CAUVERY COLLEGE FOR WOMEN
(AUTONOMOUS)
Nationally Accredited With "A" Grade By NAAC
ISO 9001:2015 Certified
TIRUCHIRAPPALLI – 18

PG & RESEARCH DEPARTMENT OF PHYSICS

M.Sc., PHYSICS SYLLABUS
2022-2023 and Onwards

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)

M.SC PHYSICS PROGRAMME STRUCTURE UNDER CHOICE BASED CREDIT SYSTEM

(For the candidates admitted from the academic year 2022-2023)

Sem	Course	Course Title	Course Code	Ins Hrs / Week	Credit	Exam Hrs	Marks		Total
							Int	Ext	
I	Core course - I	Mathematical Physics	22PPH1CC1	6	4	3	25	75	100
	Core course - II	Classical Dynamics and Relativity	22PPH1CC2	5	4	3	25	75	100
	Core course - III	Quantum Mechanics - I	22PPH1CC3	6	4	3	25	75	100
	Elective Course - I	Microprocessor and Microcontroller	22PPH1EC1A	5	4	3	25	75	100
		Non- Destructive Evaluation Techniques	22PPH1EC1B						
		Astrophysics	22PPH1EC1C						
	Core Practical - I	Physics Practical - I (General and Electronics)	22PPH1CC1P	8	4	3	40	60	100
			TOTAL	30	20	-	-	-	500

CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS), TRICHY-18.
PG AND RESEARCH DEPARTMENT OF PHYSICS

VISION

To establish a substratum for excellence and creation of knowledge by igniting the essence of learning physics and exploring its area of research with novel ideas.

MISSION

Our mission is two – fold.

- To provide an outstanding and distinctive education to our undergraduate and postgraduate students.
- To expand our research enterprises via centers and institutes to achieve national and international prominence in strategic research areas.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest qualitystandards and train the students to be effective leaders in their chosenfields.
PEO2	**ACADEMIC EXCELLENCE** To provide a conducive environment to unleash their hidden talents andto nurture the spirit of critical thinking and encourage them to achieve their goal.
PEO3	**EMPLOYABILITY** To equip students with the required skills in order to adapt to thechanging global scenario and gain access to versatile career opportunities in multidisciplinary domains.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
PEO5	**GREEN SUSTAINABILITY** To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

PROGRAMME OUTCOMES FOR M.Sc PHYSICS PROGRAMME

PO NO.	Programme Outcome On completion of M.Sc Physics Programme, The students will be able to
PO1:	**Problem Analysis :** Provide opportunities to develop innovative design skills, including the ability to formulate problems, to think creatively, to synthesize information, and to communicate effectively.
PO2:	**Scientific Skills:** Create and apply advanced techniques and tools to solve the societal environmental issues.
PO3:	**Environment and sustainability:** Ascertain eco- friendly approach for sustainable development and inculcate scientific temper in the society.
PO4:.	**Ethics:** Imbibe ethical and social values aiming towards holistic development of learners.
PO5	**Life long learning:** Instil critical thinking, communication, initiative which potentially leads to higher rates of employment and educational fulfillment.

PROGRAMME SPECIFIC OUTCOME FOR M.Sc PHYSICS PROGRAMME
M.Sc PHYSICS CURRICULUM (2022-2023 onwards)

PSO NO.	Programme Specific Outcomes Students of M.Sc Physics will be able to	POs Addressed
PSO1	Demonstrate proficiency in the mathematical concepts needed for a proper understanding of Physics	**PO1,PO2, PO5**
PSO2	Understand 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.	**PO2, PO5**
PSO3	Learn numerous numerical problem-solving approaches and the fundamentals of curve fittings.	**PO1, PO2**
PSO4	Learn about microprocessors and microcontrollers, as well as practical microprocessor programming abilities	**PO1, PO2**
PSO5	Provide students with broad theoretical and practical knowledge in all specialization of Physics with required qualitative and quantitative techniques.	**PO1, PO2 PO5**
PSO6	Pursue research in the relevant areas of nano science , crystal growth spectroscopy and thinfilm Physics with the application of Materials characterization at the universities and academic institution	**PO3, PO4**

Semester -I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
22PPH1CC1	MATHEMATICAL PHYSICS	CC - I	6	4

Course Objectives

- To provide a strong mathematical foundation in vector calculus, matrices and differential equations
- To learn complex variables and residue theorem technique to solve real integrals appearing in physics problems
- To understand basics of Fourier Transform and Laplace Transform.
- To demonstrate competence with the basic ideas of linear algebra including concepts of linear systems, theory of matrices,eigenvalues, eigenvectors and diagonalization.
- To enhance problem solving skills and to give the ability to formulate, interpret and draw inferences from the mathematical solutions.

Pre-requisites

- Strong Foundation of vector Analysis.
- Understand and appreciate the properties of complex variable.
- Commendable knowledge of special functions to apply physics problems.

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO 1	Remember and Understand the various mathematical concepts used in physics.	K1, K2
CO 2	Analyze mathematical tools like vector, matrix, group theory, complex integration, Fourier and Laplace series, special function will prepare the student to solve ODE; PDE's which model physical phenomena.	K3
CO 3	Evaluate the vector, linear, simultaneous and differential equations which will be necessary to pursue other areas in physics.	K4
CO 4	Apply mathematical methods to predict the problems in classical physics, statistical physics and quantum mechanics as well as electrodynamics.	K5
CO 5	Solve the physical problems using mathematical techniques.	K6

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	1	2	1	1	3	3	2	2	2
CO 2	3	1	1	1	1	3	1	2	2	2
CO 3	3	1	1	1	1	3	3	1	2	2
CO 4	3	1	3	1	1	1	3	2	2	2
CO 5	3	1	2	1	1	3	3	2	3	1

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation;

"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT -I **(18 HOURS)**

Vector Analysis : Vector integration – Line integral– Surface integral – Flux – Volume integral – Green's theorem – Stokes' theorem – Divergence theorem – Orthogonal curvilinear coordinates – Unit vectors in curvilinear coordinate system – The gradient, divergence, curl and Laplacian in cylindrical and spherical polar coordinates.

UNIT-II **(18 HOURS)**

Matrix and Group theory: Characteristic equation of a matrix – Matrix algebra – Rank of a Matrix – System of linear equations –Types of matrix – Inverse of a matrix – Eigenvalues and eigenvectors – Cayley–Hamilton theorem – Reduction of a matrix to diagonal form – Jacobi method.

Introduction to Group Theory – Group Multiplication Table – Cyclic Group – Subgroup – Cosets – Classes – Invariant Subgroup – Homomorphism and Isomorphism – Reducible and Irreducible Representation – Formation of character table of C_{2v}– SU(2) and SO(3)

UNIT-III **(18 HOURS)**

ComplexVariables: Complex functions and variables – Condition for a function to be analytic– Complex integration – Cauchy's theorem – Taylor expansion – Laurent series – Cauchy's residue theorem – Computations of residue – Evaluation of integrals using residues.

UNIT-IV **(18 HOURS)**

Fourier and Laplace's Integral Transforms: Fourier's Transform– Infinite Fourier Sine and Cosine Transforms– Properties of Fourier's Theorem– Finite Fourier sine and cosine transforms.

Laplace transforms– Properties of Laplace Transforms – Evaluation of Laplace Transforms -Inverse Laplace Transform-Convolution Theorem– Evaluation of Inverse Laplace Transform using Differential Equations.

UNIT-V **(18 HOURS)**

Special Function's : Solution of Differential Equations – Legendre, Hermite and Bessel Differential Equations using Power Series method – Generating Function, Rodrigues Formula, *R*ecurrence relation, Orthogonality relations.

UNIT-VI: Self-Study for Enrichment **(Not included for End Semester Examinations):**

Exact differential –Sylvester's theorem–Formation of character table of C_{3v}– Elementary ideas in Lie Groups and Lie Algebras –Cauchy's integral formula– Simple applications of Fourier Transforms– Laguerre differential equation .

Text Books

1. Gupta.B.D., (2015). *Mathematical Physics*. (2nd Edition)Vikas Publishing House, Mumbai.

2. Satya Prakash., (2014). *Mathematical Physics*.(1st Edition) Sultan chand & sons, Newdelhi.

3. Sexena.A.K., (2015). *Mathematical Physics*.(1st Edition) Narosa Pub, Newdelhi.

4. Joshi.A.W., (2006). *Matrices and Tensors in Physics*. (4th Edition)New Age, Newdelhi.

5. MurraySpiegel., (2009). *Schaum Series of Complex.* (2nd Edition) *Analysis* .McGraw-Hill, Newyork.

6. Balakrishnan.V., (2018). *Mathematical Physics with Applications*. Indian Academy of Science, Bangalore.

Reference Books

1. Dass, H.K., &RamaVerma., (2018).*Mathematical Physics*.(1st Edition) S.Chand & Co, New Delhi.

2. Pipes, L.A.,&Harvill,L.R., (1970).*Mathematical Physics for Engineering*.(3rd Edition) McGraw-Hill, Newyork.

Web References

1. https://nptel.ac.in/courses/115/106/115106086/
2. https://nptel.ac.in/courses/115/103/115103036/
3. https://www.classcentral.com/course/swayam-mathematical-methods-in-physics-1-23045

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation, Group discussion and Quiz

Course Designer

Dr.R.Gayathri

Semester - I	Internal Marks : 25	External Marks : 75		
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PPH1CC2	**CLASSICAL DYNAMICS AND RELATIVITY**	**CC – II**	**5**	**4**

Course Objectives

- To acquire Basic Knowledge about Lagrangian formulation
- To expose the students to the fundamentals of Hamiltonian equation.
- To demonstrate knowledge and understanding of the fundamental concepts of Rigid body dynamics
- To acquire knowledge of real time problems in macroscopic view and applying it to the microscopic level
- To develop critical thinking and problem solving skills
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Pre-requisites

- Knowledge about Lagrange's equation
- Knowledge about Motion under a central force
- Fundamental knowledge of physical concepts , mathematical methods of classical mechanics

Course Outcome and Cognitive Level Mapping:

CO Number	CO Statement On the successful completion of course, the student will be able to	Cognitive Level
CO 1	Remember and Understand the primary idea and principle governing the concept of tensor as well as the discrete and continuous mechanical systems related concepts in classical mechanics.	K1,K2
CO 2	Analyze the constraints on mechanical systems and Interpret the importance of concepts such as generalized coordinates.	K3
CO 3	Evaluate the ideas of rigid body dynamics and kinematics as well as the central force acting on the objects.	K4
CO 4	Apply the Lagrangian and Hamiltonian formulation of classical mechanics, poisson brackets and canonical transformations are used in order to simplify the methods to be used in solving physics problems.	K5
CO 5	Create conclusions about classical dynamics, including matrix generalization and special relativity.	K6

Mapping of CO with PO and PSO

COs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	3	3	2	1	3	3	2	2	2	2
CO 2	3	3	2	1	3	3	2	2	2	2
CO 3	3	3	2	1	3	3	2	2	2	2
CO 4	3	3	2	1	3	3	2	2	2	2
CO 5	3	3	2	1	3	3	2	2	2	2

"1"-Slight (Low) Correlation "2"-Moderate (Medium) Correlation

"3"- Substantial (High) Correlation "-"indicates there is no correlation

Syllabus

UNIT-I **(15 HOURS)**

Lagrangian Formalism: Mechanics of a system of particles – Conservation of linear momentum, Angular momentum and Energy-constraints – Classification of constraints – Degrees of freedom – Generalized coordinates – Principle of virtual work – D'Alembert's principle – Lagrange's equation of motion – Applications – Linear harmonic oscillator – Simple Pendulum – Compound Pendulum – Atwood's Machine.

UNIT-II **(15 HOURS)**

Hamilton's Formulation: Phase space and motion of the system -Hamiltonian function – Hamiltonian Variation principle – Hamilton's canonical equations of motion – physical significance of H – advantages of Hamiltonian approach – Applications of Hamilton's equations of motion – Simple Pendulum – Principle of least action- Canonical Transformations- Infinitesimal constant transformations- Poisson brackets -Equation of motion in Poisson brackets and its relation.

UNIT-III **(15 HOURS)**

Central Force Problems: Equations of motion and first integrals - The equivalent One - Dimensional problem and General features of orbits - The Kepler problem: Inverse square law of force-the Laplace-Runge - Lenz Vector – Scattering in a central force field - Scattering in a Problem to laboratory coordinates

UNIT-IV **(15 HOURS)**

Rigid Body Dynamics and Oscillatory Motion: Euler angles - Moments and Products of inertia - Euler's equations –Symmetric top under the action of gravity -Applications-Theory of small Oscillations and normal modes-Frequencies of free Vibration and normal coordinates-Linear triatomic molecule.

UNIT –V **(15 HOURS)**

Tensor and Relativistic Mechanics: Occurrence of tensor in physics-Kronecker delta-Dummy and Free index-Covariant and Contravariant-Inner and Outer Product-Quotient Law-Basic Postulates of special theory of relativity-Lorentz transformationsin real four dimensional spaces, force and energy equations in relativistic mechanics- Lagarangian formulation of relativistic mechanics-Hamiltonian formulation of relativistic mechanics

UNIT – VI Self Study for Enrichment **(Not included for End Semester Examinations)**

Superiority of Lagrangian approach over Newtonian approach-Application of Lagrangian and Hamiltonian: motion in a Uniform gravitational field-Advantage of Hamiltonian approach-Advantage of Canonical transformation-Relation between Lagrange and Poisson brackets-One dimensional harmonic oscillator- Special theory of relativity- Relativistic Generalization of Newton's laws.

Text books

1. Herbert Goldstein, (2001) *Classical Mechanics*, Narosa Publishing House , 2nd Edition, New Delhi.
2. Gupta, Kumar & Sharma (2012) *Classical Mechanics*, Pragati Prakashan, India.
3. Takwale R G & Puranik P S (2010) *Classical Mechanics*, Tata Mc Graw Hill Education Pvt. Ltd, Noida.
4. Joshi A.W.,(2002) *Matrices and Tensors in Physics*,New Age International(P)Ltd.,Publishers,New delhi.

Reference books

1. Rana N.C. and Joag P. S (1998) *Classical Mechanics*, Tata McGraw Hill, New Delhi.
2. Douglas Gregory (2008) *Classical Mechanics*,University press , Cambridge.

Web resources

1. https://sites.astro.caltech.edu/~golwala/ph106ab/ph106ab_notes.pdf
2. http://users.uoa.gr/~pjioannou/mechgrad/chapter3_Goldstein.pdf
3. http://www.cds.caltech.edu/~marsden/wiki/uploads/projects/geomech/Alemicds205final.pdf
4. https://www.physics.rutgers.edu/~shapiro/507/book7.pdf
5. https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Classical_Mechanics_(Tatum)/04%3A_Rigid_Body_Rotation/4.08%3A_Force-free_Motion_of_a_Rigid_Symmetric_Top
6. https://byjus.com/jee/what-is-cartesian-coordinate-system/
7. https://phys.libretexts.org/Bookshelves/Classical_Mechanics/Variational_Principles_in_Classical_Mechanics_(Cline)/17%3A_Relativistic_Mechanics

Pedagogy

Lecture, Seminar, Assignment, power point presentation

Course Designer

Dr. M. Kavimani

Semester: I	Internal Marks : 25	External Marks : 75		
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PPH1CC3	**QUANTUM MECHANICS - I**	**CC – III**	**6**	**4**

Course Objectives

- To study the fundamentals of wave mechanics.
- To study the stationary state and eigen spectrum of systems using time dependent Schrodinger equation.
- To solve the exactly soluble eigen value problems.
- To know the matrix formulation of quantum theory and how it can be used to understand the equation of motion.
- To understand the theory of identical particles and angular momentum.

Pre-requisites

- A thorough understanding of mechanics.
- Knowledge of partial differential equation and variable separable method.
- Commendable knowledge of integral and differential calculus.

Course Outcomes and Cognitive Levels Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall and interpret the classical and quantum mechanics	K1,K2
CO2	Analyze the various applications of quantum mechanics	K3
CO3	Discover the formalism in quantum mechanics	K4
CO4	Apply the different type of approaches to solve quantum mechanical systems	K5
CO5	Elaborate the operators in both classical and Quantum Mechanics	K6

Mapping of CO with PSO and PO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	1	2	3	3	3	3	3
CO2	3	3	3	1	3	3	3	3	3	3
CO3	3	3	3	1	3	2	2	3	2	2
CO4	3	3	2	1	2	1	1	1	1	1
CO5	3	3	2	1	3	3	3	3	3	3

"1" – Slight (Low) Correlation; "2" – Moderate (Medium) Correlation;
"3" – Substantial (High) Correlation; "-" – Indicates there is no correlation.

Syllabus

UNIT -I **(20 HOURS)**

Schrödinger Equation Approach : Recapitulation of the need for Quantum Mechanics - Thought experiments using Young's double slit -Motivation to introduce a wave function-probabilistic interpretation and Normalization - Time dependent Schrödinger equation (free particle in one dimension) - Generalization to three dimension - Non-normalizable wavefunction and Box normalization - Expectation values: Ehrenfest theorem - Conditions on the wave function-The time-independent Schödinger equation.

Applications

Particle in a square well potential - Solution of wave equation in bound states - Energy Eigenvalues - Energy Eigenfunctions - Square potential barrier: Quantum mechanical tunnelling - Reflection at potential barrier and walls -The free particle - Deutron

UNIT -II **(17 HOURS)**

Abstract Formalism- I: Linear vector space - linear operator - Eigenfunctions - Eigenvalues - Hermitian operator- - Commutation relations- Their connection with Poisson Brackets of Classical Mechanics - Properties of Unitary operator- Postulates of quantum mechanics - Observables and their connection with Hermitian operators

UNIT- III **(17 HOURS)**

Abstract Formalism- II: Uncertainty relation – Dirac's notation - Equation of motion - Momentum representation - Heisenberg method: Matrix representation of quantum states and operator-Properties of matrix element – Evolution of Schrodinger equation in matrix form - Unitary transformation-Linear harmonic oscillator in matrix form.

UNIT -IV **(17 HOURS)**

Simple Harmonic Oscillator:

Wave-function approach:

Schrödinger equation and Energy eigenvalues - Energy eigenfunctions: Series Solution; Asymptotic behavior- Orthonormality - Properties of stationary states

Abstract Operator Approach:

Formulation of Harmonic oscillator problem in abstract notation - Creation, Annihilation and number operators- Solving the Eigen value problem in Abstract Notation - Eigen states and Energy eigenvalues

UNIT-V **(19 HOURS)**

Angular Momentum

Wave-function approach:

Angular momentum operators – Commutations relations of Angular momentum - Eigenvalues and eigenfunctions of L^2 and L_z- Separation of variables- Admissibility conditions on solutions - Spherical harmonics - Physical interpretation - Angular Momentum in Stationary States of Systems with Spherical Symmetry

Abstract Operator Approach:

Constructing the Operators for J^2 and J_z - Raising and lowering operators - Eigenvalues of J^2 and J_z - Angular momentum matrices -Spin angular momentum – Addition of angular momentum- Clebsch Gordon Coefficients – Selection rules –Recursion relations - Computation of Clebsch Gordon Coefficients

UNIT-VI Self study for enrichment

De Broglie's Hypothesis-Interpretation of the Wave-Particle Dualism - Photons: The Quantization of Fields -Alpha emission-Coherent state- Parity.

Text Books

1.Mathews P. M.,and Venkatesan K.,.(1987),*A Text Book of Quantum Mechanics,*Tata McGraw Hill, New Delhi.

2.Aruldhas G., (2009),.*Quantum Mechanics,*Prentice Hall of India.

3. Ghatak .A., and Lokanathan S., (1987),*A Text Book of Quantum Mechanics.*Tata McGraw Hill, New Delhi.

4. Eugen Merzbacher., (1998),*Quantum Mechanics,* John Wiley & Son,Inc,Newyork

Reference Books

1. DevanathanV.,(2006) *Quantum Mechanics,*Narosa Publishing House, New Delhi

2. Scfiff . L.,(2004) *Quantum Mechanics,*Tata McGraw Hill, New Delhi

3. Shankar.R., (2007),*Principles of Quantum Mechanics,*Springer, New Delhi

4. Thankappan V.K., *Quantum* Mechanics., Wiley Eastern Ltd, New Delhi

Pedagogy

Chalk and talk ,Lecture, Seminar, Assignment, power point presentation

SEMESTER -I	INTERNAL MARKS: 25		EXTERNAL MARKS: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS / WEEK**	**CREDIT**
22PPH1EC1A	**MICROPROCESSOR AND MICROCONTROLLER**	**ELECTIVE COURSE - I**	**5**	**4**

Course Objectives

- To understand the architecture of 8085 & 8051
- To impart the knowledge about the instruction set
- To understand the interfacing circuits for various applications of 8051 microcontroller.
- To introduce the architecture of advanced microprocessors and microcontroller.
- To analyse the basic concepts and programming of 8051 microcontroller

Pre-requisites

- Knowledge about Digital circuits
- Understanding of Programming languages

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the ourse,students will be able to	Cognitive Level
CO 1	Understand the Basics of Microprocessor and impart the knowledge about the instruction set	K1,K2
CO 2	Demonstrate programming proficiency using the various addressing modes and data transfer instructions of microprocessor/Microcontroller	K3
CO 3	Explain the data transfer schemes and interfacing devices	K4
CO 4	Distinguish the instruction set of microprocessor and microcontroller and Create program with Microcontroller	K5
CO 5	Develop programming skill using interfacing and Peripheral devices of Microprocessor	K6

Mapping of COwithPO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	1	1	3	1	1	1	3	2	2
CO 2	2	2	1	3	1	3	3	2	2	3
CO 3	1	1	2	3	1	2	3	1	2	2
CO 4	1	1	2	3	1	3	3	3	2	3
CO 5	2	2	1	3	1	3	3	3	2	3

"1" – Slight (Low) Correlation "2" – Moderate (Medium) Correlation
"3" – Substantial (High) Correlation "-" indicates there is no correlation.

Syllabus

UNIT -I **(15 HOURS)**

Architecture of 8085: Architecture of 8085 - Data and Address buses - Registers in 8085- Addressing modes in 8085- Pin configuration of 8085 - Instruction set of 8085-Instruction types (based on number of bytes, operation) data transfer - Arithmetic - Logical- Branching- Stack and I/O instructions - Instruction cycles - Fetch operation - Execute operation - Machine cycle and State - Instruction and data flow - Timing diagram - Memory read and memory write cycles.

UNIT-II **(15 HOURS)**

Microprocessor Programing: Assembly language - Stacks - Subroutines - MACRO - Delay Subroutine - Examples of Assembly language Programming - Addition-Subtraction – Shift an 8-bit number left by one bit-Mask off Least Significant 4Bits of an 8-bit number-Find the largest and Smallest number in a data array - Sum of a series - Multiplication - Division -Multi-byte addition and subtraction.

UNIT - III **(15 HOURS)**

Data Transfer Schemes and Interfacing And Peripheral Devices: Programmed data transfer scheme-Synchronous and Asynchronous and serial data transfer schemes-Interfacing devices- Types of interfacing devices- Programmable Peripheral Interface (PPI- 8255)- Communication interfacing device (Universal Synchronous Asynchronous Receiver Transmitter (USART- 8251))- Programmable DMA controller (8257).

UNIT - IV **(18 HOURS)**

Microcontroller – 8051: Introduction to microcontroller-Difference between microprocessor and microcontroller. 8051 microcontroller: Pin configuration- Architecture and Key features 8051- Data types and directives Instruction set: Data transfer instructions - Arithmetic instructions – Logical instructions-Branching instructions- Addressing modes - Simple programs – Addition and subtraction of two 8-bit numbers – Multiplication-Division-Largest Number in an array -Sum of a set of numbers.

Unit-V **(12 HOURS)**

Microprocessor Applications: Microprocessor Interfacing and Applications: Programmable peripheral interface Intel 8255-Interfacing 7 segment LED display-Measurement of temperature-Microprocessor based traffic control-To generate square wave or pulse using Microprocessor.

UNIT-VI: SELF STUDY FOR ENRICHMENT (Not included for End Semester Examination)

Assembly language Programs using Microprocessor -Decimal to Hexadecimal Conversion - Ascending and Descending order- Shift an 8-bit number left by 2 bit - Shift a 16-bit number left by one bit - Shift a 16-bit number left by 2 bit - Mask off Most Significant 4Bits of an 8-bit number

Text Books

1. Ram B. (2013). *Fundamental of Microprocessor and Microcontroller*.Dhanpat Rai Publications(P) Ltd, New Delhi. 8 th Edition
2. Godse A.P , Godse D.A. (2017). *Microprocessorsand microcontrollers*.Technical Publications,Pune. 4 th Revised Edition

ReferenceBooks

1. Muhammad Ali Mazidi, JiniceGillispieMazidi.(2004) *The 8051 microcontroller and embedded systems.* Pearson Education, Delhi. 2nd Edition.
2. A.Nagoorkani.(2012*) Microprocessors & Microcontrollers*. RBA Publications, Chennai. 2nd Edition.

WebReferences

1. **http://nptel.ac.in/noc20_ee42**
2. **http://classcentral.com/course/swayam-micropocessor-an-interfacing-17694.**

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation, Group discussion and Quiz

CourseDesigner

Dr.T.Noorunnisha

SEMESTER -I	INTERNAL MARKS: 25		EXTERNAL MARKS: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS / WEEK**	**CREDIT**
22PPH1EC1B	**NON - DESTRUCTIVE EVALUATION TECHNIQUES**	**ELECTIVE COURSE - I**	**5**	**4**

Course Objectives

- To impart the knowledge in various Non-destructive testing (NDT) techniques.
- To overview the concepts and methods employed for NDT of Structures and materials.
- To understand the concept of Ultrasonic testing.
- To understand the limitations of NDT techniques.
- To introduce the concept of Real time Radiography Techniques.

Pre-requisites

- Knowledge about Acoustics
- Understanding of Ultrasonics
- Basic ideas about X- Rays

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course,students will be able to	Cognitive Level
CO 1	Understand the basic working principles of various NDT methods and importance of NDT.	K1,K2
CO 2	Identify and Demonstrate the limitations of NDT techniques and codes.	K2,K3
CO 3	Analyze and Interpret Non-destructive testing and Mechanical testing.	K4,K5
CO 4	Examine the Real time Radiography Techniques.	K4
CO 5	Test the instrumentation techniques with the aid of basic Principles.	K5

Mapping of CO with PO and PSO

Cos	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	2	1	1	1	1	3	3	3	2	2
CO 2	2	1	1	1	2	3	3	2	2	1
CO 3	1	1	1	1	1	3	3	3	2	2
CO 4	1	1	1	1	1	3	3	1	2	1
CO 5	1	2	1	1	2	3	1	3	1	2

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Syllabus

UNIT - I **(15 HOURS)**

Overview of NDT : NDT Versus Mechanical testing - Overview of the Non-Destructive Testing Methods for the detection of manufacturing defects- Merits and limitations -Visual inspection - Unaided and aided - Visual Examination- Optical aids used for visual inspection-Applications.

UNIT - II **(15 HOURS)**

Surfacende Methods: Liquid Penetrant Testing- Basic principles – Procedure for penetrant testing - Penetrant testing materials - Testing methods - Applications and limitations - Magnetic Particle Testing Principle- Magnetizing techniques- Procedure-Equipment used for MPT- Limitations-Eddy Current Testing principles- Applications –Limitations.

UNIT -III **(15 HOURS)**

Radiography: Radiography Basic principle -X ray source -production of X rays – High energy X ray source-Properties of X rays and gamma rays- radiographic imaging -Inspection techniques - Applications - Limitations - Safety in radiography.

UNIT – IV **(15 HOURS)**

Ultrasonic Testing: Ultrasonic Testing - Ultrasonic transducers-Inspection methods- Techniques for normal beam inspection - Techniques for angle beam inspection - Flaw characterization techniques - detection equipment - Modes of display- Immersion testing- Applications - Advantages-Limitations.

UNIT - V **(15 HOURS)**

Acoustic Emission: Testing Principles of Acoustic Emission Testing -Techniques- Applications - Thermography: Contact and non contact inspection methods – Heat sensitive paints and other coatings – Heat sensitive papers – Advantages and limitations – Instrumentations and methods – Applications.

UNIT-VI: Self Study for Enrichment (Not included for End Semester Examination)

Basic properties of sound beam - Introduction to Non-Destructive Testing Methods – Various NDT method – Fundamentals of X-Rays.

Text Books

1. Dr.BaldevRaj, T.Jayakumar and M.Thavasimuthu.,(2018).*Practical Non- Destructive Testing*., Narosa Publications, New Delhi. 3 rd Edition
2. Ravi Prakash.(2010). *Non-Destructive Testing Techniques.*, New AgeInternational Publishers. 1 st Revised Edition

Reference Books

1. BarryHull&Vernun John.,(1988).Non Destructive Testing.Springer.
2. Hull B., (2012). Non-destructive Testing., Springer Verlag., Springer Verlag. 1 st Edition
3. Charles,J. Hellier.,(2013). Handbook of Nondestructive evaluation.,McGrawHill, New York. 2 nd Edition.
4. Aquil Ahmad Leonard J. Bond.,(1989) Non Destructive Examination and Quality Control, Metals Handbook.,American Metals Society,Metals Park,OH. Vol.17 9th Edition.

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation, Group discussion and Quiz

Course Designer

Dr.T.Noorunnisha

Semester -I	Internal Marks: 25		External Marks: 75	
COURSE CODE	COURSE TITLE	CATEGORY	HRS / WEEK	CREDITS
22PPH1EC1C	ASTROPHYSICS	ELECTIVE COURSE-I	5	4

Course Objectives

- To study the positional astronomy such as measurement of distances, and angular positions of celestial objects
- To identify the physical principles involved in stellar processes
- To study the types of galaxies, dynamics of stars in a galaxy and its implication for dark matter.
- To understand the physics of the formation of white dwarfs and neutron stars
- To study the expansion of the universe and evolution of temperature in the Universe

Pre-requisites

- A thorough knowledge in Mechanics and Relativity
- Basic Knowledge in Calculus
- A basic insight in Electromagnetism

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Recall & interpret the basic concepts of Astrophysics	K1&K2
CO2	Relate and identify the principles of physics in the study of astronomical objects	K2&K3
CO3	Analyse the celestial objects in the universe	K4
CO4	Classify and explain the stars, galaxies and stellar evolution	K4&K5
CO5	Discuss the knowledge of the physical universe and its evolution	K6

Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	1	3	3	3	3	2	3
CO2	3	2	3	1	3	3	3	3	2	3
CO3	3	3	3	1	3	3	2	2	1	2
CO4	3	3	3	1	3	3	3	2	1	2
CO5	3	3	3	1	3	2	3	2	1	2

"1" – Slight (Low) Correlation; "2" – Moderate (Medium) Correlation;
"3" – Substantial (High) Correlation; "-" – Indicates there is no correlation.

Syllabus

UNIT-I **(15 HOURS)**

Distance measurements: Historical measurement of the Radius of the Earth Distance to Moon and Sun – Parallax method to measure the distance to nearby stars – Distance to inner planets – Cepheid Variables and distance to nearby Galaxies. Angular coordinates to describe angular positions on the Celestial Sphere – RA and Declination

UNIT-II **(15 HOURS)**

Stellar structure : Virial Theorem –application of virial theorem to stellar systems – Formation of stars – Hertzsprung Russell Diagram – main sequence – Mass – Luminosity – Temperature relations of stars in Main Sequence – Post main sequence evolution of stars

UNIT-III **(15 HOURS)**

Compact Objects : Formation of White dwarf and neutron stars – Mass estimation of relativistic and non-relativistic white dwarf – Chandrasekhar Mass limit – Mass of Neutron stars – Binary stars in a co rotating frame –Lagrange points – Qualitative aspects of mass transfer and accretion disk formation.

UNIT-IV **(15 HOURS)**

Galaxies: Types of Galaxies – Hubble's tuning fork diagram – dynamics of stars in galaxies – rotation curve in spiral galaxies – velocity distribution of stars in Elliptical Galaxies– Problems on density profile calculation using different rotation curves.

UNIT-V **(15HOURS)**

Basic Cosmology: Newtonian derivation for the expansion of the Universe – Hubble's law –Radiation and matter in Cosmology – evolution of radiation Temperature in the Universe – Basics of Cosmic Microwave Background Radiation

UNIT-V: Self-Study for Enrichment (Not included for End Semester Examinations)

Concept of Zenith – Nadir– Star clusters- types of binaries – the Discovery of Dark Matter– the importance of 21 cm radiation.

Text Book

1 . Frank H. Shu. (1982). *The physical universe –An introduction to astronomy*. University Science Books.1st Edition.

2 . V. B. Bhatia. (2001). *A Textbook of Astronomy and Astrophysics with Elements of Cosmology.* Narosa Publishing House. Revised Edition.

3. K.D.Abhyankar. (1999). *Astrophysics: Stars and Galaxies.* Universities Press.1st Edition.

Reference Books

1. S.L. Shapiro, S. A. Teukolsky.(1983). *Black holes, white dwarfs and neutron stars.* John Wiley.1st Edition.

2. S.Chandrasekhar.(2003).*An introduction to the study of stellar structure*.Dover publications.1st Edition.

Web References

1. https://www.coursera.org/courses?query=astrophysics

2. https://onlinecourses.swayam2.ac.in/arp19_ap73/preview

Pedagogy

Chalk and Talk, Seminar, Assignment, Power point Presentation

Course Designer

1. Ms. J. Aarthi
2. Dr. B. Anitha

SEMESTER I	INTERNAL MARKS: 40		EXTERNAL MARKS: 60	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HRS/WEEK**	**CREDITS**
22PPH1CC1P	**PHYSICS PRACTICAL – I (GENERAL AND ELECTRONICS)**	**CP-I**	**8**	**4**

Course Objectives

- To determine certain physical constants
- Demonstrate the concepts of spectrometry and to find optical constants
- Explore the concepts of electrical discharge in applied magnetic field
- Explain the operation of IC 555 timer as multivibrators
- To understand properties and characteristics of electronic components and devices

Pre-requisites

1. Fundamental knowledge of Physical and optical constants
2. Understand the concepts of specific charge of an electron by Magnetron method
3. Experimental knowledge of IC 555 timers as multivibrators

Course Outcome and Cognitive Level Mapping

CO Number	CO Statement On the successful completion of the course, students will be able to	Cognitive Level
CO1	Explain the basics of experimental physics.	K2
CO2	Understand the fundamental physics behind many scientific discoveries through hands on experience.	K2
CO3	Explore the concepts of spectrometry involved in the optic processes.	K3
CO4	Verify experimentally the basic laws of physics	K4
CO5	Develop the skill in handling instrumentation the construction of circuits	K6

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	1	2	1	2	2	3	2	1	2	1
CO2	1	3	2	3	1	3	3	2	2	1
CO3	3	3	2	3	2	3	2	3	3	2
CO4	2	3	2	3	3	2	3	2	3	2
CO5	3	2	3	3	3	2	2	2	3	2

"1" – Slight (Low) Correlation; "2" – Moderate (Medium) Correlation;

"3" – Substantial (High) Correlation; "-" indicates there is no correlation.

Syllabus

PHYSICS PRACTICAL – I

(GENERAL AND ELECTRONICS)

List of experiments (General And Electronics)

Any TEN Experiments

1. Determination of q, n, σ by elliptical fringes method
2. Determination of Rydberg's constant using spectrometer
3. Determination of wavelength of monochromatic source by Michelson's interferometer.
4. Charge of an electron by spectrometer
5. Study of Hall Effect in a semiconductor
6. Determination of e/m of electron by magnetron method
7. Design and study of Astable and monostable multivibrators using IC555
8. Design and study of Wein bridge oscillator Using op- amp
9. Design and study of Phase Shift oscillator Using op- amp
10. Operation of shift register using SISO, SIPO, PIPO
11. Construction of dual Regulated Power supply
12. Frequency divider using IC555.
13. Characteristics of SCR/Characteristics of DIAC/Characteristics of TRIAC

TEXT BOOKS

1. Ouseph, C.C., Rao, U.J., & Vijayendran, V., (2009). *Practical Physics and Electronics*.S.Viswanathan, Printers & Publishers Pvt Ltd, Chennai.

2. Dr.Somasundaram, S., (2012). *Practical Physics*. Apsara Publications, Chennai.

REFERENCE BOOKS

1. Dunlap, R.A., (1988). *Experimental Physics: Modern Methods*. Oxford University Press, New Delhi.

2. Jones, B.K., (1986). *Electronics for Experimentation and Research*. Prentice-Hall.

3. Zbar, P.B., Malvino, A.P., & Miller, M.A., (1994). *Basic Electronics: A Text-Lab Manual.* Tata Mc-Graw Hill, New Delhi.

Web References

1. https://www.msuniv.ac.in/Download/Pdf/b2efcbdbc4be452
2. https://www.studocu.com/in/document/reva-institute-of-technology-and-management/bachelors/msc-electronics-lab-student-copy/17586392
3. https://www.vlab.co.in/broad-area-physical-sciences

Pedagogy

Demonstration, practical sessions and viva voce

Course Designer

Dr.S.Gowri