrothermal growth – Melt technique	4	Chalk & Talk
2.5	Czochralski growth, Bridgemen method, Fluxgrowth	2	Discussion

UNIT – III			
3.1	Nature of thin films, Emission conditions	2	Chalk & Talk
3.2	distribution of deposits from point, surface andcylindrical sources	2	Chalk & Talk
3.3	Deposition techniques: Vacuum evaporation	3	Chalk & Talk
3.4	Pulsed laser deposition, Cathodic sputtering,Reactive sputtering	2	Chalk & Talk
3.5	RF sputtering, Spray pyrolysis	3	Chalk & Talk
3.6	Electro deposition, Substrate cleaning.	3	Chalk & Talk
UNIT – IV			
4.1	Theories of thin film nucleation – Film growth	2	Chalk & Talk
4.2	Incorporation of defects, impurities in thin film	3	Chalk & Talk
4.3	deposition parameters and grain size	3	Chalk & Talk
4.4	Interferometry – Fringes of equal chromaticorder (FECO)	3	Chalk & Talk
4.5	Ellipsometry – Vibrating quartz crystal method	2	PPT
4.6	Gravimetric balance method.	2	PPT
UNIT – V			
5.1	X-ray diffraction – Powder and single crystal	3	PPT
5.2	Fourier transform infrared analysis	3	PPT
5.3	Elemental dispersive X-ray analysis	3	PPT
5.4	Transmission and scanning electron microscopy	3	PPT
5.5	UV-Vis-NIR spectrometer.	3	Discussion
	Total	**75**	

Course Designer
Mr. S. Balaji Prasath
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE12	**Fiber Optics Communication**	**Elective - I**	**75**	**4**

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

Course Relevance	
Local	
Regional	
National	✓
Global	

Preamble

Enable the students to understand the various classifications of optical fibres and the losses encountered while sending signals and to design an optical link by choosing various parameters and components.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Understand the optical fibre communication, propagation and transmission.	**K1,K2,K3,K4,K5**
CO2	Classify the types of optical fiber and different fiber fabrication techniques	**K1,K2,K3,K4,K5**
CO3	Explore the properties of semiconductors and its applications	**K1,K2,K3,K4,K5**
CO4	Familiar with construction and characteristics of optical sources and Power launching coupling methods.	**K1,K2,K3,K4,K5**
CO5	Analyze the losses (Attenuation) in fiber and Splicing techniques	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Forms of communication systems – The evolution of fiber optic systems – Elements of an optical fiber transmission link – Optical fiber modes and configurations – Fiber types – Rays and modes – Step index fiber structure – Single mode fibers – Graded into numerical aperture (NA).

UNIT II 15 Hours

Glass fiber – Halide glass fibres – Active glass fibers – Plastic – clad glass fibers – plastic fibers – Fiber fabrication – Outside vapour phase oxidation – Vapour phase axial deposition – Modified chemical vapour deposition – Double – crucible method.

UNIT III 15 Hours

Energy bands – Intrinsic and extrinsic material – The P junctions – Direct and indirect band gaps – Semiconductor device fabrication – LED – LED structure – Light source materials – Modulation capability – Laser diode modes and threshold condition – Laser diode structures and radiation patterns – Single mode laser – Physical principles of photodiodes – The pin photo detector – Avalanche photodiodes.

UNIT IV 15 Hours

Source to fiber power launching – Source output patterns power – Power launching versus wavelength – Equilibrium numerical aperture – Non-imaging microsphere laser diode of fiber coupling fiber to fiber joints – Mechanical misalignment.

UNIT V 15 Hours

Fiber and face preparation – Attenuation units – Absorption – Scattering losses Bending losses – Core and cladding losses – Signal distortion in optical wave guide - Fiber splicing – Splicing techniques – Optical fiber connectors.

Text Books

Gerd Keiser, ***Optical fiber communications***, McGraw-Hill International Edition, 1991, 2nd Edition.

Reference Books

Govind P Agrawal, ***Fiber optic communication systems***, A John Wiley & Sons, INC., Publication, 2002, 3rd Edition.

John M Senior, ***Optical fiber communications***, PHI Publishing, 2002, 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	Forms of communication systems, The evolutionof fiber optic systems	4	Chalk & Talk
1.2	Elements of an optical fiber transmission link	3	Chalk & Talk
1.3	Optical fiber modes and configurations, Fibertypes, Rays and modes	4	Chalk & Talk
1.4	Step index fiber structure, Single mode fibers, Graded into numerical aperture (NA).	4	Chalk & Talk
UNIT – II			
2.1	Glass fiber – Halide glass fibers – Active glassfibers	4	Chalk & Talk
2.2	Plastic – clad glass fibers – plastic fibers	3	Chalk & Talk
2.3	Fiber fabrication, Outside vapour phase oxidation	3	Chalk & Talk
2.4	Vapour phase axial deposition	4	Chalk & Talk
2.5	Modified chemical vapour deposition – Double – crucible method.	3	Chalk & Talk
UNIT – III			
3.1	Energy bands, Intrinsic and extrinsic material	2	Chalk & Talk
3.2	The PN junctions – Direct and indirect band gaps	2	Chalk & Talk

3.3	Semiconductor device fabrication – LED, LED structure, Light source materials	2	Chalk & Talk
3.4	Modulation capability – Laser diode modes andthreshold condition	2	Chalk & Talk
3.5	Laser diode structures and radiation patterns – Single mode laser	3	Chalk & Talk
3.6	Physical principles of photodiodes	2	PPT
3.7	The pin photo detector – Avalanche photodiodes.	2	PPT
UNIT – IV			
4.1	Source to fiber power launching – source outputpatterns power	4	Chalk and Talk
4.2	power launching versus wavelength, Equilibriumnumerical aperture	4	Chalk and Talk
4.3	Non-imaging microsphere laser diode of fiber coupling fiber to fiber joints	3	Chalk and Talk
4.4	Mechanical misalignment.	4	Chalk and Talk
UNIT – V			
5.1	Fiber and face preparation – Attenuation units	3	Chalk and Talk
5.2	Absorption – Scattering losses – Bending losses – Core and cladding losses	3	Chalk and Talk
5.3	Signal distortion in optical wave guide	3	Chalk and Talk
5.4	Fiber splicing – Splicing techniques	3	Chalk and Talk
5.5	Optical fiber connectors.	3	Chalk and Talk
	Total	**75**	

Course Designer

Mr. A. Ansar Ahamed
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC21	Mathematical Physics- II	Core - V	75	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 mathematical physics and advanced mathematical methods in physics. It also enables the students to use mathematical concepts required in physics and enhances problem solving skills. It imparts mathematical knowledge for the description of physics phenomena.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Instruct about basic properties of complex functions and relatedtheorems.	**K1,K2,K3,K4,K5**
CO2	Inculcate about basic properties of complex variables andrelated theorems	**K1,K2,K3,K4,K5**
CO3	Develop knowledge on the basic concepts on Laplace transform	**K1,K2,K3,K4,K5**
CO4	Describe the properties and usage of special functions in physics and elucidate the characteristics of orthogonal polynomials.	**K1,K2,K3,K4,K5**
CO5	Recognize to apply the mathematical concepts to solve the problems	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Introduction- Functions of complex variables – Analytic function - Cauchy-Riemann differential equation - Cauchy-Riemann in polar form - Laplace's equation: Harmonic functions - Line integral of a complex function - Cauchy's integral theorem [elementary proof 1] - Cauchy's Integral formula.

UNIT II 15 Hours

Singularities of an analytical function – Residues and Their Evaluation - Cauchy's Residue theorem - Evaluation of definite integrals - Integration round the unit circle - Evaluation of infinite integrals by Jordan's lemma.

UNIT III 15 Hours

Laplace transforms-properties of Laplace transforms - Laplace transform of derivative of a function - Laplace transform of integrals - Application of Laplace transforms: Square wave &saw tooth wave - Inverse Laplace transform: Fourier Mellin Theorem - Properties of inverse Laplace transform.

UNIT IV 15 Hours

Legendre differential equation - Hermite differential equation - Series of solution and their polynomials - Rodrique's formula - Generating functions-Recurrence relation - Orthogonality relation.

UNIT V 15 Hours

Introduction - Definition of probability - Events - Dependent and Independent events - Mutually Exclusive events - Compound probability - Binomial distribution - The Poisson distribution - Normal or Gaussian distribution -Distribution of a sum of normal variables.

Text Books

Sathyaprakash, ***Mathematical Physics***, Sulthan chand & sons, New Delhi, 2006.

Reference Books

B.D.Gupthavikas, ***Mathematical physics***, Publishing House pvt. Ltd, New Delhi, 2006.

L.A. Pipes and L.R. Harvill, ***Applied mathematics for Engineers and Physicsts***, McGraw Hill, 1987

A.K.Ghatak, J.C. Goyal and J.Chua, ***Mathematical physics***, Mac Millan Indian Ltd., 1995 New Delhi, 2006.

H.K. Dass, ***Mathematical physics***, S. Chand Company Ltd, New Delhi, 2004.

Pedagogy

Chalk & Talk, Lecture, Seminar LMS, PPT, 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- Functions of complex variables	2	Chalk & Talk
1.2	Analytic function - Cauchy-Riemann differential equation	3	Chalk & Talk, PPT
1.3	Cauchy-Riemann in polar form	2	Discussion
1.4	Laplace's equation: Harmonic functions	2	Chalk & Talk,
1.5	Line integral of a complex function	2	PPT
1.6	Cauchy's integral theorem [elementary proof 1]	2	PPT
1.7	Cauchy's Integral formula	2	Chalk & Talk
UNIT – II			
2.1	Singularities of an analytical function	3	Chalk & Talk
2.2	Residues and Their Evaluation	2	PPT
2.3	Cauchy's Residue theorem	2	PPT
2.4	Evaluation of definite integrals	4	Chalk & Talk
2.5	Integration round the unit circle	2	Chalk & Talk
2.6	Evaluation of infinite integrals by Jordan's lemma	2	Chalk & Talk

UNIT – III			
3.1	Laplace transforms, properties of Laplace	2	Chalk & Talk
3.2	Laplace transform of derivative of a function	3	Chalk & Talk,
3.3	Laplace transform of integrals	2	Chalk & Talk
3.4	Application of Laplace transforms: square wave & saw tooth wave	3	PPT
3.5	transforms Inverse Laplace transform : Fourier Mellin Theorem	3	Chalk & Talk
3.6	properties of inverse Laplace transform	2	PPT
UNIT – IV			
4.1	Legendre differential equation.	3	Chalk & Talk
4.2	Hermite differential equation	3	Chalk & Talk,
4.3	Series of solution and their polynomials	3	Chalk & Talk
4.4	formula Generating functions- Recurrence relation	3	PPT
4.5	Rodrique's and Orthogonality relation	3	YouTube
UNIT – V			
5.1	Introduction: Definition of probability	2	Chalk & Talk
5.2	Events , Dependent and Independent events	3	Chalk & Talk,
5.3	Mutually Exclusive events	2	Chalk & Talk
5.4	Compound probability	2	PPT
5.5	Binomial distribution, The Poisson distribution and Normal or Gaussian distribution.	4	Chalk & Talk
5.6	Distribution of a sum of normal variables	2	PPT
	Total	**75**	

Course Designer
Dr. S. Prasanna Subramanian
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC22	Electromagnetic Theory	Core – VI	75	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 electromagnetic waves, fundamental principles of electrostatics, magneto statics, electrodynamics, application f Maxwell's equation. It also enables the students to understand the essential principles of electrodynamics and its applications. It analyzes physical situations and propagation of electromagnetic waves in conducting media.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Understand the concepts on electrostatics and to use Gauss's law in various applications.	**K1,K2,K3,K4,K5**
CO2	Analyze the theory of magnetostatics – wiz Biot-Savort's law, Ampere's circuital law and magnetic vector potential.	**K1,K2,K3,K4,K5**
CO3	Derive Maxwell's equation in differential and integral form, propagation of EM waves through different media.	**K1,K2,K3,K4,K5**
CO4	Acquire the knowledge of the various modes of propagation of EM waves in waveguides.	**K1,K2,K3,K4,K5**
CO5	Discuss about Retarded potentials, the Lienard – Wiechert potentials and Electric – Magnetic dipole radiation.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Electric charge – Coulomb's law – Electric field – Electrostatic potential – Gauss law and its applications – The electric dipole – Multipole expansion of electric fields. Poisson's equation – Laplace's equation: Properties of solutions (Uniqueness theorem) – Solutions to Laplace's equation in spherical coordinates (Zonal harmonics) – Usefulness of zonal harmonics (conducting sphere in a uniform electric field) – Electrostatic images – Point charge and conducting sphere – Line charges and line images.

UNIT II 15 Hours

Definition of magnetic induction – Forces on current carrying conductors – Biot – Savart Law – Elementary applications of Biot – Savart law – Ampere's circuital law – Magnetic vector potential – The magnetic field of a distant circuit – Magnetic scalar potential – Magnetic flux.

UNIT III 15 Hours

Displacement current – Maxwell's equations: equation, derivation of differential and integral forms – Pointing theorem – Poynting vector - electromagnetic waves in free space, isotropic dielectrics and conducting media.

UNIT IV 15 Hours

Boundary conditions: reflection and transmission – Reflection and transmission of electromagnetic waves at normal and oblique incidence – Guided waves: Waveguides – TE waves in a rectangular waveguide.

UNIT V 15 Hours

Gauge transformations – Coulomb gauge and Lorentz gauge – Retarded potentials – The Lienard – Wiechert potentials – the fields of a moving point charge – Electric dipole radiation – Magnetic dipole radiation – Radiation from an arbitrary source.

Text Books

J.R.Reitz, F.J.Milford, R.W. Christy, ***Foundations of Electromagnetic theory,*** Narosa Publishing House, New Delhi, 1998.

NK.K. Chopra, G.C. Agarwal, ***Electromagnetic theory,*** S K.Nath & Co., Meerut 2010.

J. David, Grififths, ***Introduction to Electromagnetic theory,*** Printice Hall House, New Delhi, 1998.

Reference Books

P. Lorrain and D.R. Corson, ***Electromagnetic Fields and Waves***, CBS Publishers & Distributers, NewDelhi, 2000.

P. Mukhopadhyay, ***Electromagnetic Fields and Applications***, Tata McGraw Hill, Noida, 1993.

W. Jr. Hayt., ***Engineering Electromagnetics***, McGraw Hill, Singapore, 2000.

A.Z. Capri & P.V. Panat, ***Introduction to Electrodynamics***, Norsa Publishing House, New Delhi, 2002.

E.C. Jordan & K.G. Balmain, ***Electromagnetic Waves and Radiating Systems,*** Printice- Hall of India, New Delhi, 2003.

Pedagogy

Chalk & Talk, Lecture, Seminar LMS, PPT, 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	Electric charge and Coulomb's law – Electric field – Electrostatic potential - Gauss law and its applications.	3	Chalk & Talk
1.2	The electric dipole – Multipole expansion of electric fields and Poissons equation	2	PPT
1.3	Laplace's equation: Properties of solutions. (Uniqueness theorem)	2	PPT
1.4	Solutions to Laplace's equation in spherical coordinates (Zonal harmonics)	2	Discussion
1.5	Usefulness of zonal harmonics (conducting sphere in a uniform electric field)	2	Chalk & Talk,

1.6	Electrostatic images Point charge and conducting sphere - Line charges and line images	4	PPT
UNIT – II			
2.1	Definition of magnetic induction and Force on current carrying conductor	2	Chalk & Talk
2.2	Residues and Their Evaluation Biot – Savart Law and Elementary applications of Biot – Savart law	4	PPT
2.3	Ampere's circuital law and Magnetic vector potential The magnetic field of a distant circuit	4	PPT
2.4	The magnetic field of a distant circuit	3	Chalk & Talk
2.5	Magnetic scalar potential and Magnetic flux	2	Chalk & Talk
UNIT – III			
3.1	Displacement current	2	Chalk & Talk
3.2	Differential form of EM waves	3	Chalk & Talk,
3.3	Integral form of EM waves	3	Chalk & Talk
3.4	Poynting theorem and vector	3	PPT
3.5	EM waves in free space, isotropic dielectric and conducting media	4	Chalk & Talk
UNIT – IV			
4.1	Boundary conditions Reflection and Refraction	3	Chalk & Talk
4.2	Reflection and transmission of electromagnetic waves at Oblique incidence	4	Chalk & Talk,
4.3	Reflection and transmission at Normal incidence	3	Chalk & Talk
4.4	Waveguides	2	PPT
4.5	TE waves in Rectangular waveguide	3	YouTube
UNIT – V			
5.1	Gauge Transformation (Coulomb and Lorentz)	3	Chalk & Talk
5.2	Retarded potential and Lienard – Wiechert potentials	4	Chalk & Talk,
5.3	the fields of a moving point charge	2	Chalk & Talk
5.4	Electric and magnetic dipole radiation	4	PPT
5.5	Radiation from an arbitrary source	2	PPT
	Total	**75**	

Course Designer

Mr. A. Ansar Ahamed

Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC23	Quantum Mechanics -I	Core – VII	75	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 deep knowledge on the basics of quantum mechanics from Schrodinger's theory and Heisenberg principles. It deals with solvable systems and methods for some systems like particle in a box. It also enables the particle interaction, rotation features and trajectory properties.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Compare classical mechanics and Quantum mechanics. Basicconcepts of wave function	**K1,K2,K3,K4,K5**
CO2	Understand the Uncertainty, Expectation values, and Ehrenfest's theorem, schrodinger equation and concept of wave function.	**K1,K2,K3,K4,K5**
CO3	Comprehend about the Observables and various operators(Hermitian, dirac function, Eigen function)	**K1,K2,K3,K4,K5**
CO4	Learn about square well potential and linear Harmonic oscillator (schrodinger and linear operator methods).	**K1,K2,K3,K4,K5**
CO5	Elaborate interaction between the particles, spin properties andquantum analysis of particles (deuteron).	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Limitation of classical physics - Planck's quantum Hypothesis a-Einstein's theory of photoelectric Effect - Compton Effect - Quantum theory of specific heat - Bohr model of Hydrogen atom - Existence of stationary states - Elliptic orbits of Hydrogen atom - The Harmonic oscillator - The Rigid Rotator-particle in a Box - Inadequacy of quantum theory.

UNIT II 15 Hours

Wave Nature of particles - The uncertainty principle - The principle of Superposition - Wave packet - Time dependent Schrodinger equation - Interpretation of the Wave function - Ehrenfest's theorem - Time independent Schrodinger equation - Stationary states – Admissibility condition on the wave function.

UNIT III 15 Hours

Linear vector space - Linear operator - Eigen function and Eigen Values - Hermitian operator - Postulates of Quantum mechanics - Simultaneous measurability of observable - General uncertainty relation - Dirac's equation - Equation of motion - Momentum Representation.

UNIT IV 15 Hours

Square well potential with rigid walls and finite walls – Square potential Barrier - Alpha emission - Bloch waves in a periodic potential - Linear Harmonic oscillator: Schrodinger method and operator method - Free particle in one dimensional Energy Eigen value Problem.

UNIT V 15 Hours

Particle moving in a spherical symmetric potential - system of two interaction particle - Rigid rotator - Three dimensional Square well potential - The Deuteron – Hydrogenic orbits.

Text Books

G. Aruldas , Quantum mechanics**,** PHI learning private Limited, New Delhi, 2013.

Reference Books

R.K. Prasad, ***Quantum Chemistry***, New Agers International Publishers, New Delhi, 1997.

P.M. Mathews, K. Venkatesan, ***Quantum mechanics***, Tata McGraw Hill, Noida, 2015.

L.L. Schiff, ***Quantum mechanics***, Tata McGraw Hill, Noida, 2017.

Pedagogy

Chalk & Talk, Lecture, Seminar LMS, PPT, 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	Limitation of classical physics and Planck's quantum Hypothesis	2	Chalk & Talk
1.2	Einstein's theory of photoelectric Effect - Compton Effect and Quantum theory of specific heat	3	PPT
1.3	Bohr model of Hydrogen atom, Existence of stationarystates	3	PPT
1.4	Elliptic orbits of Hydrogen atom	2	Discussion
1.5	The Harmonic oscillator.	2	Chalk & Talk
1.6	The Rigid Rotator-particle in a Box	2	PPT
1.7	Inadequacy of quantum theory	1	Chalk & Talk
UNIT – II			
2.1	Wave Nature of particles	2	Chalk & Talk
2.2	The uncertainty principle ,The principle of Superposition,Wave packet	3	PPT
2.3	Time dependent Schrodinger equation	2	PPT
2.4	Interpretation of the Wave function, Ehrenfest's theorem	4	Chalk & Talk
2.5	Time independent Schrodinger equation	2	Chalk & Talk
2.6	Stationary states and Admissibility condition on the wavefunction	2	PPT

UNIT – III			
3.1	Linear vector space	2	Chalk & Talk
3.2	Linear operator , Eigen function and Eigen Values	3	Chalk & Talk,
3.3	Hermitian operator and Postulates of Quantum mechanics	2	Chalk & Talk
3.4	Simultaneous measurability of observable	3	PPT
3.5	General uncertainty relation and Dirac's equation.	3	Chalk & Talk
3.6	Equation of motion and Momentum Representation	2	PPT
UNIT – IV			
4.1	Square well potential with rigid walls and finite walls	4	Chalk & Talk
4.2	Square potential Barrier ,Alpha emission and Bloch wavesin a periodic potential	4	Chalk & Talk
4.3	Linear Harmonic oscillator : Schrodinger method andoperator method	4	Chalk & Talk
4.4	Free particle in one dimensional Energy Eigen valueproblem.	3	PPT
UNIT – V			
5.1	Particle moving in a spherical symmetric potential	4	Chalk & Talk
5.2	System of two interaction particle, Rigid rotator.	4	Chalk & Talk
5.3	Three dimensional Square well potential.	4	Chalk & Talk
5.4	The Deuteron and Hydrogenic orbits	3	PPT
	Total	**75**	

Course Designer
Ms. M. Aabitha Rahman
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC2P	Practical – II	Core – VIII	150	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

It enables to gain more knowledge about practical in order to understand the basic characteristics and applications of Operational amplifier. The subject enables the fundamental concepts of Interference patterns, heat and Thermodynamics related concepts. It also covers the fundamental theories of Photo diodes and photo transistors based on experiment. The study enables the experiments of finding charge of electron using optical experiments.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Analyze the basic applications of Op-amp	**K1,K2,K3,K4,K5**
CO2	Demonstration of interference patterns	**K1,K2,K3,K4,K5**
CO3	Understand the characteristics of Photo diode and photo transistors	**K1,K2,K3,K4,K5**
CO4	Study of the charge of electron through optics	**K1,K2,K3,K4,K5**
CO5	Experiments related to heat transport phenomena	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

Experiments: (Any 10 experiments from the list)

1. Amplitude Modulation
2. Triangular and Saw - tooth Wave Generation IC741
3. Operational Amplifier - Integrator of Differentiator
4. Hyperbolic fringes
5. Elliptical fringes
6. Wave shaping circuits
7. Field Effect Transistor Amplifier
8. Charge of an electron – Spectrometer
9. Photodiode and Phototransistor - Characteristics
10. Calibration of Thermocouple - Potentiometer
11. E/M Thomson method
12. Push Pull – Power Amplifier

Course Designer

Dr. S. Prasanna Subramanian
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE21	Quantitative Aptitude and Reasoning	Elective -II	75	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

It enables to gain more knowledge about numerical ability and quantitative aptitude. The subject enables the understanding and ability to solve simple problems exactly with short duration. It also covers the skills of various national and international level competitive exams. The study shows the way to get research positions and job positions.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Understand the basic knowledge about H.C.F & L.C.M.	K1,K2,K3,K4,K5
CO2	Solve problem on percentage, profit & loss, ratio & proportion and partnership.	K1,K2,K3,K4,K5
CO3	Solve area and time related problems.	K1,K2,K3,K4,K5
CO4	Familiar with verbal reasoning and mathematical operations.	K1,K2,K3,K4,K5
CO5	Recognize the analytical reasoning and other logical non-verbal reasoning.	K1,K2,K3,K4,K5

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

- H.C.F. & L.C.M. of numbers
- Decimal Fractions.

UNIT II 15 Hours

- Profit & Loss
- Ratio & Proportion
- Partnership.

UNIT III 15 Hours

- Time & Distance
- Area.

UNIT IV 15 Hours

- Logical Venn Diagrams
- Alphabet Test
- Mathematical Operations

UNIT V 15 Hours

- Classification (Odd Man Out)
- Analytical Reasoning Spotting out the Embedded Figures
- Complete the Incomplete Pattern

Text Books

R.S. Aggarwall***, Quantitative Aptitude,*** S.Chand Company Ltd, New Delhi, 2007.

Unit I: Page nos. 3-29, 30-45, 46-66.

Unit II: Page nos. 208-250, 251-293, 294-310, 311-325

Unit III: Page nos. 341-370, 384-404, 499-548

R.S. Aggarwall**, Verbal and Non-verbal Reasoning,** S. Chand Company Ltd, New Delhi, 2007.

Unit IV: Section I (Page nos. 441-481, 482-530, 569-596)

Unit V: Section III (Page nos. 345-381, 382-407, 428-440, 441-457)

Reference Books

R.S. Aggarwall***, Numerical Ability,*** S. Chand Company Ltd, New Delhi, 2016.
AbhijitGuha***, Quantitative Aptitude,*** Mc Graw Hill, New Delhi, 2016.

Pedagogy

Chalk & Talk, Lecture, Seminar LMS, PPT, 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	H.C.F. & L.C.M. of numbers	7	Chalk & Talk
1.2	Decimal Fractions	8	PPT
UNIT – II			
2.1	Profit & Loss	5	Chalk & Talk
2.2	Ratio & Proportion	5	PPT
2.3	Partnership	5	PPT
UNIT – III			
3.1	Time & Distance	10	Chalk & Talk
3.2	Area	5	Chalk & Talk
UNIT – IV			
4.1	Logical Venn Diagrams	5	Chalk & Talk
4.2	Alphabet Test	5	PPT
4.3	Mathematical Operations	5	Chalk & Talk
UNIT – V			
5.1	Classification (Odd Man Out)	5	Chalk & Talk
5.2	Analytical Reasoning Spotting out the Embedded Figures	5	Chalk & Talk
5.3	Complete the Incomplete Pattern	5	Chalk & Talk
	Total	**75**	

Course Designer

Dr. S. Prasanna Subramanian
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE22	Microprocessor	Elective - II	75	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

It enables to gain more knowledge about organization and architecture of microprocessors. The subject enables the understanding and ability to write and execute assembly level language programming of microprocessors. It also covers the basic theory and programming of microcontroller.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Discuss the internal architecture and resources of 8085 microprocessor	**K1,K2,K3,K4,K5**
CO2	Understand the programming techniques	**K1,K2,K3,K4,K5**
CO3	Know about counters and time delay functions	**K1,K2,K3,K4,K5**
CO4	Analyze the code conversions and the interrupts	**K1,K2,K3,K4,K5**
CO5	Explore the interfacing data convertors(DAC & ADC)	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

A detailed look at the 8085 MPU and its architecture 8085 programming – instructions Classification – Instruction format – how to wire, assemble and execute a simple program – Introduction to 8085 Instructions. Data transfer operation – Arithmetic operation – Logic operations- Branch operation – Writing assembly language program – Debugging a program.

UNIT II 15 Hours

Programming techniques with additional instructions – programming techniques: Looping, counting and indexing – Additional data transfer and 16 bit arithmetic instructions – Arithmetic operations related to memory – Logic operations: Rotate and compare – Dynamic debugging.

UNIT III 15 Hours

Counters and time delays – Illustrative programs – Hexadecimal counters – Zero to nine counters- Generating pulse wave form Debugging counters and time delay programs. Stack and subroutines; Stack – Subroutine - conditional call and return instructions – Advanced and subroutine concepts.

UNIT IV 15 Hours

Code conversion, BCD arithmetic and 16 bit data operation – BCD to binary conversion – Binary to BCD to conversion – BCD to seven segment LED ode conversion - BCD addition – BCD subtraction – Introduction to advanced instruction and applications multiplication – Subtraction with carry; interrupts – The 8085 interrupts – 8085 vectored interrupts – Restart software instructions.

UNIT V 15 Hours

Digital to analog converters – Analog to digital converters – 8255A Programmable peripheral interface.

Text Books

Ramesh Goanker, ***Microprocessor Architecture, programming and application with 8085,*** Penram International Publishing, Mumbai, 1997.

Reference Books

B. Ram, ***Fundementals of microprocessors and microcomputers,*** Dhanpand Rai Publications, New Delhi, 2005.

A. P. Godse and D.S. Godse, ***Microprocessors, T***echnical Publications, Pune, 2005.

A. P. Mathur, ***Introduction to Microprocessors***, Tata Mc GrawHill, New Delhi, 2004.

Pedagogy

Chalk & Talk, Lecture, Seminar LMS, PPT, 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	A detailed look at the 8085 MPU and its architecture 8085 programming	3	Chalk & Talk
1.2	instructions Classification, Instruction format, how to wire, assemble and execute a simple program	4	PPT
1.3	Introduction to 8085 Instructions. Data transfer operation , Arithmetic operation , Logic operations- Branch operation	4	Chalk & Talk
1.4	Writing assembly language program, Debugginga program.	4	PPT
	UNIT – II		
2.1	Programming techniques with additional instructions, programming techniques: Looping, counting and indexing	5	Chalk & Talk
2.2	Additional data transfer and 16 bit arithmetic instructions , Arithmetic operations related tomemory	5	PPT
2.3	Logic operations: Rotate and compare, Dynamicdebugging.	5	PPT

UNIT – III			
3.1	Counters and time delays – Illustrative programs - Hexadecimal counters.	4	Chalk & Talk
3.2	Zero to nine counters- Generating pulse wave form Debugging counters and time delay programs	5	Chalk & Talk
3.3	Stack and subroutines; Stack, Subroutine, conditional call and return instructions, Advanced and subroutine concepts.	6	PPT
UNIT – IV			
4.1	Code conversion, BCD arithmetic and 16 bit data operation BCD to binary conversion, Binary to BCD to conversion, BCD to seven segment LED ode conversion, BCD addition, BCD subtraction.	7	Chalk & Talk
4.2	Introduction to advanced instruction and applications multiplication – Subtraction withcarry.	4	PPT
4.3	Interrupts, The 8085 interrupts, 8085 vectored interrupts, Restart software instructions.	4	Chalk & Talk
UNIT – V			
5.1	Digital to analog converters, Analog to digitalconverters	8	Chalk & Talk
5.2	8255A Programmable peripheral interface.	7	Chalk & Talk,
	Total	**75**	

Course Designer
Mr. A. Ansar Ahamed
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC31	Quantum Mechanics -II	Core – IX	90	5

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain more knowledge about Quantum Mechanics in order to develop knowledge on perturbation theory, scattering theories, identical particles and to enhance problem solving skills on Relativistic equation.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Describe the Degenerate and non-degenerate case	**K1,K2,K3,K4,K5**
CO2	Explain the concept of Approximation Methods	**K1,K2,K3,K4,K5**
CO3	Explain the symmetric and antisymmetric functions	**K1,K2,K3,K4,K5**
CO4	Solve the Problems on three dimensional problem	**K1,K2,K3,K4,K5**
CO5	Explain the concepts of Relativistic equation	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 18 Hours

Stationary state perturbation theory - Degenerate and non-Degenerate case - Effect of electric field on energy level of hydrogen atom-Variational principle – Rayleigh-Ritz method- Ground state of Helium atom - Time dependent perturbation theory- Harmonic perturbation- Transition to continuum states- Fermi's golden rule.

UNIT II 18 Hours

Sudden approximation - Adiabatic approximation - Scattering theory of Born approximation - Condition for validity of Born approximation - Scattering by a screened coulomb potential – Partial wave analysis.

UNIT III 18 Hours

Physical meaning of identity – Symmetric & Antisymmetric wave function- Construction from Antisymmetrized function - Pauli Exclusion Principle - Spin angular momentum.

UNIT IV 18 Hours

Three Dimensional problem - Hydrogen atom –Energy eigen values – Wave functions of hydrogen like atom – Radial probability Density - hydro genic Orbitals - A Free particle - Three dimensional square well potential - Ground state of deuteron.

UNIT V 18 Hours

Klein Gordan equation for free particle-Dirac's Matrices - Covariant form of dirac equation- Probability density for charge & current- Plane wave solution of Dirac's equation-Negative energy state- Dirac's equation for a electron in central potential- Spin of dirac particle.

Text Books

Aruldhas. G, ***Quantum Mechanics***, PHI Learning Private Limited, Delhi, 2nd Edition (2013).

S.L.Kakani, H.M.Chanadalia, ***Quantum MechanicsTheory and problems***, Sultan Chand & Sons.

Reference Books

R.k. Prasad, ***Quantum Chemistry***, New Agers International Publishers, 4th Edition.

P.M.Mathews, K.Venkatesan, ***Quantum Mechanics***, Tata McGraw Education Private Limited, New Delhi Hill, 2nd Edition.

Pedagogy

Chalk & Talk, Lecture, Seminar LMS, PPT, 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	Stationary state perturbation theory, Degenerateand non-Degenerate case	4	Chalk & Talk
1.2	Effect of electric field on energy level ofhydrogen atom	4	E-Resources
1.3	Variational principle, Rayleigh-Ritz method	4	Discussion
1.4	Ground state of Helium atom, Time dependentperturbation theory	3	E-Resources
1.5	Harmonic perturbation , Transition to continuum states , Fermi's golden rule	3	Discussion
	UNIT – II		
2.1	Sudden approximation, Adiabatic approximation	4	Discussion
2.2	Scattering theory of Born approximation	4	Chalk & Talk
2.3	Condition for validity of Born approximation	5	E-Resources
2.4	Scattering by a screened coulomb potential, Partial wave analysis	5	Chalk & Talk
	UNIT – III		
3.1	Physical meaning of identity – Symmetric & Antisymmetric wave function	6	E-Resources
3.2	Construction from Antisymmetrized function	6	Chalk & Talk

3.3	Pauli Exclusion Principle - Spin angular momentum.	6	Discussion
UNIT – IV			
4.1	Three Dimensional problem - Hydrogen atom ,Energy eigen values	3	Discussion
4.2	Wave functions of hydrogen like atom	3	E-Resources
4.3	Radial probability Density	3	Chalk & Talk
4.4	Hydrogenic Orbitals , A Free particle	3	Discussion
4.5	Three dimensional square well potential	3	E-Resources
4.6	Ground state of deuteron	3	Chalk & Talk
UNIT – V			
5.1	Klein Gordan equation for free particle, Dirac's Matrices , Covariant form of dirac equation.	5	E-Resources
5.2	Probability density for charge & current	5	Chalk & Talk
5.3	Plane wave solution of Dirac's equation , Negative energy state.	4	Discussion
5.4	Dirac's equation for a electron in central potential- Spin of dirac particle.	4	Chalk & Talk
	Total	**90**	

Course Designer
Dr. S. Prasanna Subramanian
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC32	Condensed Matter Physics -I	Core – X	90	5

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

A basic understanding of solids is important for practicing physicists as well as for many other related disciplines. The course is an introduction to the physics of the solid state matter.

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 properties of Crystal structures	**K1,K2,K3,K4,K5**
CO2	Analyze the inner structures of crystal	**K1,K2,K3,K4,K5**
CO3	Know the nature of bonding	**K1,K2,K3,K4,K5**
CO4	Classify the crystal vibration	**K1,K2,K3,K4,K5**
CO5	Describe the characteristics of conductivity	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 18 Hours

Introduction – Solids – Crystalline – Single and Polycrystals – Amorphous – Crystal lattice – Basis (Motif) – Crystal structure – Crystal symmetry: Translational, Rotational, Mirror and Inversion – Primitive cell, Unit cell, Bravais lattices, Crystal planes, Directions and Family of planes – Miller indices – Interplanar spacing – Crystal structures: SC, FCC, BCC and Closed packed structures – Number of atoms in unit cell – coordination numbers (coordination type) – Radii ratio – Packing factor for SC, FCC, BCC and HCP – *c/a* ratio – Structure of NaCl, CsCl, Diamond and ZnS – Density calculations.

UNIT II 18 Hours

Continuous and Characteristic X-rays – X-ray targets – Absorption of X-rays by material – X-ray diffraction – Bragg's Law – Reciprocal lattice – Reciprocal lattice for SC, FCC, BCC – Important properties of reciprocal lattices – Diffraction Intensity – Structure factor calculation for SC, FCC, BCC, NaCl and CsCl.

UNIT III 18 Hours

Forces between Atoms – Cohesion of atoms and cohesive energy – Calculation of cohesive energy – Bonding in solids – Ionic bonding: Bonding energy of NaCl molecule – Calculation of madelung constant of ionic crystals – Properties and examples of ionic solids – Covalent bond: Directional nature of a covalent bond – Properties of covalent compounds – Metallic bonding and its properties.

UNIT IV 18 Hours

Vibration of monoatomic lattices – Quantization of elastic waves – Phonon momentum – Thermal properties: Plank distribution for a system of identical harmonic oscillators – Density of states in one and three dimension – Einstein model – Debye model of specific heat, anhormonicity of lattice vibrations – Thermal expansion – Thermal conductivity and Umklapp processes.

UNIT V 18 Hours

Energy levels in one dimension – Fermi Dirac distribution for a free electron gas – Periodic boundary condition and free electron gas in three dimension – Heat capacity of the electron gas – Electrical conductivity and Ohm's law – Motion in magnetic fields – Hall Effect – Wiedemenn-Franz law – Energy bands: Nearly free electron model – Origin of the energy gap – Block functions – Motion of an electron in a periodic potential Kronig Penny Model.

Text Books

M.A. Wahab, ***Solid state physics***, 2015, 3rd edition.

S.O. Pillai, ***Solid State Physics***, 2018, 8th edition.

Charles Kittel, ***Introduction to Solid state physics***, Reprint 2017, 8th edition.

Reference Books

J.M. Zinam, ***Principles of the Theory of Solids***, Cambridge, 1972, 2nd edition.

N.W. Aschorft and N. D. Mermin, ***Solid state Physics,*** 1976.

A.O.E. Animalu, ***Intermediate Quantum Theory of the Crystalline Solids***, Prentice Hall of India, 1977.

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 – Solids – Crystalline – Single and Polycrystals – Amorphous	2	Chalk & Talk
1.2	Crystal lattice – Basis (Motif) – Crystal structure	2	E-Resources
1.3	Crystal symmetry: Translational, Rotational,Mirror and Inversion.	2	Discussion
1.4	Primitive cell, Unit cell, Bravais lattices, Crystal planes, Directions and Family of planes.	3	E-Resources

1.5	Miller indices – Interplanar spacing – Crystalstructures: SC, FCC, BCC and Closed packed structures.	3	Discussion
1.6	Number of atoms in unit cell – coordination numbers (coordination type) – Radii ratio –Packing factor for SC, FCC, BCC and HCP.	3	E-Resources
1.7	*c/a* ratio – Structure of NaCl, CsCl, Diamond andZnS – Density calculations.v	3	E-Resources
UNIT – II			
2.1	Continuous and Characteristic X-rays – X-ray targets – Absorption of X-rays by material –	6	Discussion
2.2	X-ray diffraction – Bragg's Law – Reciprocal lattice – Reciprocal lattice for SC, FCC, BCC –	6	Chalk & Talk
2.3	Important properties of reciprocal lattices – Diffraction Intensity – Structure factor calculation for SC, FCC, BCC, NaCl and CsCl.	6	E-Resources
UNIT – III			
3.1	Atomic Bonding: Forces between Atoms – Cohesion of atoms and cohesive energy – Calculation of cohesive energy.	4	E-Resources
3.2	Bonding in solids – Ionic bonding: Bondingenergy of NaCl molecule.	4	Chalk & Talk
3.3	Calculation of madelung constant of ionic crystals – Properties and examples of ionic solids.	5	Discussion
3.4	Directional nature of a covalent bond – Properties of covalent compounds – Metallic bonding and its properties.	5	E-Resources
UNIT – IV			
4.1	**Crystal vibrations**: Vibration of monoatomic lattices – Quantization of elastic waves.	5	Discussion
4.2	Phonon momentum – Thermal properties: Plankdistribution for a system of identical harmonic oscillators.	5	E-Resources

4.3	Density of states in one and three dimension –Einstein model – Debye model of specific heat, anhormonicity of lattice vibrations.	4	Chalk & Talk
4.4	Thermal expansion – Thermal conductivity andUmklapp processes.	4	Chalk & Talk
UNIT – V			
5.1	Energy levels in one dimension – Fermi Diracdistribution for a free electron gas –	4	E-Resources
5.2	Periodic boundary condition and free electron gas in three dimension – Heat capacity of the electron gas –	4	Chalk & Talk
5.3	Electrical conductivity and Ohm's law – Motion inmagnetic fields – Hall Effect –	4	Discussion
5.4	Wiedemenn-Franz law – Energy bands: Nearly free electron model – Origin of the energy gap –	3	E-Resources
5.5	Block functions – Motion of an electron in aperiodic potential Kronig Penny Model.	3	Chalk & Talk
	Total	**90**	

Course Designer
Mr. A. Ansar Ahamed
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC3P	Practical – III	Core – XI	150	5

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, optical experiments and electronics.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Learn the basic applications of Op - Amp	**K1,K2,K3,K4,K5**
CO2	Determine the Planck's Constant	**K1,K2,K3,K4,K5**
CO3	Know about IC 555 timer	**K1,K2,K3,K4,K5**
CO4	Analyse interference and diffraction pattern	**K1,K2,K3,K4,K5**
CO5	Determine the dielectric parameters	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

Experiments: (Any 10 experiments from the list)

1. Active filters IC – 741 High, low band pass and band stop
2. IC – 555 Timer Astable, Monostable and Bistable Multivibrator
3. Solving simultaneous equation – IC 741
4. Multiplexer and Demultiplexer – IC 74151
5. Michelson – interferometer – Determine the wavelength of the given source
6. Modulo - n – Counter four bit
7. Refractive index of liquid using Newton's ring
8. Photocell determination of Planck's constant
9. D/A converter – R,2R method , weighted Resistor method
10. Wide band amplifier
11. Solar spectrum - Rydberg constant
12. Dielectric parameter of a given liquid

Course Designer

Mr. M. Aabitha Rahman
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE31	Thermodynamics and Statistical Mechanics	Elective -III	75	5

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain more knowledge about Thermodynamics and statistical mechanics in order to acquire working knowledge of the fundamental laws of thermodynamics. In addition, it will also give exposure to students about the transport phenomenon of ideal gases, phase transitions and behavior of real gases and Enhance problem solving skills in thermodynamics.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Explain the fundamental laws of thermodynamics	**K1,K2,K3,K4,K5**
CO2	Know the concept of gases and its phase transition using thermodynamics laws.	**K1,K2,K3,K4,K5**
CO3	Explain the basic concepts of statistical mechanics.	**K1,K2,K3,K4,K5**
CO4	know about types of distributions	**K1,K2,K3,K4,K5**
CO5	Acquaint with the advanced topics where related to quantum theory.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

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

Syllabus

UNIT I 15 Hours

First law of thermodynamics and internal energy - Second law of thermodynamics - Carnot's engine and Carnot's cycle- Entropy- Third law of thermodynamics-Nernst Heat Theorem-Maxwell thermodynamic relations-Two Tds equations- Latent heat equations – Second Latent heat equations - Thermodynamic potentials: Internal energy-Helmholtz functions - Enthalpy-Gibbs potential-Gibbs Helmholtz relations

UNIT II 15 Hours

Triple point - Phase transition – Ehrenfest's equation –Liquefaction of Helium I & II - Ratio of two specific heats- Difference of two specific heats ($C_p - C_v = TE\alpha\ ^2V$) - Joule Thomson effect- Joule Thomson effect for perfect gas - real gas(Vander Waals's gas)

UNIT III 15 Hours

Basic concepts-Microstates and macro states- Phase space-Basic postulates of statistical mechanics – Ensembles- Canonical Ensembles - Micro canonical Ensembles -Grand canonical Ensembles - Entropy and other Thermodynamical quantities-Liouville's.

UNIT IV 15 Hours

Derivation of Maxwell Boltzmann distribution law - The distribution of molecular velocities (M.B) -Derivation of Bose Einstein statistics- Radiation of a photon gas - Bose Einstein Condensation- Derivation of Fermi Dirac statistics - F-D Energy and pressure of the Electron gas.

UNIT V 15 Hours

Specific Heat - Specific heat of Dulong and Petti's law – The Einstein's Quantum theory of a specific heat capacity of a solids - The Debye theory of a specific heat capacity of a solids – Specific heat of a monatomic gas – Specific heat of Diatomic gases - Brownian motion.

Text Books

S.L Kakani, ***Heat,Thermodynamics & statistical physics***, Chand & sons, 2009.

Reference Books

F.W.Swears & L.Salinga***, Thermodynamics, Kinetic theory & Statistical thermodynamics***, Narosa publishing house.

Sharma & Sakar, ***Thermodynamics & statistical physics***, Himalaya publishing house, 2005.

Donald A MC Quarrie, ***Statistical mechanics***, Viva books Pvt Ltd., 2003.

Gupta Kumar, PragatiPrakashan, ***Elementary statistical mechanics***.

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	First law of thermodynamics and internal energy,Second law of thermodynamics	3	Chalk & Talk
1.2	Carnot's engine and Carnot's cycle, Entropy, Third law of thermodynamics	3	E-Resources
1.3	Nernst Heat Theorem, Maxwell thermodynamic relations, Two Tds equations, Latent heat equations	3	Discussion
1.4	Second Latent heat equations , Thermodynamic potentials: Internal energy, Helmholtz functions	3	E-Resources
1.5	Gibbs potential , Gibbs Helmholtz relations	3	Discussion
UNIT – II			
2.1	Triple point , Phase transition	3	Discussion
2.2	Ehrenfest's equation, Liquefaction of Helium I &II.	4	Chalk & Talk
2.3	Ratio of two specific heats , Difference of twospecific heats ($C_p - C_v = TE\alpha^2 V$)	4	E-Resources
2.4	Joule Thomson effect , Joule Thomson effect for perfect gas , real gas(Vander Waals's gas)	4	E-Resources

UNIT – III			
3.1	Basic concepts, Microstates and macro states, Phase space, Basic postulates of statistical mechanics.	5	E-Resources
3.2	Ensembles, Canonical Ensembles, Micro canonical Ensembles, Grand canonical Ensembles.	5	Chalk & Talk
3.3	Entropy and other Thermodynamical quantities, Liouville's Theorem.	5	Discussion
UNIT – IV			
4.1	Derivation of Maxwell Boltzmann distribution law, The distribution of molecular velocities (M.B).	5	Discussion
4.2	Derivation of Bose Einstein statistics, Radiation of a photon gas, Bose Einstein Condensation.	5	E-Resources
4.3	Derivation of Fermi Dirac statistics F-D Energyand pressure of the Electron gas.	5	Chalk & Talk
UNIT – V			
5.1	Specific Heat, Specific heat of Dulong and Petti's law.	3	E-Resources
5.2	The Einstein's Quantum theory of a specific heat capacity of solids.	3	Chalk & Talk
5.3	The Debye theory of a specific heat capacity of a solids.	4	Discussion
5.4	Specific heat of a monatomic gas, Specific heat ofDiatomic gases, Brownian motion.	5	E-Resources
	Total	**75**	

Course Designer
Mr. S. Balaji Prasath
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE32	Cosmo Physics	Elective - III	75	5

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain more knowledge about Cosmo physics in order to develop knowledge in Astrophysics, Cosmo physics and to describe the properties and evolution of different types of galaxies.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	List Astro physically relevant radiation mechanisms, and identify them based on their spectral properties.	**K1,K2,K3,K4,K5**
CO2	Know the concept of time and types of telescopes.	**K1,K2,K3,K4,K5**
CO3	Explain the concept of aura and solar flares.	**K1,K2,K3,K4,K5**
CO4	Qualitatively discuss the structure of a star and its properties.Experimental support for the existence of dark matter and dark energy.	**K1,K2,K3,K4,K5**
CO5	Describe the properties and evolution of different types of galaxies.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Birth of Modern Astronomy - Geocentric and Heliocentric - Celestial sphere - Coordinate systems - Horizontal and equatorial systems -Kepler's law - Postulates of General theory of relativity - Elements of the telescope- Properties of images -Aberrations of telescopes - Kinds of Optical telescopes.

UNIT II 15 Hours

Birth of Modern Astronomy - Geocentric and Heliocentric - Celestial sphere - Coordinate systems - Horizontal and equatorial systems -Kepler's law - Postulates of General theory of relativity - Elements of the telescope- Properties of images -Aberrations of telescopes - Kinds of Optical telescopes

UNIT III 15 Hours

Planets-Terrestrial and Jovian planets (Planets individual description is not required in detail) - Satellites - Asteroids - Meteoroids - Comets - Physical properties-Composition-Photosphere - Chromosphere- Corona-Sunspots-Sunspot groups-Sunspot cycle-Solar Prominences-Solar Flares-Solar Wind-Communication disturbances- Auroras.

UNIT IV 15 Hours

Classification of spectra of stars - Hertzsprung - Russel diagram - Luminosity of a star - Photon diffusion time – Mass - Luminosity relation for a star - Nuclear reactions - stellar Evolution - White dwarfs - Chandrasekhar limit - Neutron stars - Black holes - Basic physics of Black hole.

UNIT V 15 Hours

Identifying Galaxies-Galaxy nomenclature-Types of Galaxies-Spiral – Elliptical -Irregular galaxies - Milky Way and its structure- Properties of Galaxies - Mass of a binary system- Star clusters- Galaxy clusters- Pulsars.

Text Books

Niclolas. A. Pananides and Thomas Arny, ***Introductory Astronomy***, Addison Wesley Publ. Co., 1979.

A. Mujiber Rahman, ***Introduction to Astrophysics***, KAMS Publications, Uthamapalayam, 2018.

Reference Books

Abhyankar, K.D, ***Astrophysics***, Universities Press, Delhi 2002.

Marc L. Klutner, ***Astronomy A physical perspective***, Cambridge University, UK 2003.

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 AstronomyGeocentric andHeliocentric Celestial sphere	3	Chalk & Talk
1.2	Coordinate systems, Horizontal and equatorialsystems	3	E-Resources
1.3	Kepler's law, Postulates of General theory of relativity	3	Discussion
1.4	Elements of the telescope Properties of images	3	E-Resources
1.5	Aberrations of telescopes, Kinds of Opticaltelescopes	3	Discussion
UNIT – II			
2.1	Refracting and Reflecting telescopes, Schmidttelescope	4	Discussion
2.2	Magnification of telescope, Radio telescope, Spectrograph, Limitation	4	Chalk & Talk
2.3	The orientation of Earth in space, Seasons Precession of the Earth, Arc and time units	4	E-Resources

2.4	Time keepers, Sidereal time, Local time, Standard time	3	E-Resources
UNIT – III			
3.1	Planets, Terrestrial and Jovian planets (Planets individual description is not required in detail)	5	E-Resources
3.2	Satellites, Asteroids, Meteoroids, Comets, Physical properties, Composition, Photosphere	5	Chalk & Talk
3.3	Chromosphere, Corona - Sunspots Sunspot groups, Sunspot cycle, Solar Prominences, Solar Flares, Solar Wind, Communication disturbances, Auroras	5	Discussion
UNIT – IV			
4.1	Classification of spectra of stars, Hertz sprung -Russel diagram	2	Discussion
4.2	Luminosity of a star, Photon diffusion time	2	E-Resources
4.3	Mass, Luminosity relation for a star, Nuclearreactions	2	Chalk & Talk
4.4	Stellar Evolution, White dwarfs, Chandrasekharlimit	3	E-Resources
4.5	Neutron stars, Black holes	3	Chalk & Talk
4.6	Basic physics of Black hole	3	E-Resources
UNIT – V			
5.1	Identifying Galaxies, Galaxy nomenclature,Types of Galaxies	3	E-Resources
5.2	Spiral, Elliptical, Irregular galaxies, Milky Wayand its structure	4	Chalk & Talk
5.3	Properties of Galaxies, Mass of a binary system	4	Discussion
5.4	Star clusters, Galaxy clusters Pulsars	4	E-Resources
	Total	**75**	

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

Course Code	Course Title	Category	Total Hours	Credits
20PPHC41	Condensed Matter Physics –II	Core – XII	75	6

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The aim of the proposed course is to introduce the advanced notion of the condensed matter physics and to familiarize the students with the various aspects of the interactions effects. This course will be bridging the gap between basic solid state physics and quantum theory of solids.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Describe the natures of semiconductors	**K1,K2,K3,K4,K5**
CO2	Analyze the characteristics of dielectric materials	**K1,K2,K3,K4,K5**
CO3	Analyze the optical properties of semiconductor	**K1,K2,K3,K4,K5**
CO4	Explain the magnetic properties	**K1,K2,K3,K4,K5**
CO5	Know the applications of superconductivity	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	2	3	3
CO2	2	2	2	3	3
CO3	3	2	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

Intrinsic and Extrinsic semiconductors – Carrier concentration in semiconductors – Fermi level and carrier concentration in semiconductors – Mobility in charge carriers – Effect of temperature on mobility – Electrical conductivity of semiconductors – Hall effect in semiconductors – Junction properties: Metal-Metal junction – Metal-Semiconductor junction – Semiconductor-Semiconductor (p-n) junction.

UNIT II 15 Hours

Dipole moment and Polarization – Electric field of dipole – Local electric field at an atom (Depolarization, Lorentz and Dipoles) – Dielectric constant and its measurement – Polarizability: Electronic and Ionic – The classical theory of electronic polarizability – Dipolar polarizability – PIEZO- PYRO- AND ferroelectric properties of crystals – Ferroelectricity – Ferroelectric domain.

UNIT III 15 Hours

Absorption processes – Photoconductivity and its measurement – Photoelectric effect – Photovoltaic effect – Photoluminescence and Colour centers – Types of colour centers: Electronic and Hole – Generation of colour centers – Maser and Laser: Absorption and Emission – Population Inversion – Ammonia-Beam maser – Types of laser.

UNIT IV 15 Hours

Classification of magnetic materials – Atomic theory of magnetism – Origin of permanent magnetic moments – Langevin's classical theory: Diamagnetism and Paramagnetism – Quantum theory of paramagnetism – Ferromagnetism – Weiss molecular field – Temperature dependence of spontaneous magnetization – Ferromagnetic domains –Domain theory – Antiferromagnetism – Ferromagnetism and Ferrites.

UNIT V 15 Hours

Occurrence of superconductivity – Response of magnetic field to superconductivity – The meissner effect – Thermodynamics of superconducting transition – Origin of energy gap – London equation – London penetration depth – Coherence length – Elements of BCS theory – Flux quantization – Normal tunneling and Josephson Effect – High-$T_C$super conductivity.

Text Books

M.A. Wahab, ***Solid state physics***, 3rd edition, 2015.

Reference Books

S.O. Pillai, ***Solid State Physics***, 8th edition, 2018.

Charles Kittel, ***Introduction to Solid state physics***, 8th edition, Reprint 2017.

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	Semiconductors: Intrinsic and Extrinsic semiconductors – Carrier concentration in semiconductors.	3	Chalk & Talk
1.2	Fermi level and carrier concentration in semiconductors – Mobility in charge carriers – Effect of temperature on mobility.	4	E-Resources
1.3	Electrical conductivity of semiconductors – Halleffect in semiconductors.	4	Discussion
1.4	Junction properties: Metal-Metal junction – Metal-Semiconductor junction – Semiconductor- Semiconductor (p-n) junction.	4	E-Resources

UNIT – II			
2.1	Dielectrics: Dipole moment and Polarization – Electric field of dipole.	4	Discussion
2.2	Local electric field at an atom (Depolarization, Lorentz and Dipoles) – Dielectric constant and itsmeasurement.	4	Chalk & Talk
2.3	Polarizability: Electronic and Ionic – The classicaltheory of electronic polarizability – Dipolar polarizability.	4	E-Resources
2.4	PIEZO-PYRO-AND ferroelectric properties of crystals – Ferroelectricity – Ferroelectric domain.	3	Chalk & Talk
UNIT – III			
3.1	Optical properties: Absorption processes - Photoconductivity and its measurement.	4	E-Resources
3.2	Photoelectric effect – Photovoltaic effect – Photoluminescence and Colour centers.	4	Chalk & Talk
3.3	Types of colour centers: Electronic and Hole – Generation of colour centers.	4	Discussion
3.4	Maser and Laser: Absorption and Emission – Population Inversion – Ammonia-Beam maser –Types of laser.	3	E-Resources
UNIT – IV			
4.1	Magnetic properties: Classification of magnetic - materials – Atomic theory of magnetism.	3	Discussion
4.2	Origin of permanent magnetic moments – Langevin's classical theory: Diamagnetism andParamagnetism.	3	E-Resources
4.3	Quantum theory of paramagnetism – Ferromagnetism – Weiss molecular field.	3	Chalk & Talk
4.4	Temperature dependence of spontaneous magnetization – Ferromagnetic domains.	3	E-Resources
4.5	Domain theory – Antiferromagnetism – Ferromagnetism and Ferrites	3	Chalk & Talk

UNIT – V			
5.1	Superconductivity: Occurrence of superconductivity – Response of magnetic fieldto superconductivity.	4	E-Resources
5.2	The meissner effect – Thermodynamics of superconducting transition – Origin of energygap.	4	Chalk & Talk
5.3	– London equation – London penetration depth – Coherence length – Elements of BCS theory –	3	Discussion
5.4	Flux quantization – Normal tunneling and Josephson Effect – High-$T_C$superconductivity.	3	Chalk & Talk
	Total	**75**	

Course Designer
Mr. S. Balaji Prasath
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC42	Nuclear, Particle and Astrophysics	Core – XIII	75	6

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain more knowledge about Nuclear, Particle and Astrophysics in order to knowledge in fundamental principles and concepts governing nuclear and particle physics.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Describe the different types of radioactive decays and their properties.	K1,K2,K3,K4,K5
CO2	Evaluate the life time of α-decayβ-decay and express the properties of nuclear energies.	K1,K2,K3,K4,K5
CO3	Know the classifications of elementary particles.	K1,K2,K3,K4,K5
CO4	Gain the basic information about the stars and clusters	K1,K2,K3,K4,K5
CO5	Explain the concept of solar activity and other celestial objects	K1,K2,K3,K4,K5

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Determination for q/m for the **α-**particle - Range of **α-**particles - Energy of **α-**particles - Range - Velocity - Energy - Half Life Relations - Alpha Decay - Energy - Mass Number - Alpha particle spectra - Gamow's theory of **α-**decay - Advances in the theory of **α-**decay - Beta spectroscopy - The Neutrino - Energy - Half-life relationships - Fermi theory of β-decay - Classification of Beta Transitions - General theory of beta-decay - Electron Capture - Violation of Parity Conservation in Beta decay.

UNIT II 15 Hours

Measurement of gamma ray energies - Multipole Radiations - Internal Conversion - Internal pair creation - Nuclear Isomerism - Coulomb Excitation - Angular Distribution and Directional correlation in γ-emission - Measurements of Lifetimes of Nuclear States - Nuclear Resonance Fluorescence - Mossbauer Effect

UNIT III 15 Hours

Introduction – Production of elementary particles – Types of interaction (Gravitational, Electromagnetic, Strong and weak) – Classification of elementary particles – Mass spectra and decays of elementary particles (Electrons, Meson, Neutrino, Hadrons, Mesons, Baryons) – particle symmetries – Quarks – Quantitative description of quark model.

UNIT IV 15 Hours

Stars - Stellar spectra - Colours of stars - Spectral classification of stars - Luminosity classification of stars – Hertzsprung - Russell diagram - Stellar evolution - Stellar population - Population I and II - Star clusters -Open clusters - Globular clusters - Variable stars - Energy generation in stars - PP and CN chain reactions - Derivation for Internal temperature and pressure of a star.

UNIT V 15 Hours

Sun - Internal Structure of Sun - Sun spots and magnetic fields on the sun - Solar activity - Hubble classification of galaxies - Spiral galaxies - Elliptical galaxies - Irregular galaxies - Dwarf galaxies - Milky way - Dark matter – Cosmological Models - Steady state theory – Big bang theory - Hubble's law - White Dwarfs - Neutron stars and Black Holes - Expression for basic physics of black holes.

Text Books

D.C. Tayal, ***Nuclear Physics***, Himalaya Publishing House, 5th edition.

V.K. Mittal, R.C. Verma, S.C. Gupta***, Introduction to nuclear and Particle Physics***, PHI, Learning Private Limited, 3rd edition, 2013.

Mark. L. Klutner, ***Modern Astrophysics***, Cambridge University, London 2003.

A. Mujiber Rahman, ***Introduction to Astrophysics***, KAMS Publication, 1st edition, 2018.

Reference Books

Arnab Rai Chaudri, ***Astronomy for Physicists***, Cambridge University, London, 2010.

A.B. Gupta, Books, ***Modern Atomic and Nuclear Physics***, Allied Private Limited 3rd edition, 2015.

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	Determination for q/m for the **α-**particle - Rangeof **α-**particles - Energy of **α-**particles	3	Chalk & Talk
1.2	Range - Velocity - Energy - Half Life Relations - Alpha Decay - Energy - Mass Number	3	E-Resources
1.3	Alpha particle spectra - Gamow's theory of **α-**decay - Advances in the theory of **α-**decay	3	Discussion

1.4	Beta spectroscopy - The Neutrino - Energy - Half- life relationships - Fermi theory of β-decay	3	E-Resources
1.5	Classification of Beta Transitions - General theory of beta-decay - Electron Capture - Violation of Parity Conservation in Beta decay	3	E-Resources
UNIT – II			
2.1	Measurement of gamma ray energies - MultipoleRadiations - Internal Conversion	4	Discussion
2.2	Internal pair creation - Nuclear Isomerism -Coulomb Excitation.	4	Chalk & Talk
2.3	Angular Distribution and Directional correlation in γ-emission.	4	E-Resources
2.4	Measurements of Lifetimes of Nuclear States - Nuclear Resonance Fluorescence - MossbauerEffect.	3	Chalk & Talk
UNIT – III			
3.1	Introduction – Production of elementary particles	3	E-Resources
3.2	Types of interaction (Gravitational, Electromagnetic, Strong and weak)	3	Chalk & Talk
3.3	Classification of elementary particles	3	Discussion
3.4	Mass spectra and decays of elementary particles (Electrons, Meson, Neutrino, Hadrons, Mesons, Baryons)	3	E-Resources
3.5	Particle symmetries – Quarks – Quantitativedescription of quark model.	3	E-Resources
UNIT – IV			
4.1	Stars - Stellar spectra - Colours of stars	3	Discussion
4.2	Spectral classification of stars - Luminosityclassification of stars	3	E-Resources
4.3	Hertzsprung - Russell diagram – Stellar evolution - Stellar population - Population I and II.	3	Chalk & Talk
4.4	Star clusters -Open clusters - Globular clusters	2	E-Resources
4.5	Variable stars - Energy generation in stars - PPand CN chain reactions	2	Chalk & Talk

4.6	Derivation for Internal temperature and pressureof a star	2	Chalk & Talk
UNIT – V			
5.1	Sun - Internal Structure of Sun - Sun spots and magnetic fields on the sun - Solar activity.	2	E-Resources
5.2	Hubble classification of galaxies - Spiral galaxies -Elliptical galaxies.	2	Chalk & Talk
5.3	Irregular galaxies - Dwarf galaxies - Milky way	2	Discussion
5.4	Dark matter – Cosmological Models.	2	Chalk & Talk
5.5	Steady state theory – Big bang theory.	2	E-Resources
5.6	Hubble's law - White Dwarfs - Neutron stars andBlack Holes -	2	E-Resources
5.7	Expression for basic physics of black holes.	3	Discussion
	Total	**75**	

Course Designer
Dr. S. Prasanna Subramaniyan
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHC4D	Project	Core – XIV	75	5

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

The course is aimed at giving research exposure to students by giving small projects to them in physics related areas.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Describe the different types of solar events and interstellar activities.	**K1,K2,K3,K4,K5**
CO2	Develop skills on construction and fabrication of IoT devices.	**K1,K2,K3,K4,K5**
CO3	Analyze the physical, chemical and biological properties of the materials using various analytical techniques.	**K1,K2,K3,K4,K5**
CO4	Correlate the theoretical and experimental results of various scientific methods.	**K1,K2,K3,K4,K5**
CO5	Discus research methodologies along with literature survey.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Marks

External Examiner: Evaluation of Project: 100

Course Code	Course Title	Category	Total Hours	Credits
20PPHC4P	Practical - IV	Core – XV	150	4

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain more knowledge about Practical in order to develop the practical skills on digital electronics, Hall Effect and susceptibility of diamagnetic 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 susceptibility of diamagnetic materials using Quincke's method and Guoy's method.	**K1,K2,K3,K4,K5**
CO2	Determine the Hall Voltage of given semiconductor.	**K1,K2,K3,K4,K5**
CO3	Design and construct 4bit up-down binary counters and Shift registers using flip flops.	**K1,K2,K3,K4,K5**
CO4	Estimate the viscosity of liquid using Meyer's oscillation method.	**K1,K2,K3,K4,K5**
CO5	Determine the velocity of sound and adiabatic of compressibility of liquid by ultrasonic studies.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

Experiments: (Any 10 experiments from the list)

1. JK up - down counter four bit.
2. Ring counter.
3. Karnaugh mapping.
4. Shift Register - Serial in/ Serial out SISO/SIPO.
5. Quincke's method - Study of susceptibility of diamagnetic materials.
6. Guoy's method - Study of susceptibility of diamagnetic materials.
7. Hall effect.
8. Ultrasonic studies - velocity of sound, Adiabatic compressibility of liquid.
9. Encoder and Decoder.
10. Four probe Experiment.
11. Viscosity of Liquid – Meyer's oscillation method.
12. Stefan's constant.

Course Designer

Mr. M. Aabitha Rahman
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE41	Molecular Spectroscopy	Elective -IV	75	6

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain more knowledge about Molecular Spectroscopy in order to classify the electromagnetic spectrum and discuss the rotation of the molecules and to Acquire basic knowledge about the properties of the molecules.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Explain the classification and interaction of molecules.	**K1,K2,K3,K4,K5**
CO2	Know the basic properties of diatomic molecule.	**K1,K2,K3,K4,K5**
CO3	Discuss the theory of Raman Scattering.	**K1,K2,K3,K4,K5**
CO4	Discuss the basic concept of vibrational analysis and its properties.	**K1,K2,K3,K4,K5**
CO5	Explain the magnetic properties of nuclei.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Classification of Molecules - Interaction of Radiation with Rotating Molecule-Rotational Spectra of Rigid Diatomic Molecules - Isotope Effect in Rotational Spectra - Intensity of Rotational Lines - Non- Rigid Rotator - Liner Polyatomic Molecules - Symmetric Top Molecules - Asymmetric Top Molecules - Stark Effect - Quadrupole Hyperfine Interaction – Microwave spectrometer.

UNIT II 15 Hours

Vibrational Energy of a Diatomic Molecule - Infrared Selection Rules - Vibrating Diatomic Molecule - Diatomic Vibrating Rotator - Asymmetry of Rotation - Vibration Band - Vibration of Polyatomic Molecules – Normal vibrations of (CO_2 & H_2O) molecules - More About Anharmonicity - Rotation - Vibration Spectra of Polyatomic Molecules- Rotation – Vibration spectra of polyatomic molecules.

UNIT III 15 Hours

Theory of Raman Scattering - Rotational Raman Spectra - Vibrational Raman Spectra - Mutual Exclusion Principle - Raman Spectrometer - Sample Handling Techniques - Structure Determination Using IR and Raman Spectroscopy – Molecules of Type XY_2, XY_3,- Raman Investigation of Phase Transitions.

UNIT IV 15 Hours

Vibrational Coarse Structure - Vibrational Analysis of Band Systems - Deslandres Table – Information derived from Vibrational analysis - Franck - Condon Principle - Intensity of Vibrational Electronic Spectra -Rotational Fine Structure of Electronic - Vibration Spectra - The Fortrat Parabolae - Dissociation - Predissociation - Electronic Angular Momentum in Diatomic Molecules

UNIT V 15 Hours

Magnetic properties of Nuclei - Resonance Condition - NMR Instrumentation - Additional Experimental Techniques - Relaxation Process - Bloch Equations – Dipolar Interaction - Chemical Shift – Principle of ESR – Hyperfine structure – ESR spectrum of hydrogen atom - spin I=1- spin I=1/2.

Text Books

C N Banwell and E M McCash, 1994, **Fundamentals of Molecular Spectroscopy**, 4th Edition, Tata McGraw–Hill, New Delhi.

G Aruldhas, 1994, **Molecular Structure and Molecular Spectroscopy**, Prentice–Hall of India, New Delhi.

Reference Books

J L McHale, 2008, **Molecular Spectroscopy**, Pearson Education India, New Delhi.

J M Hollas, 2002, **Basic Atomic and Molecular Spectroscopy**, Royal Society of Chemistry, RSC, Cambridge.

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 Molecules	1	Chalk & Talk
1.2	Interaction of Radiation with Rotating Molecule- Rotational Spectra of Rigid Diatomic Molecules	2	E-Resources
1.3	Isotope Effect in Rotational Spectra - Intensity of Rotational Lines	3	Discussion
1.4	Non-Rigid Rotator - Liner Polyatomic Molecules	3	E-Resources
1.5	Symmetric Top Molecules - Asymmetric Top Molecules	3	Discussion
1.6	Stark Effect - Quadrupole Hyperfine Interaction – Microwave spectrometer	3	E-Resources

UNIT – II			
2.1	Vibrational Energy of a Diatomic Molecule -Infrared Selection Rules	3	Discussion
2.2	Vibrating Diatomic Molecule - Diatomic VibratingRotator	3	Chalk & Talk
2.3	Asymmetry of Rotation - Vibration Band - Vibration of Polyatomic Molecules	3	E-Resources
2.4	Normal vibrations of (CO_2 & H_2O) molecules - More About Anharmonicity - Rotation - Vibration	3	E-Resources
2.5	Spectra of Polyatomic Molecules-Rotation – Vibration spectra of polyatomic molecules	3	Chalk & Talk
UNIT – III			
3.1	Theory of Raman Scattering - Rotational RamanSpectra	3	E-Resources
3.2	Vibrational Raman Spectra - Mutual ExclusionPrinciple	3	Chalk & Talk
3.3	Raman Spectrometer - Sample Handling Techniques	3	Discussion
3.4	Structure Determination Using IR and RamanSpectroscopy	3	E-Resources
3.5	Molecules of Type XY_2, XY_3,- Raman Investigationof Phase Transitions	3	Chalk & Talk
UNIT – IV			
4.1	Vibrational Coarse Structure - Vibrational Analysis of Band Systems	3	Discussion
4.2	Deslandres Table –Information derived from Vibrational analysis	2	E-Resources
4.3	Franck – Condon Principle -Intensity of Vibrational Electronic Spectra	3	Chalk & Talk
4.4	Rotational Fine Structure of Electronic - Vibration Spectra	2	E-Resources
4.5	The Fortrat Parabolae - Dissociation – Predissociation	2	Chalk & Talk
4.6	Electronic Angular Momentum in Diatomic Molecules	3	E-Resources

UNIT – V			
5.1	Magnetic properties of Nuclei - Resonance Condition.	3	E-Resources
5.2	NMR Instrumentation - Additional Experimental Techniques - Relaxation Process	4	Chalk & Talk
5.3	Bloch Equations – Dipolar Interaction – Chemical Shift	4	Discussion
5.4	Principle of ESR – Hyperfine structure – ESR spectrum of hydrogen atom - spin I=1- spin I=1/2	4	E-Resources
	Total	**75**	

Course Designer
Mr. A. AnsarAhamed
Assistant Professor of Physics

Course Code	Course Title	Category	Total Hours	Credits
20PPHE42	Computer Oriented Numerical Methods	Elective - IV	75	6

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

Course Relevance	
Local	
Regional	
National	
Global	✓

Preamble

To gain more knowledge about Computer Oriented Numerical Methods in order to improve the student skills in numerical methods by using the numerical analysis and learn about the algorithm and the program by using c language.

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level
CO1	Know the basic methods of iteration.	**K1,K2,K3,K4,K5**
CO2	Learn about the The Gauss – Seidal iterative method.	**K1,K2,K3,K4,K5**
CO3	Find roots using interpolation and ability to use least squares.	**K1,K2,K3,K4,K5**
CO4	Find roots using simpson's rule and to solve differential equations by numerical methods.	**K1,K2,K3,K4,K5**
CO5	Write code to find roots using C language for various numerical methods.	**K1,K2,K3,K4,K5**

K1-Knowledge K2-Understand K3-Apply K4- Analyse K5- Evaluate

Mapping of CO with PO

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

1-Low 2-Medium 3-Strong

Mapping of CO with PSO

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

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

Syllabus

UNIT I 15 Hours

Introduction – Beginning an iterative method – the method of successive bisection – Newton Raphson iterative method –The secant method – The method of successive approximations – comparison of iterative methods.

UNIT II 15 Hours

Introduction – The Gauss determination method – Pivoting – III conditioned equations, Refinement of the solution defined by Gaussian elimination – The Gauss – Seidal iterative method – An algorithm to moment the Gauss-Seidal method – comparison of direct and iterative methods.

UNIT III 15 Hours

Interpolation, Lagrange interpolation – difference tables – Truncation error in interpolation – Least squares approximation of functions – Linear regression – Algorithm linear regression.

UNIT IV 15 Hours

Formulae for numerical integration – Simpson's – Gaussian quadrature formulae – Numerical solution of differential Equations – other order differential equations.

UNIT V 15 Hours

Programs for: Solution of an equation by iterative method (Newton Raphson method) - Solution of simultaneous equations - Calculation of mean and variance - Calculation of correlation Coefficients – Linear suppressions - Solution of first order differential equation (Runge – Kutta method) - Solution of II order differential equation (Runge – Kutta method) - Evaluation of definite integrals (Trapezoidal and Simpson rule) - Evaluation on inverse of a matrix - Calculation of matrix polynomial. ***(***Programme in C Language only).

Text Books

V.Rajaraman, ***Computer oriented Numerical Methods***, II Edition, Prentice Hall of India Pvt. Ltd, 1989.

M.K.Jain. S.R.K.Iyengar, and R.K.Jain, ***Numerical Methods for Scientific and Engineering Computation,*** New Age International Publishers.

Reference Books

S.D. Conte & Carl Boor, ***Elementary Numerical Analysis an Algorithmic Approach***, Third Edition McGraw Hill international company, 1983.

Steven C Chopra, Rayamond P. Canale, ***Numerical Methods for Engineers***, Second Edition – McGraw Hill International Editions, 1990.

E. V. Krishnamurthy and S. K. Sen, ***Numerical Algorithms – Computations in Science and Engineering***, Affiliated East West Press Pvt. Ltd., New Delhi (1993).

S. Ramaswamy and P. Radhaganesan, ***Programming in C***, Second edition, SciTech 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	Introduction – Beginning an iterative method	2	Chalk & Talk
1.2	the method of successive bisection	2	E-Resources
1.3	Newton Raphson iterative method	2	Discussion
1.4	The secant method	3	E-Resources
1.5	The method of successive approximations	3	Discussion
1.6	comparison of iterative methods	3	E-Resources
	UNIT – II		
2.1	Introduction	2	Discussion
2.2	The Gauss determination method – Pivoting	2	Chalk & Talk
2.3	III conditioned equations, Refinement of the solution defined by Gaussian elimination	2	E-Resources

2.4	The Gauss – Seidal iterative method	3	E-Resources
2.5	An algorithm to moment the Gauss-Seidal method.	3	Chalk & Talk
2.6	comparison of direct and iterative methods	3	Chalk & Talk
UNIT – III			
3.1	Interpolation, Lagrange interpolation – difference tables.	4	E-Resources
3.2	Truncation error in interpolation	3	Chalk & Talk
3.3	Least squares approximation of functions	4	Discussion
3.4	Linear regression – Algorithm linear regression.	4	Chalk & Talk
UNIT – IV			
4.1	Formulae for numerical integration	3	Discussion
4.2	Simpson's – Gaussian quadrature formulae	4	E-Resources
4.3	Numerical solution of differential Equations	4	Chalk & Talk
4.4	Other order differential equations.	4	E-Resources
UNIT – V			
5.1	Programs for: Solution of an equation by iterative method (Newton Raphson method) Simpson rule) - Solution of simultaneous equations - Calculation of mean and variance.	5	Chalk & Talk
5.2	Calculation of correlation Coefficients – Linear suppressions - Solution of first order differential equation (Runge – Kutta method) - Solution of II order differential equation (Runge-Kutta method).	5	Chalk & Talk
5.3	Evaluation of definite integrals (Trapezoidal and Simpson rule) - Evaluation on inverse of a matrix - Calculation of matrix polynomial.	5	E-Resources
	Total	**75**	

Course Designer
Mr. A. Ansar Ahamed
Assistant Professor of Physics