MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by **NAAC** with '**A**' Grade

Recognized by **UGC** under Section 2(f) & 12 (B)

MUTHAYAMMAL
COLLEGE OF ARTS
AND SCIENCE
(Autonomous)
A UNIT OF VANETRA GROUP
ESTD-1994
Learn. Lead

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DEGREE OF MASTER OF SCIENCE

Learning Outcomes - Based Curriculum Framework
- Choice Based Credit System

Syllabus for M.Sc., Physics

(Semester Pattern)

(For Candidates admitted from the academic year 2021 -2022 and onwards)

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Rasipuram - 637 408

VISION

- To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, knowledgeable and socially responsible citizens.

MISSION

- To Ensure State of the world learning experience
- To Espouse value based Education
- To Empower rural education
- To Instill the spirit of entrepreneurship and enterprise
- To Create a resource pool of socially responsible world citizens

QUALITY POLICY

To Seek - To Strive - To Achieve greater heights in Arts & Science, Engineering, Technological and Management Education without compromising on the Quality of Education.

DEPARTMENT OF PHYSICS

Vision

- To provide a transformative learning and research ambience with inclusion of all the weaker sections of the society to create leaders and innovators tied with holistic values to generate new knowledge and to serve the globe.

Mission

- Periodical course revision to assimilate with current state of fields in Physics learning and research with modern gadgets.
- Individual apparatus to enhance experimental skills with well-equipped special laboratories and workshop assistance are provided for the different programmes.
- Platform to inculcate and nurture creativity through eminent scholarly lectures, sharing of resources at interdepartmental level, numerous activities of various clubs, MoU for interaction with leading research institutions, inbuilt incubation centre etc.
- For integral formation, assistance and guidance to individual student, faculty members are assigned as mentors for the entire programme of stay

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Post Graduates will be able to promote learning environment to meet the Industry expectation.
PEO2: Post Graduates will be incorporated the critical thinking with good Communication and Leadership skills to become a self-employed.
PEO3: Post Graduates will be upholding the human values and environmental sustenance for the betterment of the society.

GRADUATE ATTRIBUTES

The Graduate Attributes of M.,Sc PHYSICS are :

GA 1 Research skills
GA 2 Multicultural Competence
GA 3 Critical Thinking
GA 4 Problem Solving
GA 5 Disciplinary Knowledge
GA 6 Moral and Ethical Awareness
GA 7 Self directed learning

PROGRAMME OUTCOMES

PO1: Post graduates will attain profound proficiency and expertise
PO2: Post graduates will be ensured with corporative self - directed learning
PO3: Post graduates will acquires acumen to handle diverse contexts and function in domains of multiplicity;
PO4: Post graduates will exercise intelligence in research Investigations and Introducing innovations.
PO5: Post graduates will learn ethical values and commit to Professional ethics.

PROGRAMME SPECIFIC OUTCOMES

After the successful completion of M. Sc PHYSICS program, the students are expected to

PSO1: Gained the ability to identify and analyze complex Physics problems using the principles of Physics with suitable mathematical tools.
PSO2: Developed skills to communicate effectively with peers, professionals and society at large and demonstrate professional ethics
PSO3: Molded to adopt, absorb and develop innovative ideas
PSO4: Inculcate scientific temper and motivate student to take up further research
PSO5: Exhibited effective individual talent, and engaged themselves in lifelong learning and dissemination.

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE(Autonomous) - Rasipuram - 637 408
Scheme of Examinations - CBCS Patern
(for the Students Addmited Academic Year:2021-2022 Onwards)
M.Sc.Physics

S.No.	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
			Lect.	Lab.		CIA	ESE	TOTAL
		SEMESTER - I						
1	21M1PPHC01	CLASICAL MECHANICS, THERMODYNAMICS AND STATISTICAL MECHANICS	6		4	25	75	100
2	21M1PPHC02	MATHEMATICAL PHYSICS	6		4	25	75	100
3	21M1PPHC03	ELECTRONICS	6		4	25	75	100
4	21M1PPHP01	PRACTICAL:GENERAL PHYSICS		6	3	40	60	100
5	21M1PPHE01	ELECTIVE - I	6		4	25	75	100
		TOTAL	24	6	19	140	360	500
		SEMESTER - II						
1	21M2PPHC04	THEORY OF SEMICONDUTOR DEVICES	5		4	25	75	100
2	21M2PPHC05	QUANTUM MECHANICS-I	5		4	25	75	100
3	21M2PPHC06	COMPUTATIONAL PHYSICS & C++ PROGRAMMING	4		4	25	75	100
4	21M2PPHP02	PRACTICAL:ELECTRONICS(ANALOG & DIGITAL)		6	4	40	60	100
5	21M2PPHE02	ELECTIVE - II	4		4	25	75	100
6	21M1PELED1	EDC-I	4		4	25	75	100
7	21M2PHUR01	HUMAN RIGHTS	2		2	100		
		TOTAL	24	6	26	265	435	600

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE(Autonomous) - Rasipuram - 637 408
Scheme of Examinations - CBCS Patern
(for the Students Addmited Academic Year:2021-2022 Onwards)
M.Sc.Physics

S.No.	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
			Lect.	Lab.		CIA	ESE	TOTAL
		SEMESTER - III						
1	21M3PPHC07	QUANTUM MECHANICS - II	6		4	25	75	100
2	21M3PPHC08	ELECTRO MAGNETIC THEORY	6		4	25	75	100
3	21M3PPHC09	MOLECULAR PHYSICS AND SPECTROSCOPY	6		4	25	75	100
4	21M3PPHP03	PRACTICAL:MICROPROCESSOR AND MICROCONTROLLER		6	4	40	60	100
5	21M3PPHE05	ELECTIVE - III	6		4	25	75	100
6	21M3PPHIS1	INTERNSHIP			2	100		
		TOTAL	24	6	22	240	360	500
		SEMESTER - IV						
1	21M4PPHC10	CONDENSED MATTER PHYSICS	5		4	25	75	100
2	21M4PPHC11	NUCLEAR AND PARTICLE PHYSICS	5		4	25	75	100
3	21M4PPHC12	COMMUNICATION ELECTRONICS	5		4	25	75	100
4	21M4PPHOE1	PHYSICS FOR COMPETITIVE EXAMINATIONS			2	100		
5	21M4PPHE08	ELECTIVE - IV	5		4	25	75	100
6	21M4PPHPR1	PROJECT WORK	10		5	50	150	200
		TOTAL	30	0	23	250	450	600
		OVERALL TOTAL	102	18	90	895	1605	2200
	21M4PPHEC1	MOOC Courses offered in SWAYAM / NPTEL			2			

Dr. M. REVATHI M.Sc.,B.Ed.,M.Phil.,Ph.D.,
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Muthayammal College of Arts and Science (Autonomous) Rasipuram 637 408.

PRINCIPAL
MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS)
RASIPURAM - 637 408,
NAMAKKAL DISTRICT.

PG - REGULATIONS

1. Internal Examination Marks - Theory

Components	Marks
CIA I & II	10
Attendance	5
Assignment	5
Seminar	5
Total	25

Attendance Percentage	Marks
96 % to 100%	5
91% to 95%	4
86% to 90%	3
81% to 85%	2
75% to 80%	1
Below 75%	0

2. Question Paper Pattern for CIA I,II AND ESE (for 75 Marks) (3 hours)

Section-A (10 Marks) (Objective Type) 10 x 1=10 Marks

Answer ALL Questions

ALL questions carry EQUAL Marks

Section-B (15 Marks) (Analytical Type)

Answer any THREE Questions out of FIVE questions 3 x 5=15 Marks

ALL questions carry EQUAL Marks

SECTION - C (50 Marks)

Answer ALL the Questions 5 x 10 = 50 Marks

Either or Type.

ALL Questions Carry EQUAL Marks

Total 75 Marks

(Syllabus for CIA-I 2.5 Unit , Syllabus for CIA-II All 5 Unit)

2. a) Components for Practical CIA.

Components	Marks
CIA - I	15
CIA - II	15
Observation Note	5
Attendance	5
Total	**40**

2. b) Components for Practical ESE.

Components	Marks
Completion of Experiments	50
Record	5
Viva	5
Total	**60**

3. Internship / Industrial Training, Mini and Major Project Work

Internship / Field Work Industrial Training		**Project Work**	
Components	**Marks**	**Components**	**Marks**
CIA[*1] Work Diary Report Viva -voce Examination	25 50 25	*CIA* a) Attendance Marks 20 b) Review Marks 30	50
Total	**100**	*ESE*[*1] a) Final Report Marks 120 b) Viva-voce Marks 30	150
		Total	**200**

*[1]Evaluation of report and conduct of viva- voce will be done jointly by Internal and External Examiners

4. Components for Human Rights Course (CIA Only)

a) The Course Human Rights is to be treated as 100% CIA course which is offered in II Semester for I year PG students.
b) Total Marks for the Course = 100
c)

Components	Marks
Two Tests	75
Assignments	25
Total	100

- In case the candidate fails to secure 50 marks, which is the passing minimum, he/she may have to reappear for the same in the subsequent semesters.

5. **Guidelines for Competitive Exams- Online Mode - Online Exam 3 hours**

Components	Marks
100 Objective Type Questions 100*1=100 Marks	100

Objective type Questions from Question Bank.

- The passing minimum for this paper is 50%
- In case, the candidate fails to secure 50% passing minimum, he / she may have to reappear for the same in the subsequent semesters.

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PPHC01	CLASSICAL MECHANICS, THERMODYNAMICS AND STATISTICAL MECHANICS	DSC THEORY - I	I	6	3	3	-	4
Objective	Students will be able to learn the Lagrangian and Hamiltonian formalisms of simple classical systems and enumerate the role of statistics applied to the microscopic world and establish the link between thermodynamics and statistical mechanics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**LAGRANGIAN FORMULATION & HAMILTON'S EQUATION:** Mechanics of a particle - Conservation Laws - Types of Constraints - Generalized Coordinates - Principle of Virtual work - D'Alemberts principle - Conservative and non-conservative systems - Lagrange's equation of motion - Applications to Linear Harmonic Oscillator - Simple Pendulum - Compound Pendulum - Atwood's Machine- Cyclic coordinates - Hamilton's principle - Lagrange's equation from Hamilton's principle - Variational Principle - Hamilton's Canonical equation of motion - Applications to Harmonic Oscillator, Simple Pendulum, Compound pendulum - Principle of Least action . (L-9, T-3 Hours)	K1-k3	12
II	**CANONICAL TRANSFORMATION & THEORY OF SMALL OSCILLATIONS:** Canonical transformations - Generating functions and different forms - Poisson's brackets and its properties - Infinitesimal contact transformation - Lagrange Brackets - Hamilton - Jacobi Theory - Harmonic oscillator problem - Jacobi identity - Action-angle variables - Application to Kepler problem in action angle variables - Eigen value equation - symmetry, invariance and Noether's theorem. **Theory of Small Oscillations:** Equilibrium - Normal coordinates - Normal modes - Normal frequencies of vibration - Vibrations of a Linear Triatomic molecule. (L-9, T-3 Hours)	K4-K5	12

III	KINEMATICS OF RIGID BODY & THEORY OF RELATIVITY: **Rigid Bodies:** Independent coordinates of rigid body - Orthogonal transformation - Angular velocity of a rigid body - Angular momentum of a Rigid body - Euler's angle and Euler's theorem - Coriolis force - Angular momentum and kinetic energy of motion - Moments and products of inertia - Euler's equations of motion - Torque free motion of a rigid body - motion of a Symmetrical top. **Special Theory of Relativity:** Galilean Transformations - Lorentz Transformations -Length contraction - Time dilation - Variation of mass with velocity - Mass-energy equivalence - Relation between momentum and energy - Four vectors - Four Velocity - Space, time and energy - momentum vectors - Relativistic classification of particles - Relativistic Lagrangian and Hamiltonian for a particle. (L-9, T-3 Hours)	K1,K4	12
IV	THERMODYNAMICS & FUNDAMENTALS OF STATISTICS: Thermodynamic Systems - Thermodynamic processes - Laws of Thermodynamics - Equations of state - Carnot Cycle - Carnot's Theorem - Entropy - Thermodynamic potentials - Chemical potential - Maxwell's Thermodynamical relations - Phase transitions - Gibbs Phase rule - Clausius - Clapeyron equation. **Fundamentals of Statistics:** Phase space - Microstates and Macrostates - microcanonical, canonical and grand-canonical ensembles - comparison of various ensembles - Liouville's Theorem - Stirling's formula - Entropy and probability - Gibbs' paradox - Sackur Tetrode equation - Partition function - Grand Partition function - Density of states - Equipartition and Viral theorems. (L-9, T-3 Hours)	K1-K3	12
V	CLASSICAL & QUANTUM STATISTICS: Classical Statistics: Maxwell-Boltzmann Statistics - M-B distribution law and its applications. Bose-Einstein Statistics - B-E Energy distribution law - Bose Einstein gas - Degeneracy and Bose Einstein condensation - Black body radiation and Planck's distribution law. Fermi Dirac Statistics - F-D Energy distribution law - Fermi Dirac gas at zero and low temperature - Fermi energy and Fermi momentum - Thermionic emission - Comparison of three types of statistics - One dimensional Ising model and its solution. Specific Heat of Solids: Dulong-Petit law - Einstein and Debye Theory. (L-9, T-3 Hours)	K3-K5	12
Course Outcome	**CO1:** State the knowledge about conservation laws of system of particles, Understand elementary concepts of thermodynamics,and enumerate the role of statistics applied	K1	

	the microscopic world.		
	CO2: Establish the link between thermodynamics and statistical mechanics and Construct different ensembles	K2	
	CO3: Analyse the Euler's equations and apply them for rigid body dynamics, Apply the Knowledge about Liouville's theorem and its importance, outline the special theory of relativity and examine the invariance of relativistic systems	K3	
	CO4: Relativistic mechanics, Lagrangian and Hamiltonian dynamics and Solve small oscillation problem	K4	
	CO5: Construct canonical transformation as well as to evaluate Poisson bracket structure, Deduce Maxwell Boltzmann, Bose Einstein and Fermi Dirac distribution functions	K5	

Learning Resources

Text Books	1. S.L.Gupta, V.Kumar, H.V.Sharma, Classical Mechanics, Pragati Prakashan, Meerut (2015). 2. J.C.Upadhyaya, Classical Mechanics, Himalaya Publishing House, Mumbai (2019). 3. G.Aruldhas, Classical Mechanics, Prentice-Hall of India Private Ltld., New Delhi(2008). 4. H.Goldstein, C.Poole and J.Safko,Classical Mechanics, Pearson Education Asia,New Delhi (2002). 5. Satya Prakash, Statistical Mechanics, Kedar Nath Ram Nath, New Delhi (2019). 6. M.C.Gupta,Statistical Thermodynamics, New Age International (P) Ltd., New Delhi (2017).
Reference Books	1. B.D.Gupta and Satya Prakash, Classical Mechanics, Kedar Nath Ram Nath, Meerut (2020) 2. S.L.Gupta and V.Kumar, Elementary Statistical Mechanics, Pragati Prakashan, Meerut (2019). 3. Brijlal, N.Subramanyam and P.S.Hemne, Heat Thermodynamics and Statistical Physics, S.Chand & Company Ltd., New Delhi (2010). 4. Agarwal and Satya Prakash, Thermal Physics, Pragathi Prakashan, Meerut (2014). 5. R. Murugesan and Kiruthiga Sivaprasath, Modern Physics, S. Chand and Company Limited, New Delhi (2019)
Website Link	1. https://www.physics.rutgers.edu/~shapiro/507/book.pdf 2. https://www.pdfdrive.com/classical-mechanics-d157132284.html 3. https://archive.nptel.ac.in/courses/122/106/122106027/ 4. https://archive.nptel.ac.in/courses/115/105/115105098/ 5. https://archive.nptel.ac.in/courses/115/106/115106126/ 6. https://pdfcoffee.com/qdownload/satya-prakash-statistical-mechanics-1pdf-pdf-free.html

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	M	S	M	M
CO2	S	S	S	M	M	S	L	S	M	S
CO3	S	S	S	S	S	S	M	S	S	S
CO4	S	M	S	M	M	S	M	S	S	S
CO5	S	M	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problems solving sessions on Lagrangian and Hamiltonian Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Dr.K.Sangeetha	Dr. M. REVATHI	

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PPHC02	Mathematical Physics	DSC THEORY - II	I	6	3	3	-	4
Objective	The objective of this course is to provide a strong mathematical foundation in vector calculus, matrices and differential equations.The purpose of the course is to introduce students to methods of mathematical physics and to develop required mathematical skills to solve problems in quantum mechanics, electrodynamics and other fields of theoretical physics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**VECTOR ANALYSIS AND BETA, GAMMA FUNCTIONS:** **Vector Analysis:** Concept of gradient, divergence and curl - Gauss divergence theorem,Greens theorem, Stokes theorem - Expression for gradient, divergence, curl and Laplacian in Cartesian, Orthogonal curvilinear coordinates and Spherical co-ordinates - Linearly dependent and independent sets of vectors - Schmidt's orthogonalization process. **Beta & Gamma Functions:** Definitions - Symmetry property of Beta function - different forms of Beta function - Evaluation of Gamma function - Fundamental properties of Gamma functions - Relation between Beta and Gamma functions - Examples. (L-9, T-3 Hours)	K1-K2	12
II	**COMPLEX VARIABLE AND GROUP THEORY:** **Complex Variable:** Functions of complex variable - Analytic functions-Cauchy Riemann equations-C-R equations in Polar form-Laplace's equation-Examples - Cauchy's integral theorem - Cauchy's integral formula - Taylor's Series-Laurent's Series-Singular Points Cauchy's residue theorem - poles - evaluation of residues - evaluation of definite integrals. **Group Theory:** Concept of a group - Abelian group-Generators of finite group - Cyclic groups - Group multiplication table - Rearrangement theorem - Sub groups - Lagrange's theorem - Conjugate elements and classes - Homomorphism and Isomorphism of groups -Representations of groups -	K2-K3	12

	Reducible and irreducible representations - Schur's Lemma -Orthogonality theorem - Unitary Groups - Group of symmetry of an equilateral triangle -Group of symmetry of square - C2 V & C3 V Groups in Molecular Physics. (L-9, T-3 Hours)		
III	**DIFFERENTIAL EQUATIONS AND PROBABILITY THEORY** **Differential Equations:** Linear Ordinary Differential equations - First order and second order equations and their various solutions. **Partial differential equations:** Linear second order equations - Solution of Laplace equations - Wave equations and their solutions - Solution of Poisson's equations, Helmholtz equations and Green's functions **Elementary Probability Theory:** Basic ideas - Probability distributions: Binomial, Poisson and Gaussian distributions - Examples - Error Analysis - Principle of Least squares. (L-9, T-3 Hours)	K5	12
IV	**MATRIX THEORY & TENSOR ANALYSIS** **Matrices:** Algebraic operations of matrices, Types of Matrices and their properties-Rank of a Matrix, Symmetry and Inverse of matrix-Hermitian, Skew-Hermitian matrix-Orthogonal,Unitary matrices - Eigen values and Eigen vectors - Cayley-Hamilton's theorem Diagonalization of different matrices - Problems. **Tensors:** Definition - Scalars, Contravariant, Covariant and Mixed tensors - Rank of a Tensor - Tensors of higher rank - addition and subtraction of Tensors - Summation convention - Symmetry and Anti-symmetry Tensor - Contraction and direct product -Quotient rule - Pseudo tensors, Levi-Civita Symbol - Dual tensors, irreducible tensors -Metric tensors. (L-9, T-3 Hours)	K1-K3	12
V	**SPECIAL FUNCTIONS & INTEGRAL TRANSFORMS** **Special Functions:** Differential Equations, Rodrigue's formula, Recurrence relations and Generating functions for Legendre, Hermite, Laguerre and Bessel polynomials -Orthogonality relations of these polynomials - Applications of Special functions in Physics. **Integral Transforms:** Fourier transforms - cosine and sine transforms. Laplace transforms: Definition-Linearity, shifting and change of	K5	12

	scale properties. Inverse Laplace transforms: Definition - properties - problems. (L-9, T-3 Hours)		
Course Outcome	CO1:Remember the basic concept of Grad Div and Curl and hence verify Gauss, Greens and Stroke's theorem ector analysis and beta gama fnctions.	K1	
	CO2:Understand the C-R equations complex analysis, series and group theory.	K2	
	CO3:Apply first and second order differential equations,partial differential equations and probablity distribution.	K3	
	CO4:Analyse the basic concept of atrix and Tensor application of Tensor with dynamics of particle.	K4	
	CO5: Design Legendre, Bessel , Hermite differential equation and Various special functions and important transforms and their applications .	K5	

Text Books	1. B.D.Gupta, Mathematical Physics,Vikas Publishing House Pvt. Ltd, New Delhi (2020). 2. Satya Prakash,Mathematical Physics, Sultan Chand & Sons, New Delhi (2012) 3. B.S.Rajput, Mathematical Physics,Pragati Prakashan (2008). 4. H.K.Dass and Rama Verma,Mathematical Physics, S.Chand & Company Ltd (2014). 5. P.K.Chattopadhyay,Mathematical Physics, New Age International Limited (1996). 6. S.L.Kakani & C.Hemrajani, Mathematical Physics, CBS Publishers & Distributors (P) Ltd., New Delhi (2018).
Reference Books	1. A.K.Saxena, Mathematical Physics,Narosa Publishing House, New Delhi (2015). 2. Binoy Bhattacharyaa,Mathematical Physics, New Central Book Agency(P)Ltd., Kolkatta (2009). 3. A.W.Joshi,Matrices and Tensors in Physics, New Age International (P) Limited., New Delhi (2017). 4. A.B.Gupta,Fundamentals of Mathematical Physics, Books and Allied (P) Limited, Kolkatta (2011).
Website Link	1.https://nptel.ac.in/courses/115103036#:~:text=Definition-,HTML,-Lec.no%3A%201 2.https://youtu.be/DE5ffRejlCc

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	M	S	M	M	S	S	S	S	M
CO2	M	S	M	M	M	L	M	M	M	M
CO3	L	M	L	S	M	S	M	M	L	L
CO4	M	L	S	S	S	M	S	M	S	M
CO5	M	M	L	M	S	M	S	S	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problems solving sessions on GAMMA FUNCTIONS Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Mr.P.Thamizharasu	DR.M.REVATHI	

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PPHC03	ELECTRONICS	DSC THEORY - III	I	6	3	3	-	4
Objective	Students acquire the knowledge and apply it to various electronic devices. Providing an overview of amplifiers, oscillators and their applications in different electronic fields. Develop knowledge about analog and digital electronics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**SEMICONDUCTOR DEVICES:** Semiconductors - Characteristics and applications of PN Junction diode - Zener Diode - Gunn diode - Tunnel diode - Photo diode - Schottky diode - Impatt diode - Varactor diode.Transistor CB, CE, CC configurations - Transistor biasing methods - Multistage transistor amplifiers - RC Coupled transistor amplifier.JFET - Structure and Characteristics - MOSFET - Depletion and Enhancement type MOSFFT.Construction, V-I characteristics and applications of UJT, SCR - DIAC, TRIAC. (L - 9,T - 3 Hours)	K1-K3	12
II	**IC FABRICATION & IC TIMER:** Basic monolithic ICs - Epitaxial growth - Masking - Etching impurity diffusion - Fabricating monolithic resistors, diodes, transistors, inductors and capacitors - Circuit layout - Contacts and inter connections. **IC 555 Timer:** Description - Monostable, Bistable and Astable multivibrators - Phase Locked Loops - Basic principles - Voltage Controlled Oscillator - Design of Square wave, Saw tooth wave and Triangular wave generators. (L - 9,T - 3 Hours)	K1-K3	12
III	**OPERATIONAL AMPLIFIER:** Operational Amplifier - Characteristics - Parameters - CMRR - Sample and Hold circuits. Applications of OPAMP: Inverting and non-inverting amplifier - Adder, Subtractor, average amplifiers, Differentiator and Integrator -Voltage follower - Voltage Comparator - Logarithmic amplifier - Solving simultaneous and differential equations - Hartley, Colpitts, Phase Shift and Wien bridge Oscillators - Schmitt Trigger - Square wave, Sine Wave, Triangular wave generators - A/D	K1-K2	12

	and D/A converters - Voltage to Current and Current to Voltage Converters, Astable, Bistable and Monostable multivibrators. **Active Filters:** Design of Low, High, Band pass and Band reject first and second order filters. (L - 9,T - 3 Hours)		
IV	**SEMICONDUCTOR MEMORIES & DIGITAL ELECTRONICS:** Classification of memories and sequential memory - ROM, PROM and EPROM principle and operation Read & Write memory - Static RAM, dynamic RAM. Programmable Logic Array (PLA) - Operation, Internal Architecture. Charge Coupled Devices (CCD) - Principle, construction, working and Data transfer mechanism. **Digital Electronics:** Number Systems - Binary, Octal, Hexadecimal, Gray code, Excess-3 code - Basic Logic gates - Universal gates. **Boolean Algebra:** Boolean Laws - De Morgan's theorem - Karnaugh map - Simplification using K-map. (L - 9,T - 3 Hours)	K1-K3	12
V	**DIGITAL CIRCUITS:** **Arithmetic and Logic Circuits:** Half adder - Hall subtractor - Full adder - Full subtractor - Decoder - Encoder - Multiplexer and Demultiplexer. **Sequential Circuits:** Flip flops - RS Flip flop - D flip flop - JK flip flop - Master Slave JK flip flop. **Registers:** SISO, SIPO, PISO, PIPO Shift Registers. **Counters:** Modulus of a Counter - Synchronous, Asynchronous, Ring and Up/Down Counters - BCD Counter. (L - 9,T - 3 Hours)	K1-K3	12
Course Outcome	**CO1:** Rembember the Boolean algebra and Number system to minimize combinational functions.	K1	
	CO2: Unserstand the implications of characteristics of transistors,FET,SCR and UJT.	K2	
	CO3: Applying study the characteristics of Op-amp and it's applications.	K3	
	CO4: Analyze the various semiconductor devices and their applications.	K4	
	CO5: Evaluate the fundamental concepts and techniques used in data storage elements and Design different types of registers and counters.	K5	

Learning Resources	
Text Books	1.V.K.Mehta,Principles of Electronics, S.Chand and Company, New Delhi (2015) 2.D.Roy Choudhury & Shail B.Jain,Linear integrated circuits, New age international (P) Ltd.,New Delhi (2003) 3.R.S.Sedha,A text book of Applied Electronics, S.Chand & Company, New Delhi (2017) 4.R.P.Jain,Modern Digital Electronics,Tata McGraw-Hill Edn.,Publishing Company Ltd., New Delhi (2010) 5.Partha Kumar & Ganguly,Principles of Electronics, PHI Learning (P) Ltd.,New Delhi (2015) 6.R.F.Coughlin and F.F,Driscol,Op-Amp and linear integrated circuits,Prentice Hall of India, New Delhi (1996) 7.Ramakant A. Gayakwad,Op-Amps and Linear Integrated Circuits,Prentice-Hall of India Limited, New Delhi (2015) 8.Malvino & Brown,Digital Computer Electronics, Tata Mc Graw Hill Publishing Company Ltd.,New Delhi
Reference Books	1.David A.Bell,Electronic Devices and Circuits, Prentice Hall (2007) 2.Donald P.Leach,Albert Paul Malvino,Goutam Saha,Digital Principles and Applications, McGraw Hill Education (India) Pvt.Ltd, Chennai, (2018) 3.V.Vijayendaran,Digital Fundamentals, S.V.Printers & Publishers Pvt. Ltd., Chennai (2017)
Website Link	1.https://nptel.ac.in/course.html/electronics/operational amplifier 2. https://nptel.ac.in/course.html/digital circuits/

L-Lecture T-Tutorial
C-Credit

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	M	S	M	M	S	S	S	S	M
CO2	M	S	M	M	M	L	M	M	M	M
CO3	L	M	L	S	M	S	M	M	L	L
CO4	M	L	S	S	S	M	S	M	S	M
CO5	M	M	L	M	S	M	S	S	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problems solving sessions on Lagrangian and Hamiltonian Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Ms.M.SARANYA	Dr. M. REVATHI	

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PPHP01	PRACTICAL:GENERAL PHYSICS	DSC PRACTICAL- I	I	6	-	-	6	3
Objective	To help grow confidence while performing the practical individually. To help develop habit of practice in the experimental skill developments. To develop experimental skills in due course of time.							

S. No.	List of Experiments (Any 16 Experiments)	Knowledge Levels	Sessions
1	Young's modulus by Elliptical fringes	K2	6
2	Young's modulus by Hyperbolic fringes	K2	6
3	Charge of an Electron by Spectrometer	K3	6
4	Michelson Interferometer -- Determination of wavelength of monochromatic source	K3	6
5	Biprism-Wavelength of monochromatic source - Refractive Index of a liquid	K3	6
6	Determination of Rydberg's constant - Hydrogen spectrum	K4	6
7	F.P. Etalon - Spectrometer - determination of thickness	K4	6
8	Ultrasonic Interferometer - Velocity and Compressibility of a liquid	K3	6
9	Laser beam - Diffraction Experiments (a) Diffraction at straight edge (b) Diffraction at a straight wire (c) Diffraction at a circular aperture	K2	6
10	Determination of refractive index of the liquids using He-Ne/Laser	K2	6
11	Determination of (i) thickness of a wire (ii) diameter of a circular aperture and (iii) Wavelength of He-Ne laser / diode laser using diffraction grating	K2	6
12	Determination of Solar constant	K3	6
13	Thermal Conductivity - Forbe's Method	K3	6
14	Study of Hall Effect in a semiconductor and Measurement of Hall Coefficient of the Semiconductor	K3	6
15	Determination of resistivity of a semiconductor by Four Probe Method	K4	6

16	Determination of band gap in a semiconductor material	K2	6
17	Thermistor - Temperature Coefficient and Band Gap Energy Determination	K2	6
18	Determination of susceptibility of a paramagnetic solution by Quincke's method	K3	6
19	Determination of Stefan's constant	K4	6
20	BH loop - Energy loss of a magnetic material - Anchor ring using B.G/CRO	K4	6
Course Outcome	CO1: Students will be able remember the basics of experimental physics and compare the results with theoretical calculations	K1	
	CO2: Equip the students in basic communication skills in the course of performing the laboratory experiments in groups and by interpreting the results	K2	
	CO3: Analyze the experiments in basic as well as certain advanced areas of physics such as nuclear physics, electronics and lasers.	K3	
	CO4: Apply the basic concepts of physics particularly concepts in classical mechanics, quantum mechanics, electrodynamics and electronics to appreciate how diverse phenomena observed in nature follow from a small set of fundamental laws	K4	
	CO5: students would gain the practical knowledge by performing various experiments related to different field in physics and would also learn to design the experiments themselves under the supervision.	K5	
Text Books	1. General Physics Laboratory Manual, Department of Physics, NITT.		
Reference Books	1. Experimental Physics: Modern Methods, R.A. Dunlap,, Oxford University Press, New Delhi (1988). 2. Manual for Experiments in Applied Physics, E.V. Smith, , Butterworths (1970). 3. Methods of Experimental Physics, D. Malacara (ed.), , Series of Volumes, Academic Press Inc. (1988).		
Website Link	1.https://vlab.amrita.edu/?sub=1&brch=282&sim=1005&cnt=2 2. https://www.niser.ac.in/sps/teaching-laboratories 3.https://www.youtube.com/watch?v=_Y8QtYukwbc 4. https://www.youtube.com/watch?v=k4r46VED6Sc 5. https://www.gopracticals.com/physics/physics-verify-stefans-law/		

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	S	M	M	S	M	S	S	L	S
CO2	M	S	S	M	M	L	M	M	M	M
CO3	S	S	M	M	M	S	S	S	S	S
CO4	S	M	L	M	M	M	S	S	S	S
CO5	S	M	M	L	S	M	S	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Using laboratory manual and perform experiments and verify the results.
Teaching and Learning Methods	Perform experiments individually and verify the results.
Assessment Methods	Model practical exam , Observation , Record Note

Designed By	Verified By	Approved By
Dr.C.Indira priyadharsini	Dr.M.REVATHI	

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2PPHC04	THEORY OF SEMICONDUCTOR DEVICES	DSC THEORY - IV	II	5	3	2	-	4
Objective	To Learn the students the concepts of energy bands and diffusion process, Metal semiconductor devices, MOSFET and MESFET, microwave diodes, quantum effect, hot electronic devices, photonic devices, Radioactive Transitions & Optical Absorption, LED,LASER, photo Detectors and solar cell.							

Unit	Course Content	Knowledge Levels	Sessions
I	**SEMICONDUCTOR PHYSICS:** **Energy Bands:** Semiconductor Materials, Basic Crystal Structure, Mobility and diffusivity - Valence Bands, Energy Bands, Intrinsic Carrier Concentration, Donors and Acceptors, Non-degenerate Semiconductor, Doped Semiconductors - basic diffusion process, diffusion equation, diffusion profiles, Carrier Transport Phenomena: Carrier Drift: mobility, resistivity, Hall Effect. Carrier Diffusion: Diffusion process, Einstein Relation, current density equation; Generation and Recombination Processes: direct and indirect recombination, surface recombination, Auger recombination; Continuity Equation, The Haynes - Shockley Experiments; Thermionic Emission Process, Tunneling Process. (L-9,T-3 Hours)	K1-K4	12
II	**SEMICONDUCTOR DEVICES:** **Basic Fabrication Steps:** Oxidation, Lithography, Thermal Equilibrium Condition: Band Diagram, Equilibrium Fermi Level; Depletion Region: Abrupt junction, Linearly Graded junction; Depletion Capacitance, Current - Voltage Characteristics: generation - recombination and high-injection effects; Charge Storage and Transient behaviour, Junction Breakdown: Tunneling effect, Avalanche multiplication, Heterojunction. (L-9,T-3 Hours)	K1-K3	12
III	**METAL-SEMICONDUCTOR DEVICES:** **MOSFET and Related Devices:** MOS Diode - metal & semiconductor work function, the SiO2-Si MOS diode, CCD; MOSFET fundamental: linear and saturation regions, types of MOSFET, threshold voltage	K1-K3	12

	control; MOSFET scaling - CMOS - MOSFET on insulator - MOS Memory structures: DRAM, SRAM, Non-volatile memory-power MOSFET -Metal- Insulator-Semiconductor (MIS) system. **MESFET and Related Devices:** Metal-Semiconductor Contacts - the Schottky barrier, semiconductor work function, Ohmic contact; MESFET: Devices structure, principles of operation, high-frequency performance; MODFET fundamentals - Static Induction Transistor (SIT). (L-9,T-3 Hours)		
IV	**MICROWAVE DIODES, QUANTUM-EFFECT & HOT-ELECTRON DEVICES:** **Basic Microwave Technology:** IEEE microwave frequency bands; Tunnel devices of different types - I-V Characteristics of Tunnel diode - Tunnel diode applications - IMPATT diode - Static & dynamic characteristics, field distributions and generated carrier densities -electron devices - negative differential resistance, device operation - quantum-effect devices - resonant tunnelling diode, energy of electrons - hot electron devices - HBT, real-space- transfer transistor-MISS-diodes. (L-9,T-3 Hours)	K1-K4	12
V	**PHOTONIC DEVICES:** **Radiative Transitions & Optical Absorption:** Radiative transistor, Boltzmann distribution, optical absorption, optical absorption coefficients; **LED:** visible LEDs, bandgap semiconductors, Snell's law, organic LED, Infrared LED; **Semiconductor Laser:** Laser operation, energy bandgap, carrier & optical confinement, optical cavity & feedback, basic laser structure, distributed feedback laser, quantum-well laser, energy of charge particle. **Photo Detectors:** Photoconductor, Photodiode, quantum efficiency, response speed, PIN photodiode, heterojunction photodiode, avalanche photodiode - Photo transistors. **Solar Cell:** Solar radiation, p-n junction solar cell, conversion efficiency, silicon & compound - Semiconductor solar cells, optical concentration. (L-9,T-3 Hours)	K1-K3	12
Course Outcome	**CO1:** Remember the fundamental of energy bands, Donors and Acceptors ,Carrier Concentration and Carrier Drift, mobility, resistivity.	K1	
	CO2: Undrestand the semiconductor devices and Basic Fabrication Steps, Oxidation, Lithographyl techniques to solve equations related Depletion Region and Junction Breakdown.	K2	
	CO3: Apply the function of metal semiconductor devices of MOSFET and Related Devices and MESFET and Related Devices	K3	

	,Static Induction Transistor (SIT)	
	CO4: Analyze the behaviour of microwave diodes,quantum effect,hot electronic devices and real-space- transfer transistor - MISS diodes.	K4
	CO5: Evaluate the function of photonic devices, Radiative Transitions & Optical Absorption,LED,LASER,photo Detectors and solar cell.	K5

Learning Resources

Text Books	1. S.M.Sze, Kwok K.Ng, Physics of Semiconductor Devices,John Wiley & Sons, New Delhi (2011) 2. B.G. Streetman, S. Banerjee, Solid State Electronic Devices, Prentice Hall (2009).
Reference Books	1. D.A. Neamen Basic Principles, Semiconductor Physics and Devices,McGraw-Hill, (2003). 2. Dilip K. Roy, Physics of Semiconductor Devices,Universities Press (India) Private Limited, Hyderabad (2004).
Website Link	1. https://www2.mvcc.edu › faculty › jfiore › Linear Semiconductor Devices: Theory and Application PDF 2. https://nanohub.org › mosfet_description. Semiconductor Device Theory I - EEE 531 - nano HUBPDF 3 .https://learninglink.oup.com › access.Principles of Semiconductor Devices 2e - Learning Lin

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	M	L	S	M	M
CO2	S	S	M	S	M	M	L	S	S	S
CO3	S	S	S	S	S	S	M	S	M	S
CO4	S	M	M	S	M	S	S	S	S	S
CO5	S	M	S	S	M	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Open- book Problem solving session Discuss the one mark solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Continuous internal assessment End semester examination Pre-Semester Examination

Designed By	Verified By	Approved By
MS.L.MOHANA	Dr.M.REVATHI	

Curriculum Development Cell
MCAS (Autonomous)
Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PPHC05	QUANTUM MECHANICS-I	DSC THEORY - V	II	5	3	2	-	4
Objective	The course is on the fundamental topics of quantum mechanics and the course starts with the introduction of postulates of quantum mechanics, operator formalism. The topics covered range from exactly solvable systems, time-independent and time-dependent perturbation theories, orbital and spin angular momentum.							

Unit	Course Content	Knowledge Levels	Sessions
I	**FOUNDATIONS OF WAVE MECHANICS:** Postulates of Quantum Mechanics - operators- degeneracy - observables - Matter waves - Schrodinger Equations of motion - Hilbert space - Unitary transformation and their properties - Representation of State vector and equation of motion: Schrodinger, Heisenberg and Interaction pictures - correspondence with classical mechanics - Dirac's Bra & Ket vector notation - Coordinate and Momentum representation - normalised and orthogonal wave functions -Expansion theorem - Stationary state solutions - Expectation values - Eigen values and Eigen functions - Momentum eigen functions - Probability current density – Ehrenfest Theorem - Heisenberg's Uncertainty relation and its applications (L-9,T-3 Hours)	K1-K3	12
II	**APPLICATIONS OF SCHRODINGER'S EQUATION-ONE & THREE DIMENSIONAL EIGEN VALUE PROBLEMS:** **One Dimensional Problem:** Particle in a box - Square well potential - Barrier penetrationQuantum mechanical tunnelling - Bound States - Linear Harmonic oscillator - Schrodinger method-Operator method-matrix theory of Harmonic oscillator Three Dimensional Problems: Orbital angular momentum and spherical harmonics -Central forces and reduction of two body problem-Particle in a Spherical well - Rigid Rotator - Hydrogen atom (L-9,T-3 Hours)	K1-K4	12
III	**ANGULAR MOMENTUM:** Orbital angular momentum, Spin angular momentum and Total angular momentum Operators - Commutation relations for angular momentum operators - Eigen value spectrum of J^2, Jz, Jx, and Jy - Ladder Operators - Matrix representation of Angular momentum - Pauli's spin matrices - Addition of angular momenta - Clebsch-Gordan coefficients. (L-9,T-3 Hours)	K1-K3	12

IV	**TIME INDEPENDENT PERTURBATION THEORY:** Time independent Perturbation theory in Non-degenerate and Degenerate cases - Application to perturbed Harmonic oscillator - Stark effect in hydrogen atom - Variation method - Application to ground state of He and hydrogen atom - WKB approximation and its application to tunneling problem - Bohr-Sommerfeld quantization condition. (L-9,T-3 Hours)	K1-K2	12
V	**TIME DEPENDENT PERTURBATION THEORY:** Time dependent Perturbation theory - first and second order transitions - Transition to continuum of states - Fermi Golden rule - Constant and Harmonic perturbations – Transition Probabilities - Adiabatic and Sudden approximation - A charged particle in an electromagnetic field. (L-9,T-3 Hours)	K1-K3	12
Course Outcome	**CO1**: Recall the principles and methods of wave mechanics and matrix mechanics based on Dirac notation.	K1	
	CO2: Understand the Applications of Schrödinger's equations in one and three dimensions.	K2	
	CO3: Analyze quantum mechanical methods to study angular momentum.	K3	
	CO4: Apply the various methodology for the application of approximation methods.	K4	
	CO5: Evaluate and summarize the methods of various perturbed systems.	K5	

Learning Resources

Text Books	1. G. Aruldhas, Quantum Mechanics , PHI Learning Private Limited, New Delhi (2020) 2.Satya Prakash, Quantum Mechanics , Kedar Nath Ram Nath and Co. Publications, New Delhi (2018). 3. S.L.Gupta, V.Kumar, H.V.Sharma and R.L.Sharma,Quantum Mechanics, Jai Prakashnath and Co, Meerut. 4.A. K. Ghatak and Lokanathan, Quantum Mechanics , Theory and applications , Macmillan India Ltd Publication (2015).
Reference Books	1. P.A.M.Dirac,The Principles of Quantum Mechanics, Oxford University Press, London (1973) 2.R. Shankar, Principle of Quantum Mechanics , Plenum US Publication, Tamilnadu(1994) 3. P. M. Mathews and K. Venkatesan,A Text Book of Quantum Mechanics, Tata Mc Graw Hill, New Delhi (1987). 4. R.B. Singh,Atomic and Molecular Spectra, Kedar Nath Ram Nath, New Delhi (2016).

	5. V.Devanathan, Quantum Mechanics, Narosa Publishing House, New Delhi (2011) 6. Chatwal and Anand,Quantum Mechanics, Himalaya Publishing House, Mumbai (1989)
Website Link	1.Visual quantum mechanics: https://vqm.uni-graz.at/ 2. https://ocw.mit.edu/courses/physics/ 3. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=28 4. https://nptel.ac.in/courses/115/106/115106066/

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	L	S	M	S	M	S	S	S
CO2	M	S	L	M	L	M	S	M	M	M
CO3	M	S	S	L	M	S	M	M	S	M
CO4	S	L	M	S	L	M	M	M	M	S
CO5	M	M	L	L	M	S	M	S	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problem solving session , Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Dr.M.MEENACHI	DR.M. REVATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2PPHC06	COMPUTATIONAL PHYSICS & C ++ PROGRAMMING	DSC THEORY - VI	II	4	4	-	-	4
Objective	To understand different computational techniques for physics applications. Derive appropriate numerical methods to solve a linear system of equations. To develop programming skills using the fundamentals and basics of C ++ language.							

Unit	Course Content	Knowledge Levels	Sessions
I	**SOLUTIONS OF LINEAR AND NONLINEAR EQUATIONS:** **Simultaneous Linear Equations:** Gauss elimination method - Jordan's modification -Gauss-Seidel method. Curve fitting - Method of least squares - Normal equations - Straight line fit - Interpolation - Least squares Approximation - Newton Interpolation polynomials - Linear Interpolation - Gregory-Newton Interpolation polynomials. **Roots of Non-linear Equations:** Bisection method - Iteration method - Newton-Raphson method - Termination criteria - Pitfalls-Order of convergence.	K1-K3	9
II	**NUMERICAL INTEGRATION AND DIFFERENTIATION:** Numerical Differentiation - Numerical Integration - Trapezoidal rule - Simpson's 1/3 and 3/8 rules - Random number generation - Park and Miller method - Newton-Cotes formulas -Gaussian quadrature formula - Estimation of errors in evaluating the integrals - Roots of Equation.	K1-K4	9
III	**NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS:** **Ordinary Differential equation:** Taylor's series method - Euler and Picard methods - Predictor - corrector methods - Chaotic dynamics of a driven pendulum - Boundary-value and eigenvalue problems - The Shooting Method - Linear equations and the Sturm - Liouville problem. **First order equations:** Euler and improved Euler methods - Formulas - Second order equation -Euler methods - Solution of Ordinary differential	K1-K3	9

	equation by Euler, Runge-Kutta Fourth Order method for solving first order ordinary differential equations.		
IV	**FUNDAMENTALS OF C++ PROGRAMMING:** Basic structure of C++ programs - Creating the Source File - compiling and Linking. Tokens,Keywords - Identifiers - Basic Data Types - Symbolic Constants - Type Compatibility - Declarations of Variables - Dynamic Initialization of Variables - Reference Variables -Reading and writing a character - formatted inputs and outputs. **Operators in C++:** Arithmetic, relational, logical, assignment, increment, decrement, and conditional, bitwise special operators - Operator Precedence - Type Cast Operator Expressions and Implicit Conversions - Operator Overloading - C++ math library functions -C++ standard library header files.	K1-K2	9
V	**DECISION MAKING, ARRAYS, STRUCTURES, FUNCTIONS & POINTERSI:** **Decision Making Statements:** If-else statement - nested if-else, else-if ladder - switch case statement - conditional statement - go to statement - break and continue statement - Nested control statements. **Loops:** While loop - do-while loop - For loop - Nested For loop. **Arrays:** Defining, initializing arrays - accessing array elements - One/Two dimensional arrays. **Structures:** Specifying the structure - accessing structure Members. **Functions:** Function declaration and definition - Calling the Function. **Pointers:** Address and pointers - Address of operator & pointer variables.	K1-K3	9
Course Outcome	**CO1:** Recall numerical methods to solve the algebraic and transcendental equations by using Bisection, Newton's method and some iterative methods.	K1	
	CO2: Understand an error analysis for a given numerical method.	K2	

	CO3: solve first order differential equations and second order linear differential equations utilizing the standard techniques for separable, exact, linear, homogeneous cases.	K3	
	CO4: Introduces Object Oriented Programming concepts using the C++ language.Able to Understand C++ language features. Able to Understanding and Applying various Datatypes, Operators,Conversions in program design.	K4	
	CO5: It provides technical skills to design and develop various applications.	K5	
Learning Resources			
Text Books	1.Numerical methods in Science and Engineering-M.K.Venkataraman-National Publishing Co., Madras (1996) 2. Introductory Methods of Numerical Analysis, S.S.Sastry-Prentice Hall of India Private Ltd., New Delhi (2007) 3. Numerical Methods, Dr.P.Kandasamy, Dr. K.Thilagavathy, Dr.K.Gunavathi, S.Chand & Company Private Limited, New Delhi (2016) 4. Numerical methods, E.Balagurusamy, Tata McGraw Hill, New Delhi (1999) 5. Numerical Methods, V.N.Vedamurthy, N.Ch.S.N.Iyengar, Vikas Publishing House Pvt.Ltd., Noida (2011) 6. Programming in C++, E.Balagurusamy, McGraw Hill Education (India) Private Limited, New Delhi (2016) 7. Programming with C - Schaum's outline series, Tata McGraw Hill Publishing Company Limited, New Delhi (2004)		
Reference Books	1.Numerical Methods for Scientific and Engineering Computation, M.KJain,S.R.K.Iyengar and R.K.Jain, New Age International, New Delhi (2007) 2. Programming with C++, P.Radha Ganesan, SCITECH Publications (India) Pvt. Ltd,Chennai (2002)		
Website Link	1.https://onlinecourses.nptel.ac.in/noc20_ma33/preview 2.https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf 3.https://www.cet.edu.in/noticefiles/285_OOPS%20lecture%20notes%20Complete.pdf		

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	L	M	M	S	M	S	S	S	M
CO2	M	M	L	S	M	S	M	M	S	M
CO3	L	M	M	S	S	S	S	S	S	L
CO4	M	L	M	S	S	M	M	S	M	M
CO5	S	S	S	M	S	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Discussing One marks and Open Book problem solving
Teaching and Learning Methods	Group Discussion Interactions Kahooot Moodle cloud Google class room.
Assessment Methods	CIA ESE Pre-Semester Examination

Designed By	Verified By	Approved By
M.SARANYA	DR.M.REVATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PPHP02	Practical: Electronics (Analog & Digital)	DSC PRACTICAL - II	II	6	-	-	6	4
Objective	To develop the experimental skills further so as to prepare the students for self-handling of the practical. Students acquire knowledge on semiconductor devices and op amps characteristics.							

S. No.	List of Experiments (Any 16 Experiments)	Knowledge Levels	Sessions
1	Construction of half adder and full adder circuit using NAND gates	K2	6
2	Universal NAND/NOR Gates	K2	6
3	Construction of Shift registers using IC 7476: Serial in-Serial out, Parallel in-Parallel out, Shift left and Shift right Registers.	K3	6
4	Decoders and Encoders	K3	6
5	BCD and UP/ DOWN Counters	K3	6
6	Design and study of Monostable and Bistable multivibrators using IC 555	K4	6
7	Construction of A/D converter using comparator and study its performance	K4	6
8	I-V Characteristics of Solar cell and its efficiency	K3	6
9	Design of Square wave, Saw tooth wave and Triangular wave generators using OPAMP	K2	6
10	Design of Square wave, Saw tooth wave and Triangular wave generators using IC 555 Timer	K2	6
11	Op-amp - Solving simultaneous equations	K2	6

12	Op-amp - summing, difference, average amplifier, differentiator and integrator	K3	6
13	Op-amp - Design of Schmitt Trigger and construction of Monostable multivibrator	K3	6
14	Parameters of Op-Amp, Voltage to current and current to voltage converters using OPAMP	K3	6
15	FET - Characteristics and FET as amplifier - Frequency response	K4	6
16	Study the characteristics of UJT and construction of UJT Relaxation oscillator	K2	6
17	SCR - Characteristics, Wave shaping and switching circuits	K2	6
18	Study the characteristics of DIAC and TRIAC	K3	6
19	Single stage and multi stage RC coupled transistor amplifier - Frequency response	K4	6
20	Construction of Dual IC regulated power supply	K4	6
Course Outcome	**CO1:** Remember the Students would gain practical knowledge by performing various experiments of Electronics.	K1	
	CO2: Understand he basics of diode and working of rectifier circuits and characteristics	K2	
	CO3: Apply the Self-ability of carrying out the experimental procedures and correlate the outcomes with corresponding theoretical results.	K3	
	CO4: Analyse the relationship between amplifier and oscillators	K4	
	CO5: Develop practical skills through repeatedly practicing the experiment during the practical sessions.	K5	

Learning Resources

Text Books	1. Practical Physics and Electronics Hardcover - C.C. Ouseph, U.J. Rao, Viswanathan, S., Printers & Publishers Pvt Ltd (2009).
Reference Books	1. Electronics for Experimentation and Research, B.K. Jones, Prentice-Hall (1986). 2. Basic Electronics: A Text-Lab Manual, P.B. Zbar, A.P. Malvino and M.A. Miller,Tata Mc-Graw Hill, New Delhi (1994).

Website Link	1.https://www.electronicshub.org/half-adder-and-full-adder-circuits/ 2.https://www.iare.ac.in/sites/default/files/lab1/Electronic%20Circuit%20laboratory%20MANUAL%20.pdf 3.https://www.electronics-tutorials.ws/logic/universal-gates.html 4.https://www.javatpoint.com/decoder-digital-electronics 5.https://www.vidyarthiplus.com/vp/attachment.php?aid=14949

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	L	S	M	M	S
CO2	M	L	M	M	S	M	M	S	M	M
CO3	M	S	S	S	M	S	S	M	M	M
CO4	M	M	S	M	S	S	S	L	M	M
CO5	S	M	M	S	S	S	S	M	L	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Using laboratory manual and perform experiments.
Teaching and Learning Methods	Using laboratory manual and perform circuit connection and verify the results.
Assessment Methods	Providing a hands-on learning experience such as in measuring the basic concepts.

Designed By	Verified By	Approved By
Dr.C.Indira privadharsini	Dr. M. LEVATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3PPHC07	QUANTUM MECHANICS-II	DSC THEORY - VII	III	6	3	3	-	4
Objective	To impart knowledge about the approximation methods that deal with stationary states corresponding to time-independent Hamiltonians. To study the structure of molecules and atomic systems and to know how electromagnetic radiation interacts with these systems. To enable the students to extract the structure of matter from the scattering of particles.							

Unit	Course Content	Knowledge Levels	Sessions
I	**IDENTICAL PARTICLES AND SPIN:** Identical Particles - Symmetric and anti-symmetric wave functions - Exchange operator - Exchange degeneracy - Spin and Statistics connection: Pauli's Exclusion Principle - Bosons and Fermions - Slater determinant - Spin and Pauli's matrices - Electron Spin Hypothesis: Stern Gerlach experiment- Density operator - Density matrix - Properties - Statistical weight - Symmetric and Anti symmetric wave function of hydrogen molecule. (L-9, T-3 Hours)	K1-K3	12
II	**SCATTERING-THEORY:** Differential and Total cross-section - Laboratory and Centre of mass coordinate system - Asymptotic behaviour of the Wave function - Scattering amplitude-Partial wave analysis - Optical Theorem- Phase Shifts-Born approximation and its validity-scattering by Coulomb and Screened coulomb potentials - Square-well potential - Exponential - Gaussian potential - Scattering length and effective range scattering by a perfectly rigid sphere- resonant scattering-non resonant scattering - Ramsauer -Townsend effect. (L-9, T-3 Hours)	K4	12
III	**EMISSION AND ABSORPTION OF RADIATION: Semi-Classical theory of radiation:** Einstein's coefficients - atom field interaction - Transition probabilities for stimulated emission & absorption and spontaneous emission of radiation - Electric dipole transition - Selection rules and polarizability-forbidden transitions. Quantum theory of radiation: Radiation field Hamiltonian-Radiation field as an assembly of oscillators-emission and absorption rates. (L-9, T-3 Hours)	K1,K3	12

IV	QUANTUM THEORY OF ATOMIC & MOLECULAR STRUCTURE: Approximations in atomic structure - Central field approximation - Thomas Fermi Statistical model - Hartree-Fock Equation - method of self-consistent field - Residual electrostatic and spin orbit interaction - Alkali atoms - Doublet separation - Coupling Schemes - Hund's rule- Born-Oppenheimer approximation - Molecular orbital Theory: LCAO - Hydrogen molecule- Covalent bond. (L-9, T-3 Hours)	K4	12
V	RELATIVISTIC QUANTUM MECHANICS Klein-Gordon Equation for a free particle and its solution - Charge and current densities in four vector - KG equation in electromagnetic field - Dirac relativistic equation for a free particle - Dirac matrices - Charge and current densities - Dirac Equation in Electromagnetic field - Free particle solutions - Negative energy states - Spin of a Dirac particle - Spin orbit coupling. (L-9, T-3 Hours)	K1-K4	12
Course Outcome	CO1: Solve problems using perturbation theory.	K1	
	CO2: Describe the principles of scattering theory.	K2	
	CO3: Analyze various properties using the quantum theory and compare it with the results of classical physics.	K3	
	CO4: Evaluate and summarize the methods and properties of various quantum mechanical systems	K4	
	CO5: Design the role of spin, orbital angular momentum and their commutation relations. Evaluation of Clebsch Gordon Coefficients	K5	

Learning Resources

Text Books	1. G.Aruldhas, Quantum Mechanics PHI Learning Private Limited, New Delhi (2020) 2.Satya Prakash , Advanced Quantum Mechanics , Kedar Nath Ram Nath and Co. Publications, Meerut (2021). 3.S.L.Gupta, V.Kumar, H.V.Sharma and R.L.Sharma , Quantum Mechanics, Jai Prakashnath and Co, Meerut. 4.A.K.Ghatak and Lokanathan , Quantum Mechanics , Theory and applications, Macmillan India Ltd Publication (2015). 5.R.Shankar , Principle of Quantum Mechanics -, Plenum US Publication,

	Tamilnadu (1994)					
Reference Books	1.P.M.Mathews and K.Venkatesan , A Text Book of Quantum Mechanics, , Tata Mc Graw Hill, New Delhi (1987). 2.Dr. D.N. Tripathi, R.B. Singh, Elements of Quantum Mechanics, Atomic and Molecular Spectra, Kedar Nath Ram Nath, Meerut (2016). 3., B.K. Agarwal Hari Prakash, Quantum MechanicsPHI Learning Private limited, New Delhi (2011). 4.S.P.Kuila Fundamentals of Quantum Mechanics, Statistical Mechanics & Solid State Physics, , Books and Allied (P) Ltd., Kolkatta (2012)					
Website Link	1.Visual quantum mechanics: https://vqm.uni-graz.at/ 2. https://ocw.mit.edu/courses/physics/ 3. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=28 4. https://nptel.ac.in/courses/115/106/115106066/					
	L-Lecture	T-Tutorial	P-Practical	C-Credit		

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	M	M	M	S	S	S	M	S
CO2	S	S	S	S	L	S	L	L	M	S
CO3	M	L	S	S	S	S	M	M	S	M
CO4	M	S	S	S	S	M	M	M	M	M
CO5	M	M	M	L	L	M	M	M	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problems solving sessions on Lagrangian and Hamiltonian Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Dr.M.Meenachi	Dr. M. REVATHI	

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**TP**	**P**	**C**
21M3PPHC08	ELECTROMAGNETIC THEORY	DSC THEORY - VIII	III	6	3	3	-	4
Objective	To introduce the concepts of electrostatics and magnetostatics, Maxwell's equations, static electric and magnetic fields and methods of solving for the quantities associated with these fields, propagation of electromagnetic waves and their applications in practical problems to the students.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Electrostatics:** Coulomb's law -Electric field - continuous charge distribution - Gauss's law -Differential form of Gauss's law - Poisson's and Laplace's equation - Green's Theorem - Method of Images - Point charge in the presence of grounded conducting sphere and charged insulated conducting sphere - Point charge near a grounded conducting sphereat fixed potential -conducting sphere in a uniform electric field. (L-9, T-3 Hours)	K1-K4	12
II	**Electrostatics of Macroscopic Media:** Electric quadrupole and multipole -Multipole expansion of electric field -Dielectric polarization -External field of a dielectric medium -Electric field in a material medium -Field due to a polarized sphere -Dielectric sphere in a uniform field Molecularfield in dielectric: The Clausius Mossotti relation - Electrostatic energy in dielectric media. (L-9, T-3 Hours)	K5	12
III	**Magnetostatics:** Magnetic fields - Biot- Savart law -Ampere's law -Magnetic field due to straight conductors, circular loop-vector potential - magnetic induction for a circular loop - Magnetic force between two parallel wires - Torque -Multipole expansion- Magnetic dipole - Magnetisation- Magnetic susceptibility and permeability - Hysteresis - Magnetic circuits - Boundary conditions. (L-9, T-3 Hours)	K1-K3	12
IV	**Electromagnetics:** Maxwell's displacement current -Maxwell equations and its derivation -Maxwell equations in free space, linear isotropic medium and harmonically varying fields -Conservation of energy -Poynting's theorem-Conservation of momentum for electromagnetic fields-Plane electromagnetic waves in (i)	K5	12

	free space, (ii) nonconducting medium and (iii) conducting medium (isotropic and anisotropic). (L-9, T-3 Hours)		
V	**Wave Propagation:** Polarization of electromagnetic waves (Linear, circular and elliptical polarization) -Reflection and refraction of electromagnetic waves at a plane interface between dielectrics -Fresnel's equation -Total internal reflection - Propagation of electromagnetic waves between parallel conducting medium. (L-9, T-3 Hours)	K1-K3	12
Course Outcome	CO1:Describe the fundamental laws of Electrostatics, point charges and fields explained by mathematical constructs and explain the connection between current and magnetic flux density	K1	
	CO2:Explain potential and its expansion in multipoles and apply various mathematical techniques to solve equations related electrostatic energy and forces in the presense of dielectrics	K2	
	CO3:Analyse the knowledge to solve image problems, propagation of electromagnetic waves in various medium	K3	
	CO4:Describe the behaviour of electromagnetic fields by deducing Maxwells equation and laws of conservation energy and momentum in various medium	K4	
	CO5:To establish basic laws of magnetostatics and method of solving boundary value problems. and identify the importance of Frenel formulas	K5	

Learning Resources

Text Books	1. J.D.Jackson, Classical Electrodynamics, Wiley Eastern Ltd, New Delhi (1999). 2. D.Griffiths, Introduction to Electrodynamics, Prentice-Hall of India, New Delhi (1999). 3.Chopra and Agarwal, Electromagnetic theory, Kadernath and Ramnath & Co, Meerut (2000). 4.B.B.Laud, Electromagnetics,New Age International Pvt., Ltd, New Delhi (2005).
Reference Books	1. R. P. Feynman, R. B. Leighton, M. Sands, The Feynman Lectures on Physics, Vol. II, Narosa Book Distributors, New Delhi (1989). 2. Satya Prakash, Electromagnetic Theory and Electrodynamics, Kedar Nath Ram Nath, Meerut (2015). 3. Paul Lorrain, Dale R.Corson, Francois Lorrain, Electromagnetic fields and waves, CBS Publishers (2003).

Website Link	1.http://www.fisica.ugto.mx/~ggutj/CV/Classical_Electrodynamics_Jackson_1a_Edic ion.pdf 2. https://himafi.fmipa.unej.ac.id/wp-content/uploads/sites/16/2018/09/Introduction-to-Electrodinamic.pdf 3.https://nptel.ac.in/courses/115101005

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	M	S	M	M
CO2	S	S	S	M	M	S	L	S	M	S
CO3	S	S	S	S	S	S	M	S	S	S
CO4	S	M	S	M	M	S	M	S	S	S
CO5	S	M	S	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problems solving sessions on Lagrangian and Hamiltonian Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Dr.K.Sangeetha	Dr. M. REVATHI	

MOTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M3PPHC09	Molecular Physics & Spectroscopy	DSC THEORY - IX	III	6	3	3	-	4
Objective	Explain the behaviour of molecular systems in external electromagnetic field. Understand the principles and theories of rotational, vibrational, UU-Vis,Fluorescence, Mass and NMR spectroscopy methods, interpret the molecular spectra and find molecular properties from molecular spectra.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	MOLECULAR STRUCTURE AND BONDING : Chemical bonding - The VSEPR model - Valence bond theory - The hydrogen molecule - Homo nuclear diatomic molecules - Polyatomic molecules - Molecular orbital theory - Homo nuclear diatomic molecules - Hetero nuclear diatomic molecules - Bond properties - Polyatomic molecules - Molecular shape in terms of molecular orbitals - Molecular structure, properties and conformations. (L-9, T-3 Hours)	K1-K3	12
II	INFRARED SPECTROSCOPY: Vibrational spectroscopy of diatomic and simple polyatomic molecules - Harmonic Oscillator- Anharmonic Oscillator - Rotational vibrators - Normal modes of vibration of Polyatomic molecules - Experimental techniques - Applications of Infrared Spectroscopy - Reflectance Spectroscopy. (L-9,T-3 hours)	K4	12
III	RAMAN SPECTROSCOPY: Classical theory of Raman Scattering - Quantum theory of Raman effect- Structure determination from Raman and IR Spectroscopy- Mutual exclusion principle- Experimental techniques - Coherent anti-Stokes Raman Spectroscopy - Inverse Raman effect- Applications. (L-9,T-3 hours)	K4	12
IV	NMR AND NQR SPECTROSCOPY : Theory of NMR - Bloch equations - - Theory of chemical shifts - Experimental methods - Single Coil and double coil methods - Pulse Method - High resolution method - Relaxation Time - Applications of NMR to quantitative measurements. The Quadruple Nucleus - Principle of Nuclear Quadruple Resonance - Nuclear Quadruple energy levels for axial and	K3	12

	non-axial symmetry - Experimental techniques and applications. (L-9,T-3 hours)		
V	**ESR AND MOSSBAUER SPECTROSCOPY:** Quantum mechanical treatment of ESR - Nuclear interaction and hyperfine structure - Relaxation effects - Basic principles of Spectrographs - Applications of ESR method - Mossbauer Effect - Recoilless emission and absorption - Mossbauer spectrum - Experimental methods - Mossbauer Spectrometer - Hyperfine interactions - Isomer shift - Magnetic hyperfine interactions - Electric quadruple interactions - Simple biological applications. (L-9,T-3 hours)	K4	12
Course Outcome	**CO1:**Remember bonding in transition metal complexes, Valence bond theory, Crystal field theory, Molecular orbital theory	K1	
	CO2: Understand of Vibrating diatomic molecule, energy levels of a diatomic molecule, simple harmonic and anharmonic oscillator, Scattering of light and Raman Spectrum.rotational and vibrational Raman Spectr	K2	
	CO3: Analyze Raman & Infrared spectroscopy and its applications to structural problems.	K3	
	CO4: Apply on IR, NMR & MS Spectroscopy to interpret structure	K4	
	CO5: Make Students aware of the fine structure of ESR absorption, Hyperfine structure, Double resonance in ESR, Techniques of ESR spectroscopy.	K5	
Learning Resources			
Text Books	1. C.N.Banwell, E.M.Mc Cash, Molecular Spectroscopy, Tata McGraw-Hill Publishing Company Ltd., New Delhi (2004). 2. G. Aruldhas, Molecular Structure and Spectroscopy, PHI Learning Private Ltd., New Delhi, (2001). 3. Gupta, Kumar and Sharma, Elements of Spectroscopy, Pragathi Prakashan, Meerut (2019) 4. P.S.Sindhu, Fundamentals of Molecular Spectroscopy, New Age International Publishers, New Delhi (2011) 5. Straughn and Walker, Spectroscopy, Vol I & II Chapman and Hall (1967).		
Reference Books	1. John Ferraro, Introductory Raman Spectroscopy, Academic Press, New York, (2008). 2. Raj Kumar, Kedar Nath Ram Nath, Atomic and Molecular Spectra: Laser,Meerut, New Delhi, (2015).		

Website Link	1. https://www.topperlearning.com/neet/chemistry/chemical-bonding-and-molecular-structure 2. https://www.youtube.com/watch?v=TQEhLXkNdmo 3.https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004241216240526ranvijay_engg_Infrared_Spectroscopy.pdf 4.https://freevideolectures.com/course/4562/nptel-atomic-molecular-physics/57 5. https://archive.nptel.ac.in/courses/104/101/104101117/

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	S	M	S	M	S	S	S	M	S
CO2	S	M	M	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S
CO5	S	S	M	S	M	S	S	S	M	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Online virtual laboratory, PPT,virtual classroom teaching
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
R.AZHAGARASU	Dr. N. REVATHI	

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE
RASIPURAM
637 408
Tamil Nadu

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3PPHP03	MICROPROCESSOR AND MICROCONTROLLER	DSC PRACTICAL - III	III	6	-	-	6	4
Objective	To expose students to the operation of typical microprocessor (8085) and microcontroller (8051) trainer kit. To prepare the students to be able to solve different problems by developing different programs. To develop the quality of assessing and analyzing the obtained data.							

S. No.	List of Experiments (Any 20 Experiments)	Knowledge Levels	Sessions
1	**8085 MICROPROCESSOR PROGRAMMING EXPERIMENTS:** 8 bit Addition and Subtraction	K1	6
2	8 bit Multiplication and Division	K1	6
3	Number conversion: BCD to Binary and Binary to BCD	K3	6
4	Number conversion: ASCII to HEX and HEX to ASCII	K4	6
5	Ascending and descending order of numbers	K3	6
6	Square and square root of a given number	K3	6
7	Factorial of a given number	K3	6
8	Largest and smallest number in a set of numbers	K3	6
9	Search for a given data in an array	K4	6
10	Interfacing of ADC with 8085 Microprocessor	K4	6
11	Interfacing of DAC with 8085 Microprocessor (square, saw tooth and triangular waves)	K5	6
12	Interfacing of 8253 (Timer IC) or 8255 with 8085 Microprocessor	K5	6
13	Interfacing of 8279 keyboard/ display controller with 8085 Microprocessor	K5	6
14	Stepper Motor Interface	K4	6
15	Traffic Light Control Interface	K4	6
16	Design of digital Clock using 8085 Microprocessor	K4	6
17	Design of digital Thermometer using 8085 Microprocessor	K4	6
18	Sum of 'n' numbers using 8085 Microprocessor	K3	6

19	BCD Addition using Microprocessors	K3	6
20	Program to reverse the given string	K4	6
21	**MICROCONTROLLER (8051):** Study of 16 bit Addition and Subtraction	K4	6
22	Study of 16 bit Multiplication and Division	K4	6
23	DC Motor Control Interface	K5	6
24	HEX key board Interface	K5	6
25	Switching an array of LED'S	K4	6
Course Outcome	**CO1:** Remember relevant information to supplement to the Microprocessor and Microcontroller course. Set up programming strategies and select proper mnemonics and run their program on the training board	K1	
	CO2: Understand the different types of programming keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.	K2	
	CO3: Applying the knowledge in microprocessor architecture, programming and its various applications.	K3	
	CO4: Analyze Design circuits for various applications using microcontrollers.	K4	
	CO5: Evaluate an in-depth knowledge of applying the concepts on real- time applications.	K5	

Text Books	1.Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085/8080, Penram International Publishing (India) Private Ltd., Mumbai (2016) 2.Kenneth Ayala,The 8051 Microcontroller, Cengage Learning India Private Limited, New Delhi (2005)
Reference Books	1.Muhammad Ali Mazidi and Janice Mazidi,The 8051 Microcontroller and Embedded systems, Pearson Education (2000) 2.Douglas V. Hall, Microprocessors and Interfacing, Tata McGraw Hill Publishing Company Limited, New Delhi (2006)
Website Link	1.https://mjcollege.ac.in/images/labmannuals/MICROPROCESSORLABMANUALBIT281.pdf. 2.https://onlinecourses.nptel.ac.in/noc20_ee42/preview. 3.https://atria.edu/assets/ece/manuals/mc.pdf.

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	S	S	M	M	S	S	S	L	M
CO2	S	M	S	M	M	S	M	M	S	S
CO3	L	M	M	S	S	S	M	S	M	L
CO4	M	S	S	M	M	L	M	M	M	M
CO5	M	S	S	M	S	M	M	S	S	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	-
Teaching and Learning Methods	Demonstration and practical Sessions
Assessment Methods	To Conduct Model Practical

Designed By	Verified By	Approved By
M.SARANYA		

Curriculum Development Cell
MCAS
(Autonomous)
Rasipuram

M. Sc Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3PPHIS1	INTERNSHIP	INTERNSHIP	III	-	-	-	-	2
Objective	Learn to appreciate work and its function in the economy and develop work habits and attitudes.							

S. No.	Guidelines for Internship Training Programme	Knowledge Levels	Sessions
1	The student should undergo **15 Days Internship** training in any individual students have to identify the Institution / Industry / University of their choice during the vacation which falls at the end of the 2nd Semester.	K2-K4	
2	The training bridges the gap between the theoretical knowledge gained in the college and the practical application of the same in the industry / company / stores. The student will have a better exposure about the workplace and its nuances.		
3	Schedule of visit to be made by the staff is to be prepared by the HOD / Staff-in-charge.		
4	The trainees should strictly adhere to the rules and regulations and office timings of the institutions to which they are attached.		
5	A Staff member of a Department (Guide) will be monitoring the performance of the Candidate.		
6	The students should maintain a daily logbook where the student should record his details of the training.		
7	The trainees have to obtain a certificate on successful completion of the internship from the chief executive of an organization.		
8	The student should submit an attendance certificate to the institution for 15 days internship training from an organization.		
9	Internship Training Report (30 - 50 pages) should be prepared by the student and submitted in a month's time and at the end of the semester student should present the report with a power point presentation.		
10	Industrial training reports shall be prepared by the students under the supervision of the faculty of the department.		
11	Industrial training report must contain the following: Cover page Copy of training certificate, Profile of an industry report about the work undertaken by them during the tenure of training observation about the concern findings.		
12	Practical viva - voce examination will be conducted with internal & external examiners at the end of the **3rd semester** and the credits will be awarded.		
13	Report Evaluation: External Viva-Voce examination will be conducted and the maximum mark is 100.		

Course Outcome	CO1: Apply new techniques and ideas in field of physics	K3	
	CO2: Analyze the results of new initiatives	K4	
	CO3: Create a new work plan with greater output	K6	
	CO4: Create a framework of work execution ideas	K6	
	CO5: Create a detailed technical work plan and terminologies to be followed in industry.	K6	

Learning Resources

Text Books	1.J.C. Brice"Crystal Growth Processes" John Wiley and Sons, New York
Reference Books	1. Smith Donald. L"Thin Film Deposition" McGraw Hill, London., 2. A. Goswami "Thin film fundamentals" New Age International Pub.,
Website Link	1.http://gen.lib.rus.ec/physics 2.https://www.sanfoundry.com/best-reference-books-msc-physics/

M. Sc - Physics LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3PPHIS1	INTERNSHIP	INTERNSHIP	III	-	-	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	M	S	S	M	S	M	S	S	S	S
CO4	M	M	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG
Tutorial Schedule	-		
Teaching and Learning Methods	-		
Assessment Methods	CIA - 100 Marks 1. Work Log Book - 25 Marks 2. Training Report and Viva-Voce - 75 Marks		

Designed By	Verified By	Approved By
Dr. M.REVATHI	Dr. M.REVATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M4PPHC10	CONDENSED MATTER PHYSICS	DSC THEORY - X	IV	5	3	2	-	4
Objective	**To provide an extended knowledge of the crystal systems and techniques of solid state physics and the students to understand about structure, thermal, electrical, magnetic and superconductivity properties of matter.**							
Unit	**Course Content**						**Knowledge Levels**	**Sessions**
I	**Fundamentals of Crystal Structure and X-ray diffraction:** Crystalline and amorphous solids - unit cell - space lattice- miller indices - inter planar spacing - packing efficiency of lattices (sc, bcc, fcc) - X-ray diffraction - Laue equations interpretation of Bragg's equation - Ewald construction- reciprocal lattice properties of reciprocal lattice- Concept of Brillouin zones - atomic form factor-structure factor -X-ray diffraction experiment-powder method - defects in crystal (zero, one and two dimensional) (L-9,T-3 Hours)						K1-K2	12
II	**Lattice Vibrations and Thermal Properties :** Vibration of monoatomic lattices - Lattices with two atoms per primitive cell - Quantization of lattice vibrations - Phonon momentum - Inelastic scattering of neutrons by phonons - Lattice heat capacity - Einstein model - Density of modes in one - dimension and three dimension - Debye model of the lattice heat capacity - Thermal conductivity - Umklapp process. (L-9,T-3 Hours)						K2-K4	12

III	**Free Electron Theory, Energy Bands and Semiconductor Crystals:** Classical theory of free electron - free electron gas in one dimensional - free electron gas in three dimensional - heat capacity of electron gas - thermal conductivity of metals - Hall effect - Wiedemann - Franz law - Nearly free electron model - Bloch theorem - kronig penney model - effective mass - semiconductors effective mass - intrinsic carrier concentration - intrinsic mobility. (L-9,T-3 Hours)	K3	12
IV	**Magnestism:** Magnetic properties - Langevin diamagnetism equation - quantum theory of diamagnetism - Para magnetism - Wiess theory of Para magnetism - Hund rules - crystal field splitting, paramagnetic susceptibility of conduction electrons - ferromagnetic order - temperature dependence of the saturation magnetization- neutron magnetic scattering- Ferrimagnetic order - curie temperature and susceptibility of ferrimagnets - antiferro magnetic order - susceptibility below the Neel temperature - ferromagnetic domains - origin of domains - coercivity and hysteresis. (L-9,T-3 Hours)	k1-K4	12
V	**Ferroelectricity and Superconductivity:** General properties and classification of ferroelectric materials - Dipole theory of ferro electricity - Ferroelectric domains - Occurrence of superconductivity - Meissner effect - Thermodynamics of superconducting transition - London equation - Coherence length - BCS theory -Flux quantization - Type - I and type - II superconductors - Josephson superconductor tunneling - DC and AC Josephson effect - SQUID - Applications of superconductors. (L-9,T-3 Hours)	K2-K4	12
Course Outcome	**CO1:** List the concept of energy bands and effect of the same on electrical properties.	K1	
	CO2: Understand the physics behind structural properties of the solids.	K2	
	CO3: Apply the various types of magnetic phenomenon and their properties and applications.	K3	
	CO4: Analyze the research work in the field of material science and nanotechnology.	K4	
	CO5: Compose the different lattice types and predict electrical and thermal properties of solids	K5	

Learning Resources	
Text Books	1.C. Kittel, Introduction to Solid State Physics, (Wiley Eastern, New Delhi(2007) 2.S.O. Pillai, Solid State Physics, (New Age International, New Delhi(2005) 3.H.C. Gupta, Solid State Physics, Vikas Publishing House, Noida(2001) 4.Rita John, Solid State Physics, McGraw Hill, New Delhi(2014)
Reference Books	1. N.W. Ashcroft and N.D. Mermin, Solid State Physics, Holt, Rinehart and Winston, Philadelphia(1976) 2. A.J. Dekker, Solid State Physics, McMillan, Chennai(1971)
Website Link	1. https://onlinecoures.nptel.ac.in/noc22_ph31/preview 2. http://www.nptel.ac.in/courses/113106075/ 3. http://www.nptel.ac.in/courses/115106061/

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	M	S	S	M	S
CO4	S	M	M	S	S	S	M	S	M	S
CO5	M	M	S	S	S	S	S	M	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	virtual laboratory, PPT, virtual classroom teaching and Experimentally demonstrate.
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test, model test,

Designed By	Verified By	Approved By
Dr.K.SANGEETHA	Dr.M.REVATHI	

Curriculum Development Cell
MCAS
(Autonomous)
Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PPHC11	NUCLEAR AND PARTICLE PHYSICS	DSC THEORY - XI	IV	5	3	2	-	4
Objective	To impart higher level knowledge and understanding of nuclear physics and technology and Enhance student ability to develop mathematical models of defined physical systems. Enable students to analyze mathematical models of physical systems for enhancement of system performance and arrive at limitations of physical systems.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Nuclear Properties :** Nuclear energy levels - Nuclear angular momentum, parity, isospin - Nuclear magnetic dipole moment - Nuclear electric quadropole moment - Ground state of deuteron - Magnetic dipole moment of deuteron - Proton-neutron scattering at low energies - Scattering length, phase shift - Nature and properties of nuclear forces - Spin dependence - Charge symmetry - Charge independence - Repulsion at short distances - Exchange forces - Meson theory. (L-9,T-3 Hours)	K1-K2	12
II	**Radioactivity :** Alpha Decay: Properties of α Particles-Gamow"s Theory of α Decay-Geiger Nuttal Law- α Ray Energies-Fine Structure of α Rays- α Disintegration Energy-Long Range α Particles. Beta Decay: Properties of β Particles-General Features of β Ray Spectrum-Pauli"s Hypothesis-Fermi"s Theory of β Decay-Forms of Interactions and Selection Rules. Gamma Decay: Absorption of γ Rays by Matter-Interaction of γ Rays with Matter Measurement of γ Ray Energies-Internal Conversion. (L-9,T-3 Hours)	K1-K3	12
III	**Nuclear Models :** The degenerate gas model -Liquid Drop Model: Bohr Wheeler Theory of Fission-Condition for Spontaneous Fission Activation Energy. Shell Model: Explanation of Magic Numbers-Prediction of Shell Model-Prediction of Nuclear Spin and Parity-Nuclear Statistics-Magnetic Moment of Nuclei-Nuclear Isomerism. Collective Model: Explanation of Quadrupole Moments.	K1-K3	12

	(L-9,T-3 Hours)		
IV	**Fission and Fusion Reactors :** Characteristics of fission - Mass distribution of fragments - Radioactive decay processes - Fission cross-section - Energy in fission - Bohr-Wheeler's theory of nuclear fission - Fission reactors - Thermal reactors - Homogeneous reactors - Heterogeneous reactors - Basic fusion processes -- Characteristics of fusion - Solar fusion - Controlled fusion reactors. (L-9,T-3 Hours)	K1-K2	12
V	**Elementary Particles:** **Classification of elementary particles:** Leptons and Hadrons - Basic Conservation laws: Baryon number, Lepton number, Isospin and Hyper charge - Strange particles and Strangeness - Gell-Mann - Nishijima scheme - Eight foldway and supermultiplet - SU(3) symmetry - Quark model and quark composition of mesons and baryons - Color and Flavor - Weak and Strong interactions - Standard model. (L-9,T-3 Hours)	K1-K4	12
Course Outcome	**CO1:** Students recall skills for pursue physics as a teaching and research career.	K1	
	CO2: Students understand the versatile and solid background in fundamental physics and its application.	K2	
	CO3: Students will have the capability of apply back-of the envelope calculations in a diversity of situations.	K3	
	CO4: Students can analyze the theory of nuclear physics for newer applications	K4	
	CO5: Students Can promote the exchange of ideas and research within the nuclear/atomic science community.	K5	

Learning Resources

Text Books	1. Introductory of Nuclear Physics,K. S. Krane, John-Wiley, New York, (1987). 2. Nuclear Physics: An Introduction S. B. Patel, New Age, New Delhi, (2009). 3. Elementary Particle Physics: An Introduction D. C. Cheng and G. K. O'Neill, Addison-Wesley, New York, (1979). 4. Nuclear Physics ,D.C. Tayal, Himalaya Pub. House, New Delhi, (2011). 5. S.L. Kakani and S. Kakani, Nuclear and Particle Physics , Anshan Publ., New Delhi, (2009).
Reference Books	1. Concepts of Nuclear Physics,Bernard L. Cohen,Tata McGraw Hill- New Delhi 1600,(1978) 2. Nuclear Physics - R.C. Sharma K. Nath and Co, Meerut, (2004). 3. Concepts of Nuclear Physics, B. L. Cohen, Tata McGraw Hill, New Delhi, (1988).

Website Link	1. https://nptel.ac.in/courses/115/104/115104043/ 2. https://nptel.ac.in/courses/115/106/115106087/ 3. https://nptel.ac.in/courses/115/103/115103101/

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	M	S	S	L	S	M	S	S	M
CO2	M	S	S	M	M	M	L	M	S	M
CO3	M	M	S	S	S	M	S	S	M	M
CO4	M	L	M	S	S	M	M	S	S	M
CO5	L	M	M	S	S	S	M	S	S	L
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Discuss about the basic properties of nucleus and Book back Problem solving sessions,
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Continuous Assessment Test I, II & Model Assignment and End Semester Examinations

Designed By	Verified By	Approved By
Dr.C.INDIRA PRIYADHARSINI	Dr. M. REVATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PPHC12	COMMUNICATION ELECTRONICS	DSC THEORY - XII	IV	5	3	2	-	4
Objective	Students should have adequate knowledge in electromagnetic radiation. Understand basic concepts of communication and optical communication system. Identify different types of modulation and multiplexing formats. Compute a simple optical power budget.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Communication Systems:** Modulation - Types of Modulation - Amplitude modulation Theory - Frequency spectrum of the AM wave - Representation of AM - Power relations in the AM wave - Generation of AM - Basic requirements- Description of frequency and phase modulation - Mathematical representation of FM - Frequency spectrum of FM wave. (L-9,T-3 Hours)	K1-K4	12
II	**Antennas and Wave Propagation:** Basic concept and Definition - Effect of Ground on Antennas - Grounded $\lambda/4$ Antenna - Ungrounded $\lambda/2$ Antenna - Antenna Arrays - Broadside and End Side Arrays - Antenna Gain - Directional High Frequency Antennas - Sky wave Propagation - Ionosphere - Ecles & Larmor Theory - Magneto Ionic Theory. (L-9,T-3 Hours)	K1-K3	12
III	**Microwaves and Microwave Devices :** Microwave Generation - Multicavity Klystron - Magnetron - Travelling Wave Tubes (TWT) Fundamentals - Types, Performance and Application. - Crossed field Amplifier, Backward wave oscillator and MASER, Gunn Diode. (L-9,T-3 Hours)	K1-K2	12
IV	**Radar and Television:** Fundamentals of a Radar - Radar Equation -	K1-K3	12

	Radar Performance Factors -Radar Transmitting Systems - Radar Antennas - Duplexers - Radar Receivers and Indicators - Pulsed Radar Systems - Types of Radars (Phased array and Plane arrays) - Colour TV Transmission and -Colour mixing principle - Colour Picture Tubes -Delta Gun picture tube - PIL colour picture tube - Cable TV, CCTV and Theatre TV. (L-9,T-3 Hours)		
V	**Optical Fiber Communications:** Optical fiber communications- optical fiber types - Advantages of optical fiber cables - Block diagram of an optical fiber communication system- light propagation - optical fiber configurations and classifications-losses in optical fiber cables-light sources and optical sources- light detectors. (L-9,T-3 Hours)	K1-K4	12
Course Outcome	**CO1**: Remember integrate the strengths of the liberal arts tradition with the theoretical foundation to Enter in the research.	K1	
	CO2: Understand effective communicators and critical consumers of messages preparing them for life.	K2	
	CO3: Apply the knowledge of mathematics, science and engineering fundamentals to the solution of complex engineering problems in electronic circuits and communication electronics.	K3	
	CO4: Analyze integrate the strengths of the liberal arts tradition with the theoretical foundation to enter in the research.	K4	
	CO5: Evaluate the familiar with design consideration of fiber optics system.	K5	
Learning Resources			
Text Books	1.George Kennedy & Davis,Electronic Communication System ,Tata McGraw Hill 4th edition (1989) 2.S K Sarkar,Optical fibre and fibre optic communication systems ,S.Chand Publication edition (2007) 3.Sanjeev Gupta & Santhosh Gupta,Electronics Devices and circuits , Dhanpat Rai Publications 4.Louis E. Frenzel,Principles of Electronic Communication systems, Tata - McGraw-Hill, New Delhi (2008)		
Reference Books	1.Taub Schilling,Principles of Communication Systems, TMH (1986) 2.Taub Schilling,Communication Systems ,Taub Schilling,John Wiley & Sons (2005) 3.R.P.Singh, S.D.Sapre,Communication Systems, Tata McGraw-Hill Publishing Company Ltd., New Delhi (2001)		

Website Link	1.http://nptel.ac.in/courses/115/107/115107095/ 2.http://nptel.ac.in/courses/108/104/108104113/ 3.http://nptel.ac.in/courses/108/101/108101112/ 4.https://www.tutorialspoint.com/radar_systems/radar_systems_tutorial.pdf

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	L	M	S	S	M	M	S	S	M
CO2	M	S	L	M	S	M	S	M	S	M
CO3	M	S	M	S	S	S	L	M	S	M
CO4	L	M	S	M	S	M	M	M	S	L
CO5	M	S	S	S	S	M	S	M	S	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Discussing One Marks & open book problem solving session, Group Discussion, Interactions, Kahooot, Moodle cloud and Google class room.
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	CIA, ESE, Pre-Semester Examination

Designed By	Verified By	Approved By
Ms.M.SARANYA	Dr.M.REVATHI	

Curriculum Development Cell MCAS Autonomous Rasipuram

M.Sc., Physics for Competitive Examination Syllabus -LOCF-CBCS-Pattern with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PPHOE1	PHYSICS FOR COMPETITIVE EXAMINATION	Self study Online - Competitive Examination	IV	-	-	4	-	2
Objective	Creating the awareness on competitive examination among students. Imparting knowledge about the appearing for Competitive Examination and it impacts and developing an attitude of appearing for such exams.							
	Course Content						Knowledge Levels	Sessions
	A fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Astrophysics, Material science, Nuclear and Particle Physics, Condensed matter Physics, Atomic and Molecular Physics, Mathematical Physics, Analytical dynamics, Quantum mechanics I&II, Classical mechanics, Electronics, theory of semiconductor devices, nuclear physics, communication electronics, microprocessor and microcontroller and its linkages with related inter disciplinary areas, Physical sciences, Atmospheric Physics, Information Technology; This course aims to give a holistic view of all the topics which comprised of some factual text points, multiple choice questions (MCQ), it is extremely suitable for students pursuing their higher degree in University/institute for their entrance exams, students preparing for various national and state level competitive entrance exams such as ICAR-JRF/SRF/NET/ARS, IARI/NDRI Ph.D., SAUs; CSIR/UGC-NET/JRF/SRF; ICMR, DBT, GATE, BARC, IISc, JNU, BHU, etc. to get admission in Ph.D. in Physics. In addition, it is also useful for UPSC and states PSC. Rules for creating MCQ pattern. 1. Objective type online examination will be conducted at							K1-K6	

	the end of 4th semester. 2. Questions must be taken from all previous question papers of CSIR-NET, SET, NEET, UPSC, IBPS and Common Entrance Test for Ph.D. 3. Test critical thinking. Multiple choice questions to test the superficial knowledge. Learners to interpret facts, evaluate situations, explain cause and effect, make inferences, and predict results. 4. Emphasize Higher-Level Thinking Use memory-plus application oriented questions. These questions require students to recall principles, rules or facts in a real life context. Eg.1 Ability to Justify Methods and Procedures Which of the following measurements is not a unit of distance? (A) Ammeter (B) Cubit (C) Parsec (D) angstrom Eg.2 Ability to Interpret Cause-and-Effect Relationships What happens to your weight when you are in a lift which goes down? (A)Decreases (B)Increases (C)Decreases and then increases (D)Increases and then decreases		

	5. Mix up the order of the correct answers Keep correct answers in random positions and don't let them fall into a pattern that can be detected 6. Use a Question Format Multiple-choice items to be prepared as questions (rather than incomplete statements) Incomplete Statement Format: The capital of California is in Direct Question Format------ Less effective. In which of the following cities is the capital of California? - This is Best format. 7. Keep Option Lengths Similar Avoid making your correct answer the long or short answer 8. Avoid the "All the Above" and "None of the Above" Options Students merely need to recognize two correct options to get the answer correct 9. HOD's instruct to the faculty to prepare minimum 500 questions booklet (cumulatively for each programme) with solutions and circulate among the students. 10. Each Department to prepare the Questions (MCQ pattern with four answers) and submit to ICT.		

Course Outcome	CO1: emphasis is given for in depth and quantitative understanding of physical parameters which describe behaviour of the system subjected to various boundary conditions	K1	
	CO2: These physical parameters include mechanical, thermal, optical, electrical, magnetic properties.	K2	
	CO3: The system of study is from nano scale structure through micro, mesa and bulk systems.	K3	
	CO4: The prescribed course runs through various topics which include Vector integration, Gauss and Stoke's theorem, Matrices, Tensors etc.	K4	
	CO5: The special functions covered are quite useful in solving transfer of heat in different geometries.	K5	
Learning Resources	1.G.Gurumoorthy,Objective physics, publishers S.Viswanathan, first edition,1998 .		
	2.R.K.Gupta, Objective physics, Arihant Publications,2021		
	3. S.Chands, Objective physics, publishers Dr.Mahesh Jain,2014		
	4.Satya Prakash Arya, Objective physics,publisher MTG Learning Media,2011		
	5. Dr.M.Arumugam, Engineering physics,publisher anuradha agencies,2011		
Reference Books:1. sathaya prakash , objective physics, publisher A.S.Prakashan, Meerut,2010			
Website link	https://testbook.com/learn/physics/		
	L-Lecture T-Tutorial P-Practical		

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S	S	M	M	S	M
CO2	S	S	S	M	M	S	S	S	S	S
CO3	M	L	S	S	S	S	S	S	S	M
CO4	S	M	M	S	M	M	L	S	M	S
CO5	S	M	M	M	L	M	M	S	M	S
Level of Correlation between CO and PO					L-LOW		M-MEDIUM		S-STRONG	

Designed By	Verified By	Approved By
Dr.M.REVATHI	Dr.M.REVATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M.Sc., Physics LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PPHPR1	PROJECT WORK	PROJECT WORK	IV	10	-	-	10	5
Objective	Demonstrate a technical knowledge in their selected project topic. Undertake problem identification, formulation and solution. Develop plans with relevant people to achieve the goals of the project.							

Details	Course Content	Knowledge Levels	Sessions
PROJECT PREPARATION FORMAT			
Cover Page & Title Page	**Cover Page & Title Page:** The fonts and locations of various items on this page should be exactly as shown in a specimen copy.		
Inside cover page	Inside cover page Same as cover page.		
Bonafide Certificate	**Bonafide Certificate:** The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14.		
Acknowledgement	**Acknowledgement:** This should not exceed one page.		
Abstract	**Abstract:** Abstract should be one page synopsis of the project report typed double line spacing, Font Style Times New Roman and Font Size 14.		
Contents	**Table of Contents:** The table of contents should list all headings, sub headings after the table of contents page, as well as any titles preceding it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents. One and a half spacing should be adopted for typing the matter under this head.		
Tables	**List of Tables:** The list should use exactly the same captions as they appear above the tables in the text. 1.5 spacing should be adopted for typing the matter under this head.		
Figures	**List of Figures:** The list should use exactly the same captions as they appear below the figures in the body of the text. One and a half spacing should be adopted for typing the matter under this head. All charts, graphs, maps, photographs and diagrams should be designated as figures. X and Y axes titles are mandatory for all the graphs.		
Symbols	**List of Symbols, Abbreviations and Nomenclature:** 1.5 spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations		

	etc. should be used.		
Chapters	**Chapter I - Introduction:** Statement of the Problem, Significance, Need for the study, Objectives		
	Chapter II- Review of literature		
	Chapter III- Methodology: Tools used, Procedures, Hypothesis.		
	Chapter IV- Results and Discussion: Tables and Figures, Statistical Presentations, Hypothesis Testing.		
	Chapter V- Summary and conclusion		
	Chapter VI- Scope of the Project		
	References		

Guidelines For Project Preparation			
Numbering	• Every page in the project report, except the project report title page, must be accounted for and numbered. • The page numbering, starting from acknowledgements and till the beginning of the introductory chapter, should be printed in small Roman numbers, i.e, i, ii, iii, iv.. • The page number of the first page of each chapter should not be printed (but must be accounted for). All page numbers from the second page of each chapter should be printed using Arabic numerals, i.e. 2,3,4,5.. • All printed page numbers should be located at the right corner at the bottom of the page.	K4-K6	
Chapters	• Use only Arabic numerals. Chapter numbering should be centered on the top of the page using large bold print. <Size 14><Times New Roman>	K4-K6	
TEXT			
Regular Text	**Regular Text:** Times Roman 12 pts and normal print.	K4-K6	
Chapter Heading	**Chapter Heading -** Times Roman 14 pts. Bold and capital.	K4-K6	
Section Headings	**Section Headings -** Times roman 12 pts. Bold and capital.	K4-K6	
Subsection Headings	**Subsection Headings** - times roman 12 pts. bold print and Leading capitals i.e, only first letter in each word should be in capital.	K4-K6	
Special Text	**Special Text-** Italics/Superscript /Subscript/Special symbols, etc., as per necessity. Special text may include footnotes, endnotes, physical or chemical symbols, mathematical notations, etc.	K4-K6	
Sections	**Sections:** Use only Arabic numerals with decimals. Section numbering should be left justified using bold print. Example: 1.1, 1.2, 1.3, etc.	K4-K6	
Sub Sections	**Sub Sections:** Use only Arabic numerals with two decimals. Subsection numbering should be left Justified using bold print. Example: 1.1.1, 1.1.2, 1.1.3, etc.	K4-K6	

References	Use only Arabic numerals. Serial numbering should be carried out based on Alphabetical order of surname or last name of first author. The format is written like, author name followed by year followed by title of the work followed by details of the journal. Same font as regular text, serial number and all authors names to be in bold print. Title and Journal names should be in italic. One Author: Williams, G. State and Society in. Onco State, Nigeria, Afrographika, 1980. Two Authors: Phizacklea, A & Miles, R. Labour and Racism. London, Routledge & Kegan Paul, 1980. 3+ Authors: O'Donovan, P., et al. The United States. Amsterdam, Time-Life International, 1966.	K4-K6	
Typing Instructions	**Typing Instructions:** The impression on the typed copies should be black in color. One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 12. Use A4 (210 mm X 297 mm) bond un-ruled paper (80 gsm) for all copies submitted. Use one side of the paper for all printed/typed matter.	K4-K6	
Justification	**Justification:** The text should be fully justified	K4-K6	
Margins	**Margins:** The margins for the regular text are as follows LEFT - 1.5" RIGHT - 1" TOP - 1" BOTTOM - 1"	K4-K6	
Paragraph Spacing	Use 6 pts before & 6 pts after paragraphs. All paragraphs in the seminar/project report should be left justified completely, from the first line to the last line. Use 1.5 spacing between the regular text and quotations. Provide double spaces between: (a) From top of page to chapter title, (b) Chapter title and first sentence of a chapter, Use single spacing (a) In footnotes and endnotes for text. (b) In explanatory notes for tables and figures. (c) In text corresponding to bullets, listings, and quotations in the main body of seminar/project report. (d) Use single space in references and double space between references.	K4-K6	
Tables	All tables should have sharp lines, drawn in black ink, to separate rows/columns as and when necessary. Tables should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for	K4-K6	

	including tables on a page, should be avoided. Provide double spaces on the top and the bottom of all tables to separate them from the regular text, wherever applicable. The title of the table etc. should be placed on the top of the table. The title should be centered with respect to the table. The titles must be in the same font as the regular text and should be single spaced.		
Figures	All figures, drawings, and graphs should be drawn in black ink with sharp lines and adequate contrast between different plots if more than one plot is present in the same graph. The title of the figure etc. should be placed on the bottom of the figure. Figures should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including figures on a page, should be avoided. Provide double spaces on the top and the bottom of all figures to separate them from the regular text, wherever applicable. Figures should be centered with respect to the figure. The titles must be in the same font as the regular text and should be single spaced. The title format is given below: Fig. <blank><chapter number>.<serial number><left indent><figure	K4-K6	
Page Dimension & Binding Specifications	The project report should be prepared in A4 size. The dissertation shall be properly bound; The bound front cover should indicate in Silver and embossed letter.		
Course Outcome	**Co:1** Identification of research idea	K4	
	Co:2 Analyze of problem solving skills	K4	
	Co:3 Analyze sources for conduct of Research	K4	
	Co:4 Evaluate the research report	K5	
	Co:5 Create the research report	K6	

Learning Resources	
Text Books	**1. M.A.Shah, Principles of Nanoscience and Nanotechnology, Tokeer Ahmad.** **2. S.Chand & Company Limited,Nano Technology, Rakesh Rathi, New Delhi.**
Reference Books	**1.De Jongh J, Kulwer Academic Publishers,Physics and Chemistry of Metal cluster components, Dordrecht.**
Website Link	1. http://gen.lib.rus.ec/physics

M. Sc- Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards										
Course Code	Course Title		Course Type		Sem	Hours	L	T	P	C
21M4PPHPR1	PROJECT WORK		PROJECT WORK		IV	10	-	-	10	5
CO-PO Mapping										
CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S	S	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	M	S	S	S	S	M	M
CO5	M	M	M	S	S	M	M	S	M	S
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG			
Tutorial Schedule	-									
Teaching and Learning Methods	-									
Assessment Methods	EA - 100% 1. Project Report - 150 Marks 2. Viva-Voce - 50 Marks 3. Total - 200 Marks									
Designed By	Verified By					Approved By				
Dr. M.REVATHI	Dr. M.REVATHI									

List of Elective Course (DSE) Details for M.Sc.physics
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S.NO	SEM	SUB_CODE	TITLE OF THE SUBJECT
1	I	21M1PPHE01	Micro Processors and Micro Controllers
2	I	21M1PPHE03	Energy Physics
3	II	21M2PPHE02	Nano Physics
4	II	21M2PPHE04	Astro Physics
5	III	21M3PPHE05	Crystal Growth and Thin flims
6	III	21M3PPHE06	Laser Physics & Non-Linear Optics
7	IV	21M4PPHE07	Nano Material Synthesis and Analytical Instrumentation
8	IV	21M4PPHE08	Modern Optics and Imaging

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M1PPHE01	MICROPROCESSORS AND MICROCONTROLLERS	DSE - I	I	6	3	3	-	4
Objective	Student learn the architecture of 8085 and 8086 microprocessors An analyse the basic concepts and programming of 8051 microcontroller.To understand the interface devices.							

Unit	Course Content	Knowledge Levels	Sessions
I	**ARCHITECTURE INTEL 8085 MICROPROCESSOR :** Introduction - Pin configuration - Architecture and its operations - Machine cycles of 8085 - Opcode fetch machine cycle - Memory read machine cycle - Memory write machine cycle - I/O read cycle - I/O write cycle - Interrupt acknowledge machine cycle. Memory organization in an 8085 based system - Interfacing I/O and Peripheral Devices - Interrupts-Software Interrupts - Hardware Interrupts. (L-9, T-3 Hours)	K1-K2	12
II	**ASSEMBLY LANGUAGE PROGRAMMING IN 8085 :** Instruction Set: Data transfer instructions - Arithmetic instructions - Logical instructions - Branching instructions and machine control instructions-Addressing modes. Assembly Language programming - programming techniques - Looping, counting and indexing - Counters and time delays - Stack - subroutine - Simple programs - 16-bit additions, subtractions, multiplications and divisions. (L-9, T-3 Hours)	K3-K4	12
III	**INTEL 8086 MICROPROCESSOR :** Introduction - Comparison between 8085 and 8086 Microprocessors - Architecture of 8086 - Pin configuration - Format of 8086 instructions - Classification of 8086 instructions - Memory addressing: 8-bit data from even and odd address bank, 16-bit data from even and odd address bank - Addressing modes - Simple programs - 16-bit additions, subtractions, multiplications and divisions. (L-9, T-3 Hours)	K3-K4	12

IV	**ARCHITECTURE OF 8051 MICROCONTROLLER:** Introduction to microcontroller and embedded system - Difference between microprocessor and microcontroller - 8051 microcontrollers: Pin configuration, Architecture and Key features of 8051 - Instruction set: Data transfer instructions - Arithmetic instructions - Logical instructions - Branching instructions - Boolean operations instructions - Program control instructions - Addressing modes. (L-9, T-3 Hours)	K3	12
V	**INTERFACING OF MICROPROCESSOR 8085 :** Basic concepts of programmable device - 8255 Programmable Peripheral Interface (PPI) - interface of ADC and DAC - 8257 Direct Memory Access (DMA) controller - Basic concepts of serial I/O and data communication-interface of 8251 Universal Synchronous Asynchronous Receiver Transmitter (USART). (L-9, T-3 Hours)	K4	12
Course Outcome	**CO1:**Remember the architecture of 8085 ,organization of registers and memory in microprocessors.	K1	
	CO2: Understand the programming in assembly language.	K2	
	CO3: Analze the architectures and programms in 8086 and 8085.	K3	
	CO4: Outline the architecture of 8051 and PIC microcontroller .	K4	
	CO5: Evaluate the different interfacing devices.	K5	

Learning Resources

Text Books	1. Ramesh S.Gaonkar "MicroprocessorArchitecture, Programming and Applications with 8085/8080" Penram International Publishing (India) Private Ltd., Mumbai (2016). 2.Douglas V. Hall "Microprocessors and Interfacing" Tata McGraw Hill Publishing Company Limited, New Delhi (2006). 3. B.Ram "Fundamentals of Microprocessors & Microcomputers" Dhanpat Rai Publications (P) Ltd., New Delhi (2005) 4. , A.P.Godse and D.A.Godse" Microprocessors and Microcontrollers" Technical Publications, Pune (2012).
Reference Books	1. A.Nagoor Kani "Microprocessor and its Applications" RBA Publications, Chennai (1999). 2. Aditya P.Mathur"Introduction to Microprocessors"Tata Mc Graw Hill Publishing Company, New Delhi (2004). 3. Amar K.Ganguly, Anuva Ganguly, "Microprocessors and Microcontrollers 8085,8086 and 8051" Narosa Publishing House, New Delhi. 4. Muhammad Ali Mazidi and Janice Mazidi "The 8051 Microcontroller and Embedded systems" Pearson Education (2000).

	5. Kenneth Ayala "The 8051 Microcontroller" Cengage Learning India Private Limited, New Delhi (2005). 6. A.K. Mukhopadhyay"Microprocessor, Microcomputer and their application"NarosaPublishing House, New Delhi (2012).
Website Link	www.ecb3103 .weebly.com.

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	M	S	S	M	S	M	M	S
CO2	S	M	S	S	M	S	M	S	S	S
CO3	S	M	M	M	S	S	M	M	S	S
CO4	S	S	S	M	S	S	M	S	S	S
CO5	S	M	M	S	M	S	M	M	M	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problems solving sessions on Lagrangian and Hamiltonian Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
A.Mohandass Gandhi	Dr. M. REVATHI	

MUTHAYAMMAL COLLEGE OF ARTS & SCIENCE ★ RASIPURAM 637 408 Tamil Nadu

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M2PPHE02	NANO PHYSICS	DSE - II	II	4	4	-	-	4
Objective	Understand the influence of dimensionality of the object at nanoscale on their properties, size and shape controlled synthesis of Nanomaterials and their future applications in industry.							

Unit	Course Content	Knowledge Levels	Sessions
I	**NANO SCALE SYSTEMS:** Introduction to Nanoscale - Size-Dependent properties - Size effect - Surface tension, wettability - specific surface area and surface area to volume ratio - Reason for change in optical properties, electrical properties and mechanical properties - nanoscale catalysis - Principles of Top-Down and Bottom-Up approaches - Electrical, Optical, Thermal, Mechanical and Magnetic properties of nanoparticles.	K4	9
II	**SYNTHESIS OF NANO STRUCTURE MATERIALS:** Gas phase condensation - Vacuum deposition - Physical vapor deposition (PVD) - Chemical vapor deposition (CVD) - Sol-Gel - Ball milling - spray pyrolysis - plasma based synthesis process (PSP) - hydrothermal synthesis - Etching technologies: wet and dry etching - photolithography - Drawbacks of optical lithography for nanofabrication - electron beam lithography - ion beam lithography - dip-pen nanolithography.	K1-K3	9
III	**QUANTUM DOTS:** Quantum Dots-properties - Excitons and excitonic Bohr radius - difference between nanoparticles and quantum dots - Preparation through colloidal methods - Epitaxial methods- MOCVD and MBE growth of quantum dots - current-voltage characteristics - magneto tunnelling measurements - Absorption and emission spectra of quantum dots - Photo luminescence spectrum.	K1-K3	9
IV	**CHARACTERIZATION:** Nano SEM - Scanning Conducting microscopy (SCM) - High-resolution Transmission Electron Microscopy (HRTEM) - single nanoparticle characterization - Scanning capacitance microscopy - Principle and working of Atomic Force	K1-K4	9

	Microscopy (AFM) and Scanning tunnelling microscopy (STM) - Principle of Transmission Electron Microscopy (TEM) - applications to nanostructures-nano mechanical characterization-nano indentation - Particle size estimation by XRD/SPM/STM/AFM techniques.		
V	**APPLICATIONS OF NANOTECHNOLOGY:** Nano diodes, Nano switches, molecular switches, Nano-logic elements - Single electron transistors - small metallic tunnel junctions - Nanoparticles based solar cells and quantum dots based white LEDs - CNT based transistors- Surface acoustic wave (SAW) devices, microwave MEMS, field emission display devices - Super hard nano composite coatings and applications in tooling - Biochemistry and medical applications: lab-on-a-chip systems. Nano Boat - Nano submarines - DNA engineering.	K1-K3	9
Course Outcome	**CO1:**Recall the Size of nano materials, Principles of Top-Down and Bottom-Up approaches and properties of nanoparticles.	K1	
	CO2: Understand the synthesis of structure of nanomaterials	K2	
	CO3: Apply the Quantum dots and difference between nano particles and quantum dots.	K3	
	CO4: Examine the characterization techniques like XRD, FTIR, EDAX and SEM etc.	K4	
	CO5: Weigh of the application of nanotechnology.	K5	

Learning Resources

Text Books	1. S. Shanmugam,Nanotechnology, TBH Edition. 2.De Jongh J, Kulwer Academic Publishers,Physics and Chemistry of Metal cluster components, Dordrecht, (1994). 3. Enneth J. Klabunde, Nanoscale Materials in Chemistry,KWiley & Sons, Publcn, (2001). 4. Dexler E, Nano Systems, John Wiley, CNY, (1992). 5.Sulabha K.Kulkarni, Nanotechnology: Principles and Practices,Capital Publishing Company.
Reference Books	1. M.A.Shah, Principles of Nanoscience and Nanotechnology, Tokeer Ahmad. 2. S.Chand & Company Limited,Nano Technology, Rakesh Rathi, New Delhi (2009) 3. AIP Press, Springer-Verlag, Gregory Timp Editor, Nanotechnology, New York, (1999). 4.N. John Dinardo, Nanoscale characterization of surfaces & interfaces,Weinheim Cambridge: Wiley-VCH (2000). 5. Engineering and Technology - The Electrical Engineering Handbook Series.Hand Book of Nano Science.

	Book of Nano Science.
Website Link	1.https://nanohub.org/resources/22260/download/NACK_U3_Maeder_Nanoparticles_Nanostructures.pdf 2. https://faculty.uml.edu//zgu/Teaching/documents/Lecture6Synthesis_000.pdf 3.https://www.uobabylon.edu.iq/eprints/publication_5_10604_432.pdf 4.https://www.news-medical.net/life-sciences/Types-of-Electron-Microscopes.aspx

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	S	M	S	S	S	S	S	M	S	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	S	S	S	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Online seminars , group discussion
Teaching and Learning Methods	Class room teaching , PPT, virtual classroom teaching
Assessment Methods	Assignment, unit test, model test

Designed By	Verified By	Approved By
Dr.R.Vijayakumar dor M.	DT. M. REVATHI	

Curriculum Development Cell MCAS (Autonomous) Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PPHE03	ENERGY PHYSICS	DSC THEORY - III	I	6	3	3	-	4
Objective	Energy drives every form of movement. Walking, running, and biking use chemical energy - derived from the food we eat - to fuel our muscles and keep us moving. Trains use either electrical energy, or a combination of thermal and chemical energy, generated from fossil fuels.							

Unit	Course Content	Knowledge Levels	Sessions
I	**Solar - Thermal Conversion :** An overview of thermal application and solar radiation - energy alternatives-devices for thermal collection and storage - thermal applications - Waterheating - Space heating - Power generation - instruments for measuring solar radiation and sun shine. (L-9,T-3 Hours)	K1-K3	12
II	**Performance of Flat-Plate Collectors:** Performance analysis - -Transmissivity of the cover system based on reflection - Refraction - Absorption - Transimissivity for diffuse radiation -Transmissivity - Absorptive product. (L-9,T-3 Hours)	K1,K2	12
III	**Concentrating Collectors and Energy Storage :** General characteristics - Definitions - Methods of classifications - Thermal energy storage - Sensible heat storage - Liquids - Solids - Latent heat storage- Thermal chemical storage (L-9,T-3 Hours)	K1,K3	12
IV	**Photo Conversion :** Photovoltaic conversion - Single crystal silicon cell - Principle and working insular cells - Conversion efficiency - Single crystal silicon - Polycrystalline and amorphous silicon - Cadmium supplied - Cadmium telluride - copper indium sidelined. (L-9,T-3 Hours)	K1-K3	12
V	**Other Forms of Energy :** Wind energy - Recent developments - Energy from biomass - Direct methods- Indirect methods - Wave energy - Vegetation for fuel - Bio-diesel - Plantsfor Bio-diesel- Physical and	K1-K3	12

	chemical properties of Bio-diesel . (L-9,T-3 Hours)		
Course Outcome	CO1: Ability to know the power potential of the sun and its utility.	K1	
	CO2: Understanding the experimental procedure of collecting solar energy.	K2	
	CO3: Analyze various types of storage methods involving.	K3	
	CO4: Applying knowledge to fabricate solar cells for energy storage purpose.	K4	
	CO5: Evaluate other forms of energy which are existing in the nature.	K5	

Learning Resources

Text Books	1. P. Sukhatme, Solar energy (Second edition), Tata McGraw-Hill Publishing Co. Ltd. (New Delhi)
Reference Books	1. G.D.Rai, Solar Energy Utilization, Khanna publishers (New Delhi)
Website Link	1.https://www.energy.gov/science/hep/high-energy-physics 2.https://webzine.web.cern.ch/weblinks.html

CO - PO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	S	S	S
CO2	S	S	M	M	S	S	M	S	S	S
CO3	S	M	S	S	S	S	S	M	S	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	S	S	S	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Online seminars , group discussion
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Dr.M.REVATHI	Dr.M.REVATHI	

Curriculum Development Cell
MCAS
(Autonomous)
Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
21M2PPHE04	ASTRO PHYSICS	DSE - IV	II	4	3	1		4
Objective	Acquire the knowledge on the elements of space dynamics, solar system with their small bodies, universe and its neighbors and life in universe.							

Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**ELEMENTS OF SPACE DYNAMICS:** Man's quest for space - the energy requirements - Rocket propulsion - suborbital flights - Artificial earth satellites - Lunar and planetary probe. **(L-9,T-3 Hours)**	K1-K3	12
II	**THE HEART OF THE SOLAR SYSTEM:** Vital statistics of the Sun - the solar photosphere - the Fraunhoffer lines - structure of solar atmosphere - the solar interior - Sunspots and solar activity - other features of the solar activity - Radio studies of the quiet Sun - Radio radiation of the distributed Sun. **(L-9,T-3 Hours)**	K1-K3	12
III	**SMALL BODIES IN THE SOLAR SYSTEM:** Asteroids - Meteorites - Comets as members of the Solar system - Physical properties of comets - Origin and evolution of comets - Space studies of comets - Meteors - an inventory of satellites - the large satellites - Medium, small and tiny satellites - Planetary rings. **(L-9,T-3 Hours)**	K2-K3	12
IV	**OUR HOME AND THE NEAREST NEIGHBOUR:** **EARTH:** Gross properties - internal structure - the terrestrial atmosphere - the Earth's magnetic field - motions - Solar terrestrial relations - the Earth in space - atmospheric circulation in the troposphere. **MOON :** Some basic facts - telescopic studies - internal structure - surface features - Origin of the Moon - the lunar environment - Solar and Lunar eclipses. **(L-9,T-3 Hours)**	K2 - K4	12

V	**LIFE IN THE UNIVERSE:** Nature of life on Earth - A survey of objects in the Solar System - Pre Mariner search for life on Mars - Post Mariner search for life on Mars - Life outside the Solar system - the search for life in the Universe. **(L-9,T-3 Hours)**	K3 - K5	12
Course Outcome	**CO1:**The students are expected to understand the fundamentals, principles, physical concepts and recent developments in the Astrophysics area.	K1	
	CO2: The practical course is framed in relevance with the theory courses to improve the understanding of the various concepts in Astrophysics.	K2	
	CO3: Design and perform experiments in the laboratories to demonstrate the concepts, principles and theories of Astrophysics learned in the classroom.	K3	
	CO4: Perform job in various fields' like space science, engineering and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought, expression, and systematic approach.	K4	
	CO5: To develop the power of appreciations, the achievements in Astrophysics and role in nature and society.	K5	
Learning Resources			
Text Books	1.KD Abhyankar, Astrophysics of the Solar System ,University Press Pvt. Ltd. Hyderabad, 1999.		
Reference Books	1. Lectures on Astronomy, Astrophysics, And Cosmology, Luis A.Anchordoqu 2. Astrophysics of the Solar System, K.D.Abhayankar 3. Astrophysics of the Sun,Harold Zirin.		
Website Link	1. https://nptel.ac.in/courses/115/105/115105046/ 2. http://www.nptelvideos.in/2012/12/astrophysics-cosmology.html 3. https://onlinecourses.swayam2.ac.in/arp19_ap73/preview		

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	S	S	S
CO2	S	M	S	S	S	M	S	M	S	M
CO3	S	S	M	S	S	S	S	M	S	S
CO4	S	M	M	M	M	S	M	M	M	S
CO5	M	S	M	S	S	S	M	L	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignments , Unit test conducting, Model test conducting

Designed By	Verified By	Approved By
M.SARNAYA	Dr.M.REVATHI	

Curriculum Development Cell
MCAS
(Autonomous)
Rasipuram

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards

Course Code	Course Title	Course Type	Sem	Hours	L	TP	P	C
21M3PPHE05	CRYSTAL GROWTH AND THIN FILMS	DSE - III	III	6	3	3	-	4

Objective	To introduce the knowledge of crystal growth and know the basic ideas of thin films.

Unit	Course Content	Knowledge Levels	Sessions
I	**NUCLEATION AND GROWTH :** Nucleation -Classical theory of nucleation - Spherical and cylindrical nucleus - Growth Kinetics - Singular and rough faces- Models on surface roughness- Kossel, Stranski, Volmer (KSV) theory- Burton, Cabrera, Frank (BCF) theory. (L-9,T-3 Hours)	K1-K3	12
II	**LOW TEMPERATURE GROWTH TECHNIQUES:** Solution Growth Technique: Solution - Solubility and super solubility - Expression of super saturation - Mier's T-C diagram - Constant temperature bath and crystallizer - Seed preparation and mounting - Slow cooling and solvent evaporation methods. **Gel Growth Technique:** Principle - Various types - Structure of gel - Importance of gel - Experimental procedure-Chemical reaction method - Single and double diffusion method - Chemical reduction method - Complex and decomplexion method - Advantages of gel method. (L-9,T-3 Hours)	K3-K4	12
III	**MELT AND VAPOUR GROWTH TECHNIQUES:** Melt Growth: Bridgman technique - Basic process - Various crucibles design - Thermal consideration - Vertical Bridgman technique - Czochralski technique - Experimental arrangement - Growth process. **Vapour Growth:** Physical vapour deposition - Chemical vapour deposition (CVD) - Chemical Vapour Transport. (L-9,T-3 Hours)	K3-K4	12
IV	THIN FILM DEPOSITION TECHNIQUES Introduction- Thin film growth stages- Application of thin films- Properties of thin films - Deposition techniques - Physical methods- Chemical methods- Resistive heating, Electron beam gun, Laser gun evaporation and flash evaporations, sputtering - Reactive Sputtering, Radio-	K3-K4	12

	Frequency sputtering - Chemical methods - Spray pyrolysis - Preparation of TCO tin oxide thin films . (L-9,T-3 Hours)		
V	CHARACTERIZATION TECHNIQUES X - Ray Diffraction (XRD) - Powder and single crystal - Fourier Transform Infra Red Analysis(FT-IR) - Elemental analysis - Elemental Dispersive X-ray Analysis (EDAX) - Scanning Electron Microscopy (SEM) - UV-Vis-NIR Spectrometer - Etching (Chemical) - Vicker's micro hardness. (L-9,T-3 Hours)	K5	12
Course Outcome	**CO1:** Remember the Nucleation growth.	K1	
	CO2: Understand laboratory technique of growing crystal.	K2	
	CO3: Analyze the High level technique of melt growth	K3	
	CO4: Acquire adequate knowledge of thin flim & crystal growth preparation and characterization.	K4	
	CO5: Develop various thin film based devices.	K5	

Text Books	1.J.C. Brice"Crystal Growth Processes" John Wiley and Sons, New York
Reference Books	1. Smith Donald. L"Thin Film Deposition" McGraw Hill, London ., 2. A. Goswami "Thin film fundamentals" New Age International Pub.,
Website Link	1.https://acadpubl.eu/hub/2018-119-12/articles/2/489 2.https://youtu.be/VSz_eKdGz88 http://nptel.ac.in 3.http://www.infocobuild.com/education/audio-video-courses/materials-science/FundamentalsOfMaterialProcessing2-IIT-Kanpur/lecture-38.html

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	M	S	S	S
CO2	S	S	M	M	S	S	S	M	S	S
CO3	S	S	M	S	S	S	S	M	S	S
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	S	S	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	1. Assignments. 2. Seminars 3. Group discussion
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assesment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
V.Satheeshkumar	Dr. M. REVATHI	

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M3PPHE06	Laser Physics & Non-Linear Optics	DSC THEORY - VI	III	5	4	1	-	4
Objective	Lasers have many uses. They are used in precision tools and can cut through diamonds or thick metal. They can also be designed to help in delicate surgeries. Lasers are used for **recording and retrieving information.**							

Unit	Course Content	Knowledge Levels	Sessions
I	**LASERS-FUNDAMENTALS AND TYPES** Basic Construction and Principle of Lasing-Einstein Relations and Gain Coefficient - Creation of a Population Inversion - Three-Level System - Four-Level System - Threshold Gain Coefficient for Lasing-Laser Types - He-Ne Laser - CO2 Laser - Nd:YAG Laser- Semiconductor Laser. (L-9,T-3 Hours)	K1-K3	12
II	**LASER OPERATION** Optical Resonator - Laser Modes - Axial modes - Transverse Modes - Modification in Basic Laser Structure - Basic Principle of Mode Locking - Active Mode Locking - Passive Mode Locking - Q switching - Pulse Shaping. (L-9,T-3 Hours)	K1-K2	12
III	**LASER BEAM CHARACTERISTICS** Wavelength - Coherence - Mode and Beam Diameter - Polarizations - Introduction to Gaussian Beam width - Divergence - Radius of Curvature - Rayleigh Range - Gouy Phase Shift - 3-D Gaussian Beams - ABCD Law for Gaussian Beam - Complex Radius of Curvature- Tensorial ABCD Law. (L-9,T-3 Hours)	K1-K3	12
IV	**FOCUSING OF LASER BEAM** Diffraction - Limited spot size - M2 Concept of Beam Quality - Spherical Aberration - Thermal Lensing Effects - Depth of Focus - Tight focusing of laser beam - Angular Spectrum Representation of Optical near Field - Aplanatic Lens - Focusing of Higher - order laser modes - Radially Polarized Doughnut Mode - Azimuthally Polarized Doughnut mode. (L-9,T-3 Hours)	K1-K4	12

V	**NON-LINEAR OPTICS** Introduction - Nonlinear Optical Media - The Nonlinear Wave Equation - Scattering Theory Born Approximation - Second-order Nonlinear Optics-Second - Harmonic Generation (SHG) and Rectification - Electro-Optic Effect - Three Wave Mixing - Frequency and Phase Matching - Third Harmonic Generation-Optical Kerr Effect - Self-Focusing - Four-Wave Mixing (FWM) - Optical Phase Conjugation (OPC) - Use of Phase Conjugates in Wave Restoration. (L-9,T-3 Hours)	K1-K3	12
Course Outcome	CO1: Remember if some characteristics of laser emission are needed for a specific application.	K1	
	CO2: Understand the parameters of a laser for a specific application	K2	
	CO3: Apply the mechanism to generate pulses for a specific application	K3	
	CO4: Analyze the different parts of a laser.	K4	
	CO5: Evaluate the non linear optics	K5	

Learning Resources

Text Books	1. Nonlinear Optics - D.L. Mills - Basic Concepts, Springer, Berlin (1998). 2. Lasers and Nonlinear Optics - B.B. Laud, New Age International (P) Ltd., New Delhi (2011).
Reference Books	1. An introduction to Laser Spectroscopy, David L.Andrews and Andrey A.Demidov, Springer (India) Private Limited, New Delhi. 2. Nano Materials: Processing and Characterization with Lasers - Subhash Chandra Singh, Haibo Zeng, Chunlei Guo (2012). 3. Principles of Nano Optics - L. Novotny and B. Hecht-Cambridge University Press (2006).
Website Link	1. http://www.drps.ed.ac.uk/13-14/dpt/cxphys11044.htm 2. https://www.kth.se/student/kurser/kurs/SK2411?l=en

CO -CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	L	M	S	S	M	M	S	S	M
CO2	M	S	L	M	S	M	S	M	S	M
CO3	M	S	M	S	S	S	L	M	S	M
CO4	L	M	S	M	S	M	M	M	S	L
CO5	M	S	S	S	S	M	S	M	S	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Discussing One Marks & open book problem solving session, Group Discussion, Interactions, Kahooot, Moodle cloud and Google class room.
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
M.SARANYA	Dr.M.REVATHI	

Curriculum Development
MCAS
Autonomous
Rasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PPHE07	NANOMATERIAL SYNTHESIS AND ANALYTICAL INSTRUMENTATION	ELECTIVE - IV	IV	4	3	1	-	4
Objective	Nanotechnology can be used to design pharmaceuticals that can target specific organs or cells in the body such as cancer cells, and enhance the effectiveness of therapy. Nanomaterials can also be added to cement, cloth and other materials to make them stronger and yet lighter.							
Unit	Course Content						Knowledge Levels	Sessions
I	BASIC CONCEPTS AND PRIME MATERIALS IN NANOTECHNOLOGY Basics of atoms and molecules - Material structure and properties - Materials at Nano-scale - quantum confinement in Nano-materials - Particle size versus Surface area -Semiconductor Nano-materials - Ceramic Nano-materials - Polymer and composites-Metal Nano-particles - Biomaterials.						K1- K2	12
II	NANO FABRICATION Introduction to Nano-particle synthesis - Top down approach: Arc discharge method - Laser ablation - Ball milling - Inert gas condensation - Bottom up approach: Homogeneous nucleation - Chemical vapour deposition (CVD) - Molecular beam epitaxy (MBE) - Sol-Gel process- Hydrothermal synthesis - Microwave method.						K1- K2	12
III	STRUCTURAL CHARACTERIZATION TECHNIQUES Powder and single crystal X-Ray diffraction (XRD) - Particle size estimation by XRD analysis - Fourier transform infrared (FTIR) analysis - Raman spectroscopy - Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) - Energy dispersive x-ray analysis (EDAX) - Scanning tunneling microscopy (STM).						K1- K3	13
IV	PHYSICAL AND OPTICAL CHARACTERIZATION TECHNIQUES Auger Vickers micro hardness - AFM - Hall effect - Auger emission spectroscopy - SIMS - UV-Vis absorption spectrometer - UV-Vis-NIR spectrometer - Photoluminescence spectrometer - X-ray photoelectron spectroscopy - Dynamic light scattering.						K1- K3	10
V	APPLICATIONS OF NANOTECHNOLOGY Medical: applications in Forensics, Image guidance, Cancer and gene therapy, Drug delivery, cosmetics - Electronic applications: Nano diodes, Nano switches, molecular switches, Nano-logic elements - Single electron transistors - Computing applications - Chemical applications - Agriculture and food applications						K1- K5	14

Course Outcome	CO1: To understand the basic science concepts behind the strcture and properties of matter at Nano scale				K2	
	CO2: To give deep insite into the fabrication methods of nanomaterials				K2	
	CO3: Introduce different structural characterization techniques applicable for nanomaterials				K3	
	CO4: To understand physical and optical characterizations techniques of nanomaterials				K3	
	CO5: Awareness about the applications of Nanotechnolgy in various fields of science				K5	
Learning Resources						
Text Books	1. M.A. Shah, K.A. Shah, "**Nanotechnology the science of small**", Wiley india Pvt. Ltd., 2013 (Unit 1 to 5).					
Reference Books	1. Sulabha K.Kulkarni, "**Nanotechnology: Principles and Practices**", Capital Publishing Company. 2. Rakesh Rathi,"**Nano Technology**", S.Chand & Company Limited, New Delhi, 2009. 3. N. John Dinardo, "**Nanoscale characterization of surfaces & interfaces**", Weinheim Cambridge: Wiley-VCH, 2000.					
Website Link	1. https://iopscience.iop.org/book/mono/978-1-64327-644-1 2. https://www.researchgate.net/publication/287350185_Experimental_techniques_for_structural_characterization					
	L-Lecture	T-Tutorial	P-Practical		C-Credit	

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	M	S	M	M	S	S	S	S	M
CO2	M	S	M	M	M	L	M	M	M	M
CO3	L	M	L	S	M	S	M	M	L	L
CO4	M	L	S	S	S	M	S	M	S	M
CO5	M	M	L	M	S	M	S	S	M	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Problems solving sessions on GAMMA-FUNCTIONS Open- book problem solving session
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
Dr.R.VIJAYAKUMAR	Dr.M.REVATHI	

Curriculum Development Cell MCAS Autonomous Nasipuram

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M4PPHE08	Modern Optics and Imaging	DSE - IV	IV	5	3	2	-	4
Objective	To determine how well the system resolves the two point objects and the most important imaging component in an optical microscope, and also the most complex.							

Unit	Course Content	Knowledge Levels	Sessions
I	**WAVE NATURE AND LIGHT PROPAGATION :** Electromagnetic wave propagation, Harmonic waves, phase velocity, group velocity, energy flow - Poynting vector - Wave motion - equation - superposition of waves, interference, diffraction, basics of coherence theory, temporal and spatial coherence - Multi-wave interference - Michelson and Fabry-Perot interferometer - Scattering and polarization - types. (L-9,T-3 Hours)	K1-K3	12
II	**OPTICAL ENGINEERING AND NON-LINEAR OPTICS:** Image formation (first-order optics), aberrations, prisms and mirrors, stops and apertures, basic optical devices, the design of optical systems: general, aplanatic points, solid immersion lens, numerical aperture increasing lens. Fourier optics - Thin lens as phase transformation - Thickness function -Various types of lenses. **Non-linear Optics:** Principle - Nonlinear wave equation - second harmonic generation - phase matching - frequency conversion-electro optic effect-Solution. (L-9,T-3 Hours)	K2-K4	12
III	**FIBER OPTICS COMMUNICATION & OPTICAL FIBER SENSORS:** Evolution of fiber optic systems - optic fiber transmission link - optic fiber modes and configurations - fiber types - single mode fibers - graded index fiber - Fiber materials - Fiber fabrication - Fiber optic cables-LED and lasers source - Transmitter modulator - Modulation of an LED - Laser Diodes - Laser diode Rate Equations - Modulation of Laser diodes - Temperature effects - acousto-optic, electro optic	K1,K2	12

	modulator - AM, FM, DCM modulation - detection and demodulation radiation detection. **Optical Fiber Sensors:** General features, types of OFS, intrinsic and extrinsic sensors, intensity sensors, temperature and pressure measurements - reflective OFS and applications. (L-9,T-3 Hours)		
IV	**HOLOGRAPHY & PHOTO DETECTORS :** Basic Principles of Holography - Recording of amplitude and phase-recording medium - Reconstruction of original wave front-Image formation by wave front reconstruction- Gabor Hologram- Limitations of Gabor Hologram-Off axis Hologram. **Photo Detectors:** Physical principles of Photodiodes-Pin Photo Detector-Avalanche Photodiodes - Photodetector Noise - Comparison of Photo Detectors. (L-9,T-3 Hours)	K1-K3	12
V	**OPTICAL MICROSCOPY & IMAGING TECHNIQUES:** Basics of Optical Microscopy, bright field and dark field microscopy, polarizing microscopy, phase contrast microscopy, fluorescence microscopy, light sheet fluorescence microscopy, nonlinear optical microscopy, two photon fluorescence microscopy. (L-9,T-3 Hours)	K1,K4	12
Course Outcome	**CO1:** The student shall recall the knowledge about and be able to explain concepts such as numerical aperture, F-number, spatial resolution and image quality for optical systems that originates from diffraction.	K1	
	CO2: The student shall understand how the polarization of light changes at reflection and transmission at interfacesThe student shall know the conditions for near and far-field diffraction and be able to calculate the far-field diffraction from gratings and simple aperture functions.	K2	
	CO3: The student will apply an introduction to the discipline of optics and its role in the modern society.	K3	
	CO4: The student will be able to analyze typical optical imaging systems, with emphasis on the human eye, the camera, the telescope and the microscope.	K4	
	CO5: The evaluate geometrical approximation, including Guass thin lens formula, Fermat's and Huygen's principles, and the paraxial matrix formalism for refractive and reflective surfaces.	K5	

Learning Resources	
Text Books	1. Fundamental Optics - Francis Jerkins and Harvey White, McGraw Hill Inc., New Delhi, (2011). 2. Modern Optical Engineering - W.J. Smith, McGraw-Hill, (2000). 3. Lasers and Non-Linear optics - B.B. Laud, Wiley, (1992). 4. Introduction to Optical Microscopy - J. Mertz, Roberts & Company Publishers, (2010). 5. Introduction to Optics - F.L. Pedrotti and L.S.Pedrotti, Prentice Hall International, Wilmington, (2006).
Reference Books	1. Principles of Optical Electronics, A.Yariv, John Wiley, New York, (1984). 2. Physics of Optoelectronics, Michael A.Parker, CRC Press, (2005). 3. Optoelectronic Devices, Optical Fiber Communications & Fiber Optic Metrology, Amar K.Ganguly, Books and Allied (P) Ltd., Kolkata (2007). 4. Physical Optics and Lasers, D.N.Tripathi, R.B.Singh, Kedar Nath and Ram Nath Co., Meerut (2018) 5. Optical Fiber Communications, John M.Senior, Pearson Education Ltd., New Delhi (2008)
Website Link	1.https://www.fulviofrisone.com/attachments/article/404/Fundamentals%20of%20Optics_0072561912.pdf 2.https://shijuinpallotti.files.wordpress.com/2019/07/optical-fiber-communications-principles-and-pr.pdf

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	M	S	S	S
CO2	S	S	M	M	S	S	S	M	S	S
CO3	S	S	M	S	S	S	S	M	S	S
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	S	S	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	1. Assignments. 2. Seminars 3. Group discussion
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test, model test, end semester examination

Designed By	Verified By	Approved By
Dr.M.REVATHI	Dr.M.REVATHI	

Curriculum Development Cell
MCAS
(Autonomous)
Rasipuram

List of Extra Disciplinary Course(GEC) Details
SYLLABUS - LOCF-CBCS Pattern
EFFECTIVE FROM THE ACADEMIC YEAR 2021-2022 Onwards

S.NO	SEM	SUB_CODE	TITLE OF THE SUBJECT
1	II	21M1PPHED1	Electronic Appliances
2	II	21M1PPHED2	Laser and Nano Optics

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PPHED1	ELECTRONIC APPLIANCES	GEC - EDC - I	II	4	4	-	-	4
Objective	Electronic devices are components for controlling the flow of electrical currents for the purpose of information processing and system control. Prominent examples include transistors and diodes. Electronic devices are usually small and can be grouped together into packages called integrated circuits.							

Unit	Course Content	Knowledge Levels	Sessions
I	**ELECTRONIC COMPONENTS :** Components - Resistors - Condensers - Resistance Value - Capacitor Value - Diodes - transistors - IC's - Transformers and their classification. (L-9,T-3 Hours)	K1-K3	12
II	**ELECTRICAL APPLIANCES** Electrical Bulbs - Florescent Lamps - Inverter - Basic of UPS - Stabilizers - Voltage regulators - Iron Box - Heaters - Electrical Oven - Wet Grinder - Mixer - Refrigerators - Air Conditioners - Freezers - Washing Machines. (L-9,T-3 Hours)	K1	12
III	**ELECTRONIC APPLIANCES** Basics of Radio - TV - CD Players - LCD Projectors - Digital Camera - Scanners - Video Conferencing. (L-9,T-3 Hours)	K2,K3	12
IV	**COMPUTERS** Block diagram of a Computer - Input Device - Memory Device - Control Unit - Arithmetic logic unit - Output device - Microprocessor - RAM - ROM. (L-9,T-3 Hours)	K4	12
V	**COMMUNICATION ELECTRONICS** Basics of Telephones - Mobile Phones - Wireless Phones - Antenna - Internet - Satellites. (L-9,T-3 Hours)	K1-K3	12
Course Outcome	**CO1:** Remember basic electrical DC concepts and theorems to analyze circuits.	K1	
	CO2: Understand the Build and simulate electrical DC circuits and perform measurements with electronic test	K2	

	equipment.		
	CO3: Apply to teach the physics behind electronic device operations and also prepare students for advanced courses in solid state and quantum electronics.	K3	
	CO4: Analyze the intended to increase knowledge gained in undergraduate level courses in electronic devices.	K4	
	CO5: Evaluate the Student will gain knowledge digital electronics. CO5 :Student will gain knowledge on electronic systems.	K5	
Learning Resources			
Text Books	1. S. S. Kamble, Electronics & Mathematical Data Book, Allied Publishers Ltd., (1997).		
Reference Books	1. William David Cooper, Electronic Instrumentation and Measurement Technique, Second Edition, Prentice Hall, New Delhi (2007).		
Website Link	1.https://www.vijaysales.com/ 2.https://viveks.com/		

CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	M	S	S	S
CO2	S	S	M	M	S	S	S	M	S	S
CO3	S	S	M	S	S	S	S	M	S	S
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	S	S	M	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
P.Tamizharasu	Dr.M.REVATHI	

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2021-2022 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
21M1PPHED2	Laser and Nano Optics	GEC THEORY - II	II	4	4	-	-	4
Objective	Lasers have many uses. They are used in precision tools and can cut through diamonds or thick metal. They can also be designed to help in delicate surgeries. Lasers are used for **recording and retrieving information.**							

Unit	Course Content	Knowledge Levels	Sessions
I	**LASERS-FUNDAMENTALS AND TYPES** Basic Construction and Principle of Lasing-Einstein Relations and Gain Coefficient - Creation of a Population Inversion - Three-Level System - Four-Level System - Threshold Gain Coefficient for Lasing-Laser Types - He-Ne Laser - CO2 Laser - Nd:YAG Laser- Semiconductor Laser. (L-9,T-3 Hours)	K1-K3	12
II	**LASER OPERATION** Optical Resonator - Laser Modes - Axial modes - Transverse Modes - Modification in Basic Laser Structure - Basic Principle of Mode Locking - Active Mode Locking - Passive Mode Locking - Q switching - Pulse Shaping. (L-9,T-3 Hours)	K1-K2	12
III	**LASER BEAM CHARACTERISTICS** Wavelength - Coherence - Mode and Beam Diameter - Polarizations - Introduction to Gaussian Beam width - Divergence - Radius of Curvature - Rayleigh Range - Gouy Phase Shift - 3-D Gaussian Beams - ABCD Law for Gaussian Beam - Complex Radius of Curvature- Tensorial ABCD Law. (L-9,T-3 Hours)	K1-K3	12
IV	**FOCUSING OF LASER BEAM** Diffraction - Limited spot size - M2 Concept of Beam Quality - Spherical Aberration - Thermal Lensing Effects - Depth of Focus - Tight focusing of laser beam - Angular Spectrum Representation of Optical near Field - Aplanatic Lens - Focusing of Higher - order laser modes - Radially Polarized Doughnut Mode - Azimuthally Polarized Doughnut mode. (L-9,T-3 Hours)	K1-K4	12

V	**NANO OPTICS:** Nano SEM - Scanning Conducting microscopy (SCM) - High-resolution Transmission Electron Microscopy (HRTEM) - single nanoparticle characterization - Scanning capacitance microscopy - Principle and working of Atomic Force Microscopy (AFM) and Scanning tunnelling microscopy (STM). Optical activity - Specific Rotation - Laurents half shade polarimeter - Optical rotation by magnetic and electric fields. (L-9,T-3 Hours)	K1-K3	12
Course Outcome	**CO1:** Remember if some characteristics of laser emission are needed for a specific application.	K1	
	CO2: Understand the parameters of a laser for a specific application	K2	
	CO3: Apply the mechanism to generate pulses for a specific application	K3	
	CO4: Analyze the different parts of a laser.	K4	
	CO5: Evaluate the non linear optics	K5	
Learning Resources			
Text Books	1. Nonlinear Optics - D.L. Mills - Basic Concepts, Springer, Berlin (1998). 2. Lasers and Nonlinear Optics - B.B. Laud, New Age International (P) Ltd., New Delhi (2011).		
Reference Books	1. An introduction to Laser Spectroscopy, David L.Andrews and Andrey A.Demidov, Springer (India) Private Limited, New Delhi. 2. Nano Materials: Processing and Characterization with Lasers - Subhash Chandra Singh, Haibo Zeng, Chunlei Guo (2012). 3. Principles of Nano Optics - L. Novotny and B. Hecht-Cambridge University Press (2006).		
Website Link	1. http://www.drps.ed.ac.uk/13-14/dpt/cxphys11044.htm 2. https://www.kth.se/student/kurser/kurs/SK2411?l=en		

CO -CO Mapping

CO NUMBER	PO1	PO2	PO3	PO4	PO5	PS01	PS02	PSO3	PSO4	PSO5
CO1	M	L	M	S	S	M	M	S	S	M
CO2	M	S	L	M	S	M	S	M	S	M
CO3	M	S	M	S	S	S	L	M	S	M
CO4	L	M	S	M	S	M	M	M	S	L
CO5	M	S	S	S	S	M	S	M	S	M
Level of Correlation between CO and PO	L-LOW		M-MEDIUM		S-STRONG					

Tutorial Schedule	Discussing One Marks & open book problem solving session, Group Discussion, Interactions, Kahooot, Moodle cloud and Google class room.
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, unit test conducting, model test conducting, Experimentally demonstrate

Designed By	Verified By	Approved By
P.THAMIZHARASU	Dr.M.REVATHI	

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