LEARNING OUTCOMES–BASED CURRICULUM FRAME WORK (LOCF)

In the

POST GRADUATE PROGRAMME M.Sc., PHYSICS

FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2021-2022 AND ONWARDS

HICAS

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
(Affiliated to Bharathiar University and Accredited by NAAC)
COIMBATORE-641028
TAMILNADU, INDIA.
Phone: 0422-4440555
Website:www.hindusthan.net/hicas/

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PREAMBLE

Learning Outcome Based Curriculum Framework for Postgraduate Education in Master of Science in Physics. The M.Sc. Physics is a rigorous study program at post graduate level covering both the depth and breadth of all relevant areas, and provides substantial research training. This program is designed to impart a thorough knowledge of the fundamental principles of the several branches of physics, as mathematically and experimentally.

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

DEPARTMENT OF PHYSICS

VISION

To provide world class education to the students to face global challenges and to inculcate the latest trends in technological advancement. To cater the needs of the environmental and ethical values in the mind of students to become good citizens and entrepreneurs.

MISSION

The Mission of the college is to pursue a philosophy of perpetual acquisition of knowledge. The important policy is to provide value-based education and to bring out the hidden potentials in students that equip them to approach life with optimism.

Programme Educational Objectives (PEO)

PEO1: Apply knowledge and skill in the design and development of Physics to cater the needs of science and excel in the research related to Physics and Materials characterization.

PEO2: Become professionally trained in the area of materials characterization and laser. Demonstrate highest standards of actuarial ethical conduct and professional behavior, critical, interpersonal and communication skills as well as a commitment to life-long learning.

PEO3: Postgraduate will have a solid foundation for academic excellence and quality leadership to meet the challenges in interdisciplinary and multi-disciplinary environment.

PEO4: Postgraduate will have ability to adopt, absorb and develop innovative and new technology in physical sciences and related areas through lifelong learning process.

PEO5: Postgraduate will inculcate value system and work ethically in a multidisciplinary environment, to enhance the advancement in physics in general and contribute significantly through their critical thinking and scientific competence.

PROGRAM OUT COME (PO)

PO1: DISCIPLINARY KNOWLEDGE: Understand the basic concepts / laws in physical sciences.

PO2: PROBLEM SOLVING AND ANALYSING: Identify and formulate, research literature & analyze complex Physical Science problems.

PO3: ENVIRONMENT SUSTAINABILITY AND ETHICS: Apply appropriate techniques including prediction for modeling complex Physical Science activities.

PO4: MODERN TOOL USAGE: Design solution for cutting edge problems related to public health, safety, social and environmental considerations using modern tools.

PO5: CO-OPERATIVE TEAM WORK & COMMUNICATIVE SKILLS: Communicate effectively through report writing, documentation and effective presentations.

PO6: SELF DIRECTED / LIFE LONG LEARNING: Function effectively as an individual, and as a member or leader in diverse teams, in multidisciplinary settings.

PO7: ENHANCING RESEARCH CULTURE: Enhance and adopt new skills for future employability in teaching and research through seminar, internship and dissertation.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1: Analyze the essential concept of Physics components and systems.

PSO2: Competence in using electronic modern IT tools for design and analysis of complex Physics problems.

PSO3: Offers the professional skills necessary for the students to play a meaningful role in industrial and academic career at national and international level.

PSO4: Be able to apply experimental expertise in basic as well as advanced areas of physics.

PSO5: Have necessary skills and expertise in field of research and development.

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
COIMBATORE-641028
SCHEME OF EXAMINATIONS - CBCS & LOCF PATTERN

(For the students admitted from the Academic year 2021-2022 and onwards)

PG PROGRAMME

Programme: M.Sc., **Branch: Physics**

Course Code	Course Type	Course Title	Credit points	Lecture Hours/ Week		Exam Duration (hours)	MAX. MARKS		
				Theory	Practical		I.E.	E.E	Total
Semester - I									
21PHP01	DSC	Mathematical Physics	4	5		3	40	60	100
21PHP02	DSC	Classical Mechanics	4	5		3	40	60	100
21PHP03	DSC	Thermodynamics and Statistical Methods	4	5		3	40	60	100
21PHP04	DSC	Integrated Electronics	4	4		3	40	60	100
21PHP05	DSC	**Practical I:** General Physics–I	3		5	5	50	50	100
21PHP06	DSC	**Practical II:** General Electronics	3		5	5	50	50	100
21PHP07	SEC	Internship / Institutional Training / **Mini-Project**	2	-			100	-	100
21PHPE01	AEE	Open Elective - I	2	3			100		100
21PHPV01	ACC	VAC–I	1*	2			50	-	50**
21PHPJ01	SEC	**Aptitude / Placement Training**	Grade*	2			50		50**
-	SEC	SDR – Student Development Record	**Assessment will be done in the end of III – rd semester**						
		Total	**26**	**26**	**10**		**460**	**340**	**800**
Semester – II									
21PHP08	DSC	Electromagnetic Wave Theory	4	5		3	40	60	100
21PHP09	DSC	Condensed Matter Physics	4	5		3	40	60	100
21PHP10	DSC	Quantum Mechanics	4	5		3	40	60	100
21PHP11	DSC	8051 Microcontroller	4	4		3	40	60	100
21PHP12	DSC	**Practical III:** General Physics –II	3		5	5	50	50	100
21PHP13	DSC	**Practical IV:** Advanced Electronics	3		5	5	50	50	100
21PHP14	SEC	Internship / Institutional Training / **Mini-Project /** Extension Activity	2	-			100	-	100
21PHPE02	AEE	Open Elective – II	2	3			100		100

21PHPV02	ACC	VAC–II	1*	2			50	-	50**
21PHPJ02	SEC	**Online Courses**	Grade*				-	-	C/NC
21PHPJ03	SEC	**Aptitude / Placement Training**	Grade*	2			50		50**
		Total	**26**	**36**			**440**	**340**	**800**
Semester - III									
21PHP15	DSC	Nuclear and Particle Physics	4	4		3	40	60	100
21PHP16	DSC	Atomic and Molecular Spectroscopy	4	5		3	40	60	100
21PHP17	DSC	Communication systems	4	5		3	40	60	100
21PHP18	DSC	**Practical III:** Advanced Physics	2		4	5	50	50	100
21PHP19A / 21PHP19B	DSE	Elective –I	3	3			40	60	100
21PHP20A / 21PHP20B	DSE	Elective -II	3	3			40	60	100
21PHP21	DSC	**Practical IV:** Communication Systems	3		5	5	50	50	100
21PHP22	SEC	Internship / Institutional Training / **Mini-Project /** Extension Activity	2	-			100	-	100
21PHPE03	AEE	Open Elective-III	2	3			100	-	100
21PHPV03	ACC	VAC–III	1*	2			50	-	50**
21PHPJ04	SEC	**Aptitude / Placement Training**	Grade*	2			50		50**
21PHPJ05	SEC	**Online Courses**	Grade*				-	-	-
21PHPJ06	SEC	SDR – Student Development Record	2*	-	-	-	-	-	-
		Total	**27**	**36**			**500**	**400**	**900**
Semester – IV									
21PHP23A / 21PHP23B	DSE	Elective - III	3	5		3	40	60	100
21PHP24A / 21PHP24B	DSE	Elective - IV	3	5		3	40	60	100
21PHP25	SEC	**Self-Study Course**	3	-	-		40	60	100
21PHP26	SEC	**Project Work /Student Research**	6	-			50	150	200
		Total	**15**	**10**			**170**	**330**	**500**
		Grand Total	**94**						**3000**

- * denotes Extra credits which are not added with total credits.
- ** denotes Extra marks which are not added with total marks.
- **VAC**-Value Added Course (Extra Credit Courses)
- * Grades depends on the marks obtained

Range of marks	Equivalent remarks
80 and above	Exemplary
70 – 79	Very good
60 – 69	Good
50 – 59	Fair
Below 50	Not Satisfactory = Not completed

- Part IV & V not included in total marks and CGPA calculation.
- **I.E**-Internal Exam
- **E.E**-External Exam
- **JOC**-Job Oriented Course

PASSING MINIMUM

- Passing Minimum for PG 50%

ABSTRACTFORSCHEMEOFEXAMINATIONS

(For the Candidates admitted during the academic year 2021- 2022andonwards)

Course	Papers	Credit	Total Credits	Marks	Total Marks
Core /**DSC**	11	4	**44**	100	**1100**
*Self-Study Course /**SEC***	*1*	*3*	*3*	*100*	***100***
Electives/**DSE**	4	3	**12**	100	**400**
Practical / **DSC**	6	3/2	**17**	100	**600**
Project / **SEC**	1	6	**6**	200	**200**
Internship/ Institutional Training/ Mini-Project / Extension Activity	*3*	*2*	*6*	*100*	***300***
Open Electives /**AEE**	3	2	**6**	100	**300**
Value Added Course	*3*	*1**	*3**	*50*	***150*****
Aptitude/Placement training /**SEC**	3	Grade*	Grade*	50	**150****
Online Courses / SEC	**2**	Grade*	Grade*	-	-
SDR - SEC	**1**	2*	2*	-	-
Total			**94+ (5 Extra Credits)**		**3000 + (300**)**

List of Open Elective Papers	
Open Electives	Yoga for Human Excellence Human Health & Hygiene Indian Culture and Heritage Indian Constitution and Political System Consumer Awareness and Protection Professional Ethics and Human Values Human Rights, Women's Rights& Gender Equality Disaster Management Green Farming Corporate Relations start a Business? Research Methodology and IPR General Studies for Competitive Examinations IIT JAM Examination (for Science only) CUCET Examination
VAC Papers	a)Electronic Test Instruments b)Verilog HDL c)Bioelectronics d)Material Characterization e)Io T and its Applications f)Electric Vehicle Design g)Ocean Electronics h) Artificial Intelligence using Rasp berry Pi
Courses offered by the Departments to other Programmes	

List of Elective Papers/DSE (Can choose anyone of the paper as electives)		
	Course Code	Title
Electives/ **DSE-I**	21PHP19A	Nano Science and Technology
	21PHP19B	Experimental Techniques and Data Analysis
Electives/ **DSE-II**	21PHP20A	Laser and Optics
	21PHP20B	Plasma Physics
Electives/ **DSE-III**	21PHP23A	Solid state Physics
	21PHP23B	Electronic Instrumentation
Electives/ **DSE-IV**	21PHP24A	Material Characterization
	21PHP24B	Computational Physics

Syllabus Coordinator

Mr. N. SURESH

BOS-Chairman/Chairperson

Dr. V. BALAPRAKASH

Academic Council – Member Secretary

Dr. M. MAHALAKSHMI

PRINCIPAL

PRINCIPAL
Hindusthan College of Arts and Science
Coimbatore - 641 028.

Co-ordinator
Academic Audit Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Regulations

1. Internship / Institutional Training / **Mini-Project** is related to the discipline can be permitted to complete during the end of I and III semesters for minimum seven days each and permitted to submit a report.

Internship / Institutional Training	Not more than seven days
Mini project	Depends on the departments

2. Project work is considered as a special course involving application of knowledge in problem solving / analyzing /exploring a real-life situation. A Project work may be given in lieu of a discipline specific elective paper.
3. The practical marks for PG programme for Internal assessment and External assessment is 50 marks respectively and to assess the component for Internal marks as Test-1 = 20, Test-2 = 20 and Observation and concept application = 10.
4. To modify the Internal and External Assessment marks FOR THEORY as 40 and 60 for all the post graduate programme for the Academic year 2021-2022 and onwards. Subsequently, the Internal component is to be modified as Test -1 = 10, Model = 10 and other component = 20. The Components for internal assessment can be of 5 marks for each 4 components out of 10 components **(10 Components can be fixed by the concern boar chairman**) selected by the each subject incharges for their respective courses.
5. To incorporate Online courses as a non-credit skill enhancement course for the III and IV th semesters and Grades will be assessed based on the certificates produced by the students. It is compulsory to produce one Online course certificate for each semester to avail grades for the students. (2 certificates in any of the online platform is mandatory)
6. **Two Elective courses DSE- III & DSE- IV are the subjects which are to be related with NPTEL courses.**

   FAST TRACK SYSTEM:

   The Students have the options of taking two subjects of the fourth semester of M.Sc., Physics programme through NPTEL / Swayam portal from the list given or offered by NPTEL and approved by the department for which credit transfer is permitted. The students should inform the department prior to the registration of the course and get due

approval for the same. If the student completes these courses before the start of the fourth semester, the student can be considered for a fast track programme, and do the project work alone during the fourth semester apart from the self-study paper. Once the student submits the successful course completion credentials as required by the college for the NPTEL/SWAYAM online courses, then the credit transfer will be considered for qualifying the degree.

7. **If the students who are all completed the NPTEL courses before semester -III, they can avail exemption from appearing exams of DSE- III & DSE- IV in Fast track scheme.**
8. SDR – Student Development Report to be received by the department from the students till end of the **Third** semester. (Evidences of Curriculum activities and Co-curriculum activities)

PG/MCA Scheme of Evaluation (Internal & External Components)

(For the students admitted during the academic year 2021-2022 and onwards)

1. Internal Marks

Components	Marks
Test	10
Model Exam	10
Internal Assessment components	20 #
TOTAL	**40**

 # List of components for Internal Assessment

S.No	Components
1	Multiple choice questions
2	Quiz
3	Video teach
4	UT – Unannounced test
5	Co-operative or Collaborative Learning
6	Mini Project/Assignment
7	Case study
8	Seminar

(Any four components from the above list with five marks each will be calculated .4x5=20 marks)

2. a) Components for Practical I.E.

Components	Marks
Test –I	20
Test - II	20
Application*	10
Total	**50**

b) Components for Practical E.E.

Components	Marks
Experiments	40
Record	5
Viva	5
Total	**50**

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

Internships/Industrial Training (I.E)		Major Project Work		
Component	**Marks**	**Component**	**Marks**	**Total Marks**
Work diary Report Viva-voce	25 50 25	I.E a)Attendance b)Review	20 30	50
Total	**100**	E.E* a) Final report b)Viva-voce	120 30	150
			Total	**200**

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

4. Value Added Courses / Aptitude/Placement courses:

Components	Marks
Two Test (each 1 hour) of 25 marks each QP is objective pattern (25x1=25)	50
Total	**50**

5. Guidelines for Open Elective

No of Activities	Marks
Two Tests (each 3 hours) of 50 marks each [5 out of 8 descriptive type questions 5 x 10 = 50 Marks]	100

Guidelines:

1. The passing minimum for these items should be 50%
2. If the candidate fails to secure 50% passing minimum, he / she may have to reappear for the same in the Subsequent semesters
3. Item No's:4 is to be treated as 100% Internals and evaluation through online.
4. Item No.2: * - Application should be from the relevant practical subject other than the listed programme It must be enclosed in the practical record.

For all **PG/MBA/MCA** ***Programmes*** ***(2021-2022Regulations)***

QUESTION PAPER PATTERN FOR CIA EXAM

Reg.No:---------- **Q.P.CODE:**

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

PG/MBA/MCA DEGREE CIA EXAMINATIONS ----------20-------

(---------Semester)

BRANCH: ---------

Subject Name: ----------

Time: Two Hours **Maximum: 50 Marks**

Section-A (3 x 4=12 Marks)

Answer **ALL** Questions

ALL questions carry **EQUAL** Marks

(Q.No: 1 to 3 Either Or type)

Section-B (2 x 12=24 Marks)

Answer any **TWO** Questions out of **THREE** Questions

ALL questions carry **EQUAL** Marks

(Q.No: 4 to 6)

Section-C (1 x 14=14 Marks)

(Compulsory Question: It should be a Case study/Application oriented/Critical analysis from any of the units)

(Q.No: 7)

QUESTION PAPER PATTERN FOR MODEL / END SEMESTER EXAM

Reg.No:---------- **Q.P.CODE:**

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

PG/MBA/MCA DEGREE MODEL EXAMINATIONS ----------20-------

(---------Semester)

BRANCH: ---------

Subject Name: ----------

Time: Three Hours **Maximum: 60 Marks**

SECTION – A (5x4=20 marks)

Answer **ALL** Questions

ALL Questions carry **EQUAL** Marks

(Q.No 1 to 5 Either Or type)

(One question from each Unit)

SECTION – B (3x10=30 Marks)

Answer any **THREE** Questions Out of **FIVE** Questions

ALL Questions carry **EQUAL** Marks

(Q.No 6 to 10)

(One question from each Unit)

SECTION – C (1x10=10Marks)

(Compulsory Question: It should be a Case study/Application oriented/Critical analysis from any of the units)

(Q.No: 11)

Course Code:	21PHP01	Course Title						Batch:	2021-2022 and Onwards
		MATHEMATICAL PHYSICS						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To Remember the Students to establish the special functions.
2. To understand about complex variable theory to study physics problems.
3. To highlight functions of linear space.
4. To develop concept of Fourier transform and Laplace transform in theoretical mechanics.
5. To evaluate the group theory in Quantum mechanics and electromagnetism.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the concept of Special functions of mathematical physics.	K1
CO2	Understand the principles of complex variable theory.	K2
CO3	Apply the functions of linear space.	K3
CO4	Apply the basic concept of Fourier transform and Laplace transform in theoretical mechanics and quantum mechanics.	K3
CO5	Analyze the concept of group theory in Quantum mechanics and electromagnetism.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP01	MATHEMATICALPHYSICS	Sem: I
Unit No.	Topics	Hours
I	**Special Functions** Legendre's Polynomials and Functions- Differential Equations and Solutions - Generating Functions - Orthogonality-Relation between Legendre Polynomial and their Derivatives Recurrence Relations-Bessel's Function-Differential Equation and Solution Generating Functions-Recurrence Relations-Hermite function.	12
II	**Complex Variable Theory** Functions of a Complex Variable-Single and Multivalued Functions –Cauchy-	12

	Reimann Differential Equation-Analytical Line Integrals of Complex Function-Cauchy's Integral Theorem and Integral Formula-Derivatives of an Analytic Function-Taylor's Variables-Residue and Cauchy's Residue Theorem.	
III	**Linear Space** Definition of Vector Space-Linear Dependence-Linear Independence-Basis-Dimension of a Vector Space-Representation of Vectors and Linear Operators with respect to Basis-Schmidt Orthogonalization Process-Inner Product.	**12**
IV	**Fourier Series & Laplace Transforms** Fourier Series-Dirichlet's Theorem-Change of Interval-Complex Form Fourier Series in the Interval $(0,\infty)$-Uses of Fourier Series Laplace Transform: Definition–Properties Translation Property. Inverse Laplace Transform-Properties, example problems.	**12**
V	**Group Theory** Concepts of groups-The cyclic group, group multiplication table-The rearrangement theorem subgroups, cosets, conjugate elements and classes – The product of classes, Isomorphism and Homomorphism - The group symmetry of an equilateral triangle-group symmetry of a square–The character of Representation-reducible, irreducible representation- orthogonality theorem-character tables.	**12**

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. ``SatyaPrakash, "Mathematical Physics", Sultan Chand & Sons.
2. Arfken, Weber &Harris, "Mathematical methods for Physicists-II", Academic Press- 7th edition.
3. A.W.Joshi, "ElementsofgrouptheoryforPhysicists", WileyEastern, 2002.

REFERENCEBOOKS

1. B.D. Gupta, "Mathematical Physics", Vikas Publishing House, 3rdEdition, 2006.
2. B.S.Rajput, "Mathematical Physics", Pragati Prakashan, Meerut, 17thEdition, 2004.
3. P.K.Chattopadhayay, "MathematicalPhysics", NewAge International, NewDelhi.
4. P.P. Gupta, Yadav & Malik, "Mathematical Physics", Kedarnath Ramnath-Meerut.
5. M.K. Venkataraman, "Numerical Methods in Science & Engineering", National Publishing, Chennai, 1986.
6. A. Singaravelu, "Numerical Methods", Meenakshi Publishing.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/106/115106086/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	S	M	M	M
CO2	S	S	M	M	M	S	M
CO3	S	M	M	M	M	M	M
CO4	S	M	M	M	M	M	
CO5	S	S	M	M	M		

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(MRS. R. NISHALASHI)	(Dr. V. BALAPRAKASH)	

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Curriculum Development Cell
Hindusthan College of Arts & Science

Course Code:	21PHP02	Course Title						Batch:	2021-2022 and Onwards
		CLASSICAL MECHANICS						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To learn the classical mechanics in Lagrangian formalism.
2. To study about Hamiltonian formalism.
3. To represent Hamilton-Jacobi Method of classical mechanics.
4. To develop math skills over two body problems.
5. To understand basic mechanical concepts of motion of a rigid body.

COURSE OUTCOMES (CO)

S. No	CLASSICAL MECHANICS	BLOOMS LEVEL
CO1	Remember the Lagrangian formalism.	K1
CO2	Understand Hamiltonian formalism and the physical parameters.	K2
CO3	Analyze the Hamilton-Jacobi Method and theoretical problems of classical mechanics.	K3
CO4	Evaluate two body problems and rigid body dynamics.	K4
CO5	Apply the concept of planar and spatial motion of a rigid body.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP02	CLASSICAL MECHANICS	Sem: I
Unit No.	Topics	Hours
I	**Lagrangian Formalism** Constraints and Degrees of Freedom- Generalized Coordinates: Generalized Displacement,Acceleration,Momentum,force&Potential-Variationtechniques and Euler's Lagrange Differential equation- Hamilton's Variational principle- Lagrange's equation of motion from Hamilton's principle- Deduction of Newton's Second law of Motion from Hamilton "principle- Application of Lagrange's equation of motion: Linear Harmonic Oscillator-Simple Pendulum-Isotropic Oscillator.	12
II	**Hamiltonian Formalism** Phasespace-Hamiltonian-Hamilton'sCanonicalEquationofMotion-Significance of H-Deduction of Canonical Equation from Variation principle-Application of Hamilton's equation of motion: Simple Pendulum, Isotropic Oscillator -	12

	Principle of Least Action and Proof- Canonical Transformations-Generating Function and different forms.	
III	**Hamilton-Jacobi Method** Hamilton Jacobi Method, Solution of Harmonic Oscillator by HJ method-Particle falling freely-Kepler Problem-Damped Harmonic Oscillator-Lagrange's & Poisson's Brackets- Definition-Equation of motion in Poisson's Bracket form-Poisson Theorem (Jacobi Identity)- Angular Momentum and Poisson's Brackets.	12
IV	**Two Body Problem** Equivalent One body problem-General Features of central force, motion-Stability of orbits and Conditions for closure- Motion under Inverse Square Law-Shapes of orbits-Inertial/Non-inertialframes-RotatoryCoordinatorysystem-EffectsofCoriolisforceonthemovingbodies.	12
V	**Rigid body dynamics** Euler theorem-Euler's angle-Angular velocity of a rigid body –Angular momentum of Rigid Body - Moments and Products of Inertia- Principle Axis of Transformation-Torque Free Motion of a Rigid Body- Poinsot Solutions-The motion of a Symmetric Top under action of Gravity-Stable and Unstable Equilibrium's.	12

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *S.L.Gupta, V. Kumar & H.V.Sharma, "Classical Mechanics", Pragati Prakashan, Meerut,2003.*
2. *H.Goldstein,"ClassicalMechanics",AddisonWesley,London,1996.*
3. *G. Aruldhas, "Classical Mechanics", PHI Learning, 2013.*

REFERENCE BOOKS

1. *Kamal Singh &S.P. Singh,"Elements of Statistical Mechanics", S.Chand&Company,NewDelhi,1999.*
2. *Gupta & Kumar,"Elements of Statistical Mechanics",Pragati Prakashan, Meerut.*
3. *J.C.Ubadhyaya,"ClassicalMechanics",HimalayaPublishingHouse,2012.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/105/115105098/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	S	M	M	M
CO2	S	M	M	M	M	S	M
CO3	S	M	M	M	M	M	M
CO4	S	M	M	M	M	M	M
CO5	S	S	M	M			

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. BALAPRAKASH)	

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science
Coimbatore-641 028.

Course Code:	21PHP03	Course Title						Batch:	2021-2022 and Onwards
		THERMODYNAMICS AND STATISTICAL METHODS						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To study the basics of thermodynamics, kinetic theory.
2. To learn ensemble approach of canonical functions.
3. To provide the applications of quantum statistics.
4. To recognize concepts of Fermi energy in thermodynamics.
5. To provides information on the thermodynamic properties in phase transitions.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand Equilibrium of thermodynamics.	K2
CO2	Interpret the Ensemble approach of canonical functions.	K2
CO3	Analyze the applications of quantum statistics.	K3
CO4	Apply the concepts of Fermi Energy in thermodynamics.	K4
CO5	Apply the thermodynamics properties in phase transitions.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP03	THERMODYNAMICS AND STATISTICAL METHODS	Sem: I
Unit No.	Topics	Hours
I	**Equilibrium Thermodynamics, Classical Statistics** Review of Classical Thermodynamics – Zeroth Law, First Law, Second Law and Third Law and Its Consequences – Thermodynamic Potentials – Maxwell's Relations – Dulong Petit's Law – Microstates – Macrostates – Phase Space- μ-Space and Γ-Space – Liouville's Theorem, Proof and its Consequences – Postulates of Statistical Mechanics – Thermodynamic probability - Classical Statistics –Maxwell Boltzmann Distribution – Root mean Square Speed – Average Speed – Boltzmann entropy relation	12
II	**Ensemble Approach** Introduction to Ensembles – Microcanonical, canonical and grand canonical ensembles – Definition of partition function in the ensembles – Determination of thermodynamic quantities from Partition function – Demonstration of ensemble	12

	approach – First example – Classical ideal gas in micro canonical, canonical and grand canonical ensemble – Gibbs paradox and correct formula for entropy – Second example – Linear harmonic oscillator in micro canonical, canonical and grand canonical ensemble –Demonstration of equipartition of energy through canonical distribution	
III	**Quantum Statistics** Quantum Statistics-Indistinguishability and quantum statistics-Bose Einstein Distribution-Fermi Dirac Distribution-Symmetric and antisymmetric wave functions-Difference between Bose-Einstein and Fermi-Dirac statistics-Bosons and Fermions-Calculating the partition function for Bosons and Fermions-Free electron model and Electronic emission -Liquid Helium-Onsagar relations-Enthalpy-Bragg William Approximation-Quantum Ideal gas.	**12**
IV	**Fermi energy** Weakly degenerate Bose and Fermi gas – Determination of thermodynamic quantities and equation of state – Strongly degenerate Bose gas – Bose- Einstein Condensation – Thermodynamic quantities – Black body radiation – Planck's distribution law – Heat capacity of solids – Einstein and Debye's theory of Specific heat of solids – Thermionic emission.	**12**
V	**Phase transitions** Introduction to phase transition - van der Waals equation – First order phase transitions – Phase diagram – Critical point – Clausius – Clapeyron equation - Critical exponents – Landau theory of Phase transitions – Ising model in one dimension – Exact solution of Ising model in one dimension.	**12**

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. S. C. Garg, R. M. Bansal and C. K. Gosh, Thermal Physics: with Kinetic Theory, Thermodynamics and StatisticalMechanics (McGraw Hill Education, 2nd edition, 2017).

2. B. K. Agarwal and M. Eisner, Statistical Mechanics (New Age International Publishers, 3rd edition, 2013).

3. F. Reif, Fundamentals of Statistical and Thermal Physics (Waveland Press, 2010).

REFERENCE BOOKS

1. D. A. McQuarrie, Statistical Mechanics (Viva Books India, Viva Student Edition, 2018).

2. R. K. Pathria and P. D. Beale, Statistical Mechanics (Academic Press, 3rd edition, 2011).

3.W.Greiner, L. Neise and H. Stocker, Thermodynamics and Statistical Mechanics (Springer Verlag, New York, 1st edition,1995).

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/103/115103113/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	S	M	M	M
CO2	S	S	L	S	M	M	M
CO3	S	M	S	M	M	M	M
CO4	S	S	M	L	M	M	
CO5	S	S	M	S	M	M	

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Ms. R. Amirthavalli)	(Dr. V. BALAPRAKASH)	Co-ordinator

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Hindusthan College of Arts & Science
Coimbatore-641 028

Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	21PHP04	Course Title						Batch:	2021-2022 and Onwards
		INTEGRATED ELECTRONICS						Semester:	I
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To give an insight about fundamental concepts of Semiconductor Devices.
2. To evaluate the linear and non-linear applications of operational amplifiers.
3. To provide the knowledge on analog and digital Communication electronics.
4. To provide a good understanding on the design of flip flops.
5. To apply different parameters of registers and counters.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the basic concepts of semiconductor devices and its fabrication.	K1
CO2	Understand the characteristics of Operational Amplifiers for linear and non-linear applications.	K2
CO3	Analyze the working of various Analog and Digital modulation schemes.	K4
CO4	Examine the behavior of various combinational and sequential flip flops.	K4
CO5	Evaluate the parameters of registers and counters.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP04	INTEGRATED ELECTRONICS	Sem: I
Unit No.	Topics	Hours
I	**Semiconductor Devices & IC Fabrication** Semiconductor diodes – Characteristics – Ideal diode – Clippers and clampers circuits Special diodes Zener, Schottky and Tunnel diodes: Applications– Junction transistors – JFET, MOSFET, UJT and SCR – applications – Principle of Integrated Circuits – fabrication process–Linear and Digital Integrated Circuits.	10
II	**Operational Amplifier (Op-Amp) and its Applications** Op-Amp characteristics – DC & AC characteristics – basic applications – linearOp – Amp circuits – Analog Multiplier and Divider–Frequency Doubling Electronic Analog Computation–Active filters.	10
III	**Communication Electronics** Modulation – Demodulation – Principle of Amplitude modulation, Frequency Modulation – Simple circuits for AM and FM – Digital principles – Pulse modulation – APM, PPM, PWM and PCM.	10

IV	**Flip-Flops** Types of Flip-flops –RS Flip-flops, Clocked RS Flip-flops, Clocked D Flip-flops, Positive Edge – Triggered RS Flip - flops, Negative – Edge – Triggered RS Flip – flops, Edge – Triggered D Flip - flops, Positive – Edge – Triggered JK Flip - flops, Flip - flop timing, JK Master - Slave Flip flops.	9
V	**Registers and Counters** Types of Registers: Serial in - Serial out, Serial in - Parallel out, Parallel in – Serial out, Parallel in – Parallel out. Types of Counters: Asynchronous (Ripple) counters, Synchronous counters, Decade counters.	9

Note: Distribution of marks: Problems %, Theory %

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *J.Millman &C.C.Halkias, "Electronic Devices and Circuits",Tata McGrawHill, NewDelhi,1985.*
2. *G.Kennedy, "Electronic Communication Systems", Tata McGrawHill, NewDelhi, 3rdEd.,1994.*
3. *D.R.Choudhury & S.Jain,"Linear Integrated Circuits", New Age International,NewDelhi,2001.*
4. *S.Chattopadhyay," Text book of Electronics",New Central Book Agency (p)Ltd,Kolkata,2006.*

REFERENCE BOOKS

1. *D.Pleach , A.P.Malvino and G. Saha, "Digital Principles and Applications", Tata McGraw- Hill Education PvtLtd,NewDelhi,6thEdition,2009.*
2. *A.B.Bhattacharya,"ElectronicsPrinciples&Application",NewCentral Book Agency(P) Ltd.,Kolkata,2007.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/108/108108111/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	S	M	M	M
CO2	S	S	S	S	M	M	M
CO3	S	M	M	S	M	M	
CO4	S	M	M	M	M	M	
CO5	S	S	M	S	M	M	

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Senthil)	(Dr. V. BALAPRAKASH)	Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
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Coimbatore-641 028

Course Code:	21PHP05	Course Title						Batch:	2021-2022 and Onwards
		PRACTICAL I: GENERAL PHYSICS–I						Semester:	I
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To make the students to gain a practical knowledge on general Physics.
2. To demonstrate knowledge on Practical Physics.
3. To expand experiments in modern physics for day to day requirements.
4. To connect each physical discovery with its history contents.
5. To write the Matlab programme to solve the modern physics Problems.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the basics of experimental physics.	K1
CO2	Interpret the concepts of practical physics	K2
CO3	Analyze the experiment knowledge level to present-day requirements in industries, research fields.	K3
CO4	Develop the physical discovery of each experiment with background.	K4
CO5	Apply the matlab programme knowledge in modern Physics	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP05	PRACTICAL-I: GENERALPHYSICS–I	Sem: I
S.No.	Topics	Hours
	(Any 10 experiments)	
1.	Young's Modulus-Elliptical Fringes.	
2.	Determination of wavelength of laser source using grating, Particle size of Lycopodium powder using laser source, Numerical aperture and acceptance angle using optical fiber.	
3.	Determination of band gap of a Semiconductor using p-n junction diode.	
4.	Determination of thickness of Wire - Air Wedge Diffraction.	
5.	Determination of Ultrasonic velocity in a given liquid for fixed frequency.	
6.	Young's Modulus-Hyperbolic Fringes.	
7.	Viscosity of a Liquid- Mayer's Oscillating Disc.	
8.	Electronic Specific Charge 'e/m' by Thomson's Method.	
9.	Determination of the wavelength of given monochromatic source and the	

	difference in wavelength of the two spectral lines D1 and D2 of Sodium source using Michelson Interferometer.	
10.	Determination of thermal conductivity in Forbe's method.	
11.	Susceptibility of a given liquids – Quinke's method.	
12.	Determination of the charge of a single electron – Millikan Oil drop method.	
13.	Matlab Programming-Roots of a Quadratic Equation & Solution of a System of Linear Equations.	
14.	Matlab Programming-Solution of Ordinary Differential Equations– First Order.	
15.	Matlab Programming-Runge-Kutta Method.	

Teaching Methods: <Practical Demonstration>

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/106/115106090/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S			
CO2	S	S	S	M	M		M
CO3	S	S	M	M	M		
CO4	S	S	M	S		M	
CO5	S	S	S	S			M

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. BALAPRAKASH)	Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

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Coimbatore-641 028

Course Code:	21PHP06	Course Title						Batch:	2021-2022 and Onwards
		PRACTICAL - II:GENERAL ELECTRONICS						Semester:	I
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To gain a practical knowledge on general electronics.
2. To understand analog and digital systems and their applications
3. To analyze the performance of various analog circuits.
4. To identify design trade-off of analog electronic circuit design.
5. To understand the various digital circuit design.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the basic knowledge of simple electronics circuits.	K2
CO2	Apply the theoretical concepts by doing experiments.	K3
CO3	Analyze the behavior of UJT and power electronics components.	K4
CO4	Understand the design knowledge towards real time applications.	K2
CO5	Evaluate the concepts of waveform generation and special function ICs.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP06	PRACTICAL - II:GENERAL ELECTRONICS	Sem: I
	Topics	**Hours**
1.	Characteristics of PN junction diode	
2.	Characteristics of Zener diode	
3.	Characteristics of LED	
4.	Characteristics of SCR	
5.	Characteristics of JFET	
6.	Characteristics of UJT	
7.	Frequency response characteristics Op-Amp inverting and non-inverting amplifier	
8.	First order and second order low pass filter design using Op-Amp	
9.	First order and second order high pass filter design using Op-Amp	
10.	Wide band pass filter design using Op-Amp	
11.	Notch filter design using Op-Amp	
12.	Zero crossing detector and Schmitt trigger design using Op-Amp	

13. Wein-Bridge and phase shift oscillator design using Op-Amp 14. 8x1multiplexer design 15. RS&JK flip-flop	

Teaching Methods: :<Practical Demonstration>

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/108/108108111/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	M	M	M
CO2	S	S	M	M	M	M	M
CO3	S	S	S	M	M	M	M
CO4	S	S	M	S	M	M	M
CO5	S	S	S	S	M	M	M

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Balaprakash)	(Dr. V. BALAPRAKASH)	Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

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Course Code:	21PHP08	Course Title						Batch:	2021-2022 and Onwards
		ELECTROMAGNETIC WAVE THEORY						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To learn fundamentals of electromagnetic waves.
2. To enable the students to have a sound knowledge about Propagation of electromagnetic waves.
3. To study the concepts of Oscillators and Radiations systems.
4. To solve the problems in interactions of electromagnetic waves.
5. To understand the concepts of relativistic electro dynamics.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the fundamentals of Electromagnetic wave theory.	K1
CO2	Understand the Propagation behavior of electromagnetic waves.	K2
CO3	Apply the concept of Oscillators and Radiation systems.	K3
CO4	Solve problems in electromagnetic interactions.	K4
CO5	Understand the concept of Relativistic electro dynamics.	K2
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP08	ELECTROMAGNETIC WAVE THEORY	Sem: II
Unit No.	Topics	Hours
I	**EM Wave Theory** Introduction to Microwaves: History–RegionandBandDesignations–Advantages–Applications–Maxwell's Equations: Ampere's Law–Faraday's Law – Gauss Law–Wave Equations – TEM / TE / TM / HE WaveDefinitions–Transmission Lines-Two wire parallel transmission lines–Voltage and current relationship on transmission lines.	12
II	**Propagation of EM Waves** Types of Waveguides – Propagation of Waves in Rectangular Wave guides–TE and TM Modes – Propagation of TM Waves in Rectangular Waveguide–TM Modes in Rectangular Waveguides.	12
III	**Oscillators and Radiating Systems** Klystrons: Two Cavity Klystron Amplifier–Multi cavity Klystron–Reflex	12

	Klystron–Traveling Wave Tube (TWT):Construction–Operation Backward Wave Oscillator–Magnetrons: Cavity Magnetron Operation–Sustained Oscillations in Magnetron–Applications Oscillating electric dipole Radiation from an Oscillating dipole–Radiation from small current element Radiation from a linear antenna (Half wave) and Antenna Arrays (Qualitative treatment).	
IV	**Interaction of EM Waves with Matter** Boundary Conditions at the interface between two media – Reflection and refraction of electromagnetic waves - Kinematic and dynamic properties – Fresnel's formula – Brewster's law and Polarisation of electromagnetic waves– Total internal reflection and critical angle –Reflection From metallic surface	**12**
V	**Relativistic Electrodynamics** Four Vectors – Transformation Relation for Charge and Current Densities - Transformation of for Electromagnetic Potentials A and Φ– Lorentz condition in Covariant Form–Invariance(covariance) of Maxwell's field equations interms of four vectors- Lorentz transformations of electric and magnetic fields-Covariance of Electromagnetic Field Tensor.	**12**

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Dr. Kulkarni. M, "Microwave and Radar Engineering"*, Umesh Publications, *Fifth Revised Edition, 2015. (UnitI-III)*
2. *Chopra & Agarwal, "ElectromagneticTheory",Nath&Co.,1984.*
3. *Satyaprakash, "Electromagnetic Theory & Electrodynamics" Kedarnath Ramnath & Co., Meerut.*

REFERENCEBOOKS

1. *Gupta, Kumar & Singh, "Electrodynamics", Pragati Prakashan-Meerut.*
2. *J.D.Jackson, "Classical Electrodynamics",WileyEastern, 3rdEdition,2004.*
3. *M.Schwartz, "Principles of Electrodynamics", McGrawHill.*
4. *Carson & Lorraine, "Introduction to EM Fields & Waves".*
5. *David J Griffiths, "Introduction to Electrodynamics", Pearson, 4thedition, 2012.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/104/108104087/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	M	M	M
CO2	S	S	S	S	M	M	M
CO3	S	S	S	S	M	M	M
CO4	M	S	M	M	M	M	M
CO5	S	S	S	S	M	M	M

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. BALAPRAKASH)	

Co-ordinator
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Coimbatore-641 028

Course Code:	21PHP09	Course Title						Batch:	2021-2022 and Onwards
		CONDENSED MATTER PHYSICS						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To impart fundamental of bonding and crystallography with associated parameters.
2. To study properties of the condensed phase of matter especially in solids.
3. To apply the knowledge on free electron, energy bands and semiconductors.
4. To predict different magnetic materials.
5. To explain the concept of ferroelectric and superconductivity.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the basics of Bonding and Crystallography.	K2
CO2	Remember the vibration and thermal properties of matter.	K1
CO3	Apply the knowledge of free electron model and band structure in metals.	K3
CO4	Analyze the behavior of different types of magnetic behaviors.	K4
CO5	Evaluate various types of ferroelectric and superconductivity.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP09	CONDENSED MATTER PHYSICS	Sem: II
Unit No.	Topics	Hours
I	**Bonding and Crystallography** Bonding: Ionic bonding–calculation of lattice energy-calculation of made lung constant in ionic crystals – Born Haber cycle – Crystals of inert gases –Vander waal's interaction – London interaction – Compressibility and bulk modulus. Crystallography: Reciprocal lattices – Vector development of reciprocal lattice – Properties of the reciprocal lattice – Reciprocal lattice to bcc lattice and fcc lattice–Bragg's condition in terms of reciprocal lattice– Brillouin zones –Ewald sphere–atomic scattering factor–Geometrical structure factor.	12
II	**Lattice Vibrations and Thermal properties** Vibration of monatomic 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 mode in one –dimension and three Dimension–Debye model of The lattice heat capacity.	12

III	**Free Electron theory, Energy Bands and Semiconductor Crystals** Band theory of solids – Bloch theorem –Kronig - Penney model – Effective mass – Free electron gas in one dimension – Energy levels and density of states– Free electron gas in three dimensions–Fermi energy–Heat capacity of the electron gas–Thermal conductivity of metals–Wiedemann–Franzlaw–Halleffect– Intrinsiccarrierconcentration.	12
IV	**Diamagnetism, Para magnetism and Ferromagnetism** Diamagnetism and Antiferromagnetism–Langevin classical theory of Diamagnetism–Weiss theory–Quantum theory of Paramagnetism– Demagnetization of a paramagnetic salt –Determination of susceptibility of para and diamagnetism using Gouy's method–Ferromagnetism–Spontaneous magnetization in ferromagnetic materials – Quantum theory of ferromagnetism – Curie-Weiss law – Weiss Molecular field – Ferromagnetic domains – The Domain Model – Domain theory –Anti ferromagnetism–Ferri magnetism– Structure of Ferrite.	12
V	**Dielectrics, Ferroelectrics and Superconductivity** Macroscopic electric field – Local electrical field at an atom – Dielectric constant and Polarizability– Clausius-Mossotti equation–Ferro electric crystals Polarization Catastrophe–Ferroelectric domains–Superconductivity – Meissner effect – Thermodynamics of Superconducting transition–London equation– Coherence length–BCS theory –Flux Quantization – Type-I and Type-II Superconductors–Josephson tunneling effect–DC and AC Josephson effect– SQUID–Superconductivity–High temperature superconductors (HTSC) -Recent developments in high Temperature Superconductivity–Application of superconductors.	12

Note: Distribution of marks: Problems %, Theory %

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Solid State Physics, S.L. Gupta and V.Kumar, Pragati Prakashan (2002).*
2. *Fundamentals of Solid State Physics, B.S.Saxena, R.C.Gupta and P.N.Saxena, Pragati Prakashan, Meerut (2010).*
3. *Solid State Physics, S.O.Pillai, New Age International Pvt.Ltd.,NewDelhi (1999).*

REFERENCE BOOKS

1. *Solid State Physics, N.W.Asherof and N.D. Mermin, Harcourt Asia Pvt. Ltd, Singapore(2001).*
2. *Solid State Physics, J.S.Blakemore, Second edition, Cambridge University Press, Cambridge, London(1974).*
3. *An Introduction to X-ray Crystallography, M.M.Woolfson, Cambridge University Press , Cambridge, London(1991).*
4. *Introduction to High-Temperature Superconductors, Thomas P.Sheahen, Plenum Press, NewYork (1994).*
5. *Introduction to Solid State Physics, C.Kittel, Fifth Edition, Wiley Eastern, NewDelhi(1977).*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/106/115106061/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	M	M	M
CO2	S	S	S	S	M	M	M
CO3	S	M	S	M	M	M	M
CO4	S	S	M	M	M	M	M
CO5	S	S	S	S	M	M	M

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Senthil)	(Dr. V. BALAPRAKASH)	Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science Coimbatore-641 028.

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Coimbatore-641 028

Course Code:	21PHP10	Course Title						Batch:	2021-2022 and Onwards
		QUANTUM MECHANICS						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To develop mathematical methods of quantum mechanics to solve physics problems.
2. To learn the basics of quantum mechanical concepts using Schrödinger equation.
3. To study basics of approximation methods.
4. To acquire knowledge Time Dependent Perturbation Theory to solve simple problems.
5. To explain the variations of angular momentum.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the mathematical foundations of quantum mechanics.	K1
CO2	Understand the Schrödinger equation using various approximation methods.	K2
CO3	Apply approximation methods to solve the Non-degenerate states.	K3
CO4	Analyse Time Dependent Perturbation Theory to solve simple problems.	K4
CO5	Evaluate the concept of Angular Momentum.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP10	QUANTUM MECHANICS	Sem: II
Unit No.	Topics	Hours
I	**Introduction & General Formalism** Inadequacy of classical Physics-Spectral Distribution in Black –Body Radiation-Einstein's Derivation of Radiation law Through A and B Coefficients–Momentum Wave function–Free particle–particle in one dimension - Wave packets – Gaussian wave packet –spread of wave packet with time-the principle of casualty uncertainty relations-Schrodinger wave Equation and probabilistic interpretation, Simple one-dimensional problems.	12
II	**Applications of Schrodinger wave equation** State Vectors-Hilbert Space- Dirac Notation- Dynamical Variables As Operators- Change of Basis-Unitary Transformation - Equation of Motion in Schrodinger Picture, Heisenberg Picture & Dirac Picture.	12
III	**Approximate Methods** Time Independent Perturbation Theory in Non-Degenerate Case-Ground State of	12

	Helium Atom-Degenerate Case-Stark Effect in Hydrogen-Variation Method & its Application to Hydrogen Molecule-WKB Approximation.	
IV	**Time Dependent Perturbation Theory** Time Dependent Perturbation Theory-First and Second Order Transitions-Transition to Continuum of States-Fermi Golden Rule Constant and Harmonic Perturbation-Transition Probabilities SelectionRulesforDipoleRadiation-Collision-AdiabaticApproximation.	**12**
V	**Angular Momentum** Orbital Angular Momentum-Spin Angular Momentum-Total Angular Momentum Operators- Commutation Relations of Total Angular Momentum with Components – Ladder Operators – Commutation Relation of Jz with J+ and J- - Eigen Values of J2, Jz - Matrix Representation of J2, Jz, J+ and J- – Addition of Angular Momenta – Clebsch-Gordon Coefficients-Properties.	**12**

Note: Distribution of marks: Problems %, Theory %

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Gupta, Kumar & Sharma, " Quantum Mechanics", 23rd Edition, 2003-2004. 2. Aruldhas, "Quantum Mechanics", 2002.

REFERENCE BOOKS

1. Quantum Mechanics- Satya Prakash

2. Quantum Mechanics-L.I. Schiff- McGraw Hill, 3rd Edition, 1968. 3. QuantumMechanics-E. Merzbacher-WileyandSons, 3rd Edition, 2004.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/122/106/122106034/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	M	S	M	M	M
CO2	S	S	M	S	M	M	M
CO3	S	M	S	S	M		M
CO4	S	M	S	S	M	M	
CO5	S	S	M	S	M	M	M

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mrs. R. Vishalashi)	(Dr. V. BALARAJASU)	Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	21PHP11	Course Title						Batch:	2021-2022 and Onwards
		8051 MICROCONTROLLER						Semester:	II
Hrs/Week:	4	L	4	T	-	P	-	Credits:	4

COURSE OBJECTIVES:

1. To enable the students to learn the instruction set of 8051Microcontroller.
2. To study the 8051 Assembly language.
3. To learn the programming in C.
4. To know the various functional units of 8051 microcontroller.
5. To understand microcontroller based system design for various applications. .

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the architecture of 8051Microcontroller.	K2
CO2	Analyze the addressing mode and Instructions set.	K4
CO3	Apply the use of Interrupts and Communication in various real time problems.	K3
CO4	Evaluate various embedded systems products for consumer and industrial applications.	K4
CO5	Analyze microcontroller based system design for various applications	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP11	8051 MICROCONTROLLER	Sem: II
Unit No.	Topics	Hours
I	**Overview of 8051** Introduction to Computing–Microprocessor and Microcontrollers – Microcontrollers and Embedded Processors – Overview of 8051 Family – 8051Architecture–Timers–Registers and Memory Organizations.	10
II	**8051 Assembly Language Programming** Inside the 8051–PinOut–Instruction Set: Addressing Modes Data Transfer Instruction–Logical Instruction–Arithmetic Instructions–Jump and Call Instructions–Bit Oriented Instructions–Flags and Stack.	10
III	**Programming with C** Data Types–Time Delay Programming–I/O Programming–Logic Operations–Arithmetic Operations – Timer Programming–Counter Programming.	10
IV	**8051Interrupts & Peripherals** 8051 Interrupts – Programming External Hardware Interrupts – 8051 Serial Communication Programming – Programming with Serial Communication	9

	Interrupts –Peripheral and Interrupt Programming in C.	
V	**Real World Applications and Case Studies** LCD Interfacing–Keyboard Interfacing–Parallel and Serial ADC Interfacing–DAC Interfacing–Sensor Interfacing and Signal Conditioning–RTC Interfacing–Relays and Opto–Isolator Interfacing–Stepper Motor Interfacing–DC Motor Interfacing and PWM.	9

Teaching Methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1.Muhammad Ali Mazidi, Janice Gillispie Mazidi and RolinD.McKinlay, "The8051Microcontroller and Embedded Systems Using Assembly and C" by PHI, 2nd Edition,2006.

REFERENCE BOOKS

1.KennethJ.Ayala, "The8051Microcontroller",DelmarCengageLearning,3rdEdition,2004.

WEBRESOURCES

Web Link: https://nptel.ac.in/courses/117/104/117104072/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	M	M	M
CO2	S	S	S	S	M	S	M
CO3	S	M	S	S	M		M
CO4	S	M	M	S	S	M	
CO5	S	S	S	S		M	

S-Strong, M-Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Balaprakash)	(Dr. V. BALAPRAKASH)	

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
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Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	21PHP12	Course Title						Batch:	2021-2022 and Onwards
		PRACTICAL III: GENERAL PHYSICS–II						Semester:	II
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To gain practical knowledge on general Physics.
2. To demonstrate the techniques used to carry out experimental physics.
3. To provide an experimental foundation for the theoretical concepts.
4. To learn how to write scientific information in a clear and concise manner.
5. To introduce new concepts and techniques which have a wide application in experimental science.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the basics of experimental physics.	K1
CO2	Understand the techniques to carry out experimental Physics.	K2
CO3	Apply the theoretical concepts to experiments.	K3
CO4	Analyse scientific information in concise manner	K4
CO5	Evaluate the data is acquired through practical applications.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP12	PRACTICAL III:GENERALPHYSICS–II	Sem: II
	Topics	**Hours**
	(Any10Experiments) 1. Determination of thermal conductivity of bad conductor–Lee's disc method 2. Determination of wavelength of spectral lines using diffraction grating. 3. To study the characteristics of photo voltaic cell. 4. Determination co-efficient of viscosity of given liquid- Poiseuille's method 5. Determination of Refractive Index of transparent solids and liquids using Laser source 6. Determination of Cauchy's constant and dispersive power of a given prism by measuring refractive index for different wavelengths. 7. Determination of the polarizability of the given liquid by measuring there refractive index at different wavelengths. 8. Determination of specific charge 'e/m' – Zeeman effect. 9. Determine the refractive index of a given liquid – Newton's ring method. 10. Thermal conductivity of rubber using calorimeter.	

11. Thermistor characteristics and Bandgap measurements 12. Matlab Programming-Newton-Raphson Method 13. Matlab Programming-Mean, Median & Standard Deviation 14. Matlab Programming-Curve Fitting & Interpolation 15. Matlab Programming-Matrix Summation, Subtraction and Multiplication	

Teaching Methods: :<Practical Demonstration>

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/115/105/115105120/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	M	M	M
CO2	S	S	M	S	M	M	M
CO3	S	M	S	S	M	M	M
CO4	S	M	S	M			
CO5	S	S	S	S	M	M	M

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh)	(Dr. V. BALAPRAKASH)	

Co-ordinator
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Coimbatore-641 028.

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Coimbatore-641 028

Course Code:	21PHP13	Course Title						Batch:	2021-2022 and Onwards
		PRACTICAL - IV:ADVANCED ELECTRONICS						Semester:	II
Hrs/Week:	5	L		T	-	P	5	Credits:	3

COURSE OBJECTIVES:

1. To study the fundamentals of Timer and interfacing various devices with 8051 Microcontroller.
2. To learn the linear and non-linear applications of operational amplifiers.
3. To introduce the applications of analog multipliers and PLL
4. To learn the theory of ADC and DAC.
5. To introduce the concepts of waveform generation and function ICs.

COURSE OUTCOMES (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall the fundaments of Timer.	K1
CO2	Understand the linear and non-linear applications operational amplifiers.	K2
CO3	Apply the operation of analog multipliers in 8051 Microcontroller.	K3
CO4	Analyze various products for real time applications using 8051 Microcontroller.	K4
CO5	Evaluate the experimental observations in waveform generation.	K4
KI- Remember, K2- Understand, K3- Apply, K4- Analyze		

SYLLABUS

21PHP13	PRACTICAL - IV:ADVANCED ELECTRONICS	Sem: II
	Topics	**Hours**
	(Any 10 Experiments) 1. Mono stable multi vibrator design using timer 2. Astable multi vibrator design using timer 3. Voltage controlled oscillator design using timer 4. Study of micro wave components and instruments 5. Reflex klystron characteristics and frequency measurement of Reflex Klystron	

6. Attenuator Characteristics of Reflex Klystron 7. Arithmetic and Logical operations using 8051 Microcontroller 8. Addition of array of 8-bit data using 8051 Microcontroller 9. Square wave generation using internal timer of 8051Microcontroller 10. Stepper motor interfacing with8051Microcontroller 11. DAC interfacing with 8051Microcontroller 12. ADC interfacing with 8051 Microcontroller 13. Matrix key board interfacing with 8051 Microcontroller 14. RTC interfacing with 8051 Microcontroller 15. DC motor interfacing with 8051 Microcontroller	

Teaching Methods: <Practical demonstration>

WEB RESOURCES

1. https://nptel.ac.in/courses/117/104/117104072/
2. https://nptel.ac.in/courses/108/101/108101094/
3. https://nptel.ac.in/courses/117/101/117101054/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	M	M	M
CO2	S	S	S	S	M	S	M
CO3	S	S	S	M	M		
CO4	S	S	M	M	M		M
CO5	S	S	S	S	M	M	M

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Dr. V. Balaprakash)	(Dr. V. BALAPRAKASH)	Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
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Coimbatore-641 028

Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 and Onwards
		VAC: Electronic Test Instruments						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To impart the knowledge of different Electronic Test Instruments
2. To understand the working of various signal sources to the students.
3. To get strong knowledge on working of digital meters.
4. Can able to study the characteristics of oscilloscope.
5. Can get familiar to interpret the working of recorders.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember fundamentals of analog DC and AC type meters	K1
CO2	Understand the working of signal sources and digital meters	K2
CO3	Demonstrate the working of Oscilloscopes and Digital meters	K3
CO4	Examine to design new electronic test instruments forindustrial needs	K4
CO5	Evaluate the functions of Digital meters and recorders	K5

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: Electronic Test Instruments	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	**Analog Meters** **DC Meters:** Voltmeter – Ammeter. **AC Meters:** Voltmeter– Ammeter. Analog Mutimeter.	6
II	**Signal Sources** Audio Frequency Generator – Function Generator – Wave Analyser – Spectrum Analyser.	6
III	**Oscilloscopes** **General Purpose Oscilloscope** – CRT – Single and Dual Trace – Storage Oscilloscope – Digital CRO.	6

IV	**Digital Meters** Digital Mutimeter – Digital Frequency Meter – Measurement of Time – Digital Tachometer – Digital pH Meter.	6
V	**Recorders** X-Y Recorder – Magnetic Recorder – Digital Data Recording – Digital Memory Waveform Recorder.	6

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Albert D. Herlfrick & William D. Cooper, "Modern electronic Instrumentation & Measurement Techniques" Prentice Hall of India,2002. (Unit –I to III).*
2. *H S Kalsi, "Electronic Instrumentation"Tata McGraw-Hill,Second Edition, 2006. (Unit–IV & V)*

REFERENCE BOOKS

1. *Joseph, J.Carr,"Elements of Electronic Instrumentation & Measurements" III edition, Pearson Education,2003.*
2. *Sawhney A.K, "A Course in Electrical and Electronic Measurements and Instrumentation" Dhanpat Rai & Co. 2015.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/105/108105153/
https://swayam.gov.in/nd1_noc19_ee44/preview

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S
CO3	S	S	M	S	S	M	S
CO4	M	M	S	M	M	S	M
CO5	M	S	S	S	S	S	S

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mrs. R. Nishalashi) Name & Signature of the Staff	(Dr. V. BALAPRAKASH) Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 and Onwards
		VAC: Verilog HDL						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To import the concepts of digital circuit design using Verilog.
2. To equip the students to develop new digital systems.
3. To determine various operators used in verilog.
4. To diagnose the additional features used in verilog.
5. To enable the students to design and interpret various digital systems.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the functionality of digital systems	K1
CO2	Analyze and synthesize digital modules and circuits for a wide application range	K2
CO3	Interpret the special features of Verilog HDL	K3
CO4	Design and implement simple digital systems using Verilog	K4
CO5	Evaluate the modeling features and examples of sequential logic	K5
K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate		

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: Verilog HDL	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	Basics: Synthesis – Design Process – Logic Value System – Verilog Constructs To Gates: Continuous Assignment Statement – Procedural Assignment Statement.	6
II	Always – If – Case – Loop Statements – Functions – Tasks – Verilog Data Types – Nets – Register – Variables – Constants – Array Of Nets Or Registers.	6
III	Verilog Operators – Arithmetic – Bitwise – Reduction –Logical –Relational – Shift Conditional – Concatenation – Expressions And Operands – Operator Precedence.	6

IV	Additional Features of Verilog – Arrays of Primitives and Modules – Hierarchical Dereferencing – Parameters Substitution – Procedural Continuous – Intra Assignments – In Determinant Assignments and Race Condition – Wait Statements – Fork Join Statements.	**6**
V	Modeling Examples – Modeling Combinational Logic – Modeling sequential logic – modeling a memory – writing Boolean equations – Modeling a counter.	**6**

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. J.Bhasker, " Verilog HDL Synthesis, A Practical Primer" , BS Publication, Ist Indian Edition, 2008. (Unit–I to V)

REFERENCE BOOKS

1. Micheal D. Ciletti, "Advanced Digital Design With The Verilog HDL", PHI Publications, Indian reprint, 2014.

2. Morris Mano, "Digital Design with Verilog HDL", Pearson Education, Fifth Edition, 2016.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/106/105/106105165/
https://nptel.ac.in/courses/106/105/106105083/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S
CO3	S	S	M	S	S	M	S
CO4	S	M	S	M	M	S	M
CO5	M	S	S	S	M	S	S

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N.Suresh)	(Dr.V. BALAPRAKASH)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 and Onwards
		VAC: Bioelectronics						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To impart the fundamentals of Bioelectronics
2. To get strong knowledge about electrical properties of Bio-Medical Instrumentation.
3. To enable the students to determine the features of bio nano machines.
4. To analyze about the energy conservation scheme.
5. To estimate the importance of medical applications of bio-electronics.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the principles of Bioelectronics	K1
CO2	Interpret the features of bio nano machines	K2
CO3	Apply energy conservation scheme in bioelectricity generation	K3
CO4	Analyze the cellular components of human body	K4
CO5	Evaluation of various bioelectronics equipments	K5
K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate		

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: Bioelectronics	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	Overview of bioelectronics - the interactions between electronics and biomedical science -The fundamental properties of ions in the solution	6
II	The electrical properties of cellular components: lipid bilayer and membrane proteins - Natural nanoconductors: ion channels and pumps	6
III	Energy conversion scheme in the bioelectricity generation of the cell - Single channel recording: measurement and noise	6

IV	Patch clamp amplifier - Electronics of low noise current detection - Biomimetic versions of natural nanoconductors - Functional bionanomachines.	6
V	Medical applications of bioelectronics: ECG – EEG – EMG - Pre-clinical and clinical testing of bioelectronic technology	6

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *Bertil Hille, "Ion Channels of Excitable Membrane", Sinauer Associates, Inc., 2001.*
2. *Chandran Karunakaran, Kalpana Bhargava, Robson Benjamin, "Biosensors and Bioelectronics" 1st Edition,2009.*

REFERENCE BOOKS

1. *Wolfgang Hanke and W. R. Schlue, "Planar Lipid Bilayers: Methods and Applications", Academic Press, 2001*
2. *C.P. Wong, Kyoung-Sik Moon, "Nano Bio-Electronic, Photonic & MEMS Packaging, Springer, 2010.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/106/105/106105165/
https://nptel.ac.in/courses/106/105/106105083/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	M	M	S	S	S	M	M
CO5	S	S	S	S	M	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr. V. Senthil)	(Dr. V. BALAPRAKASH)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
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Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 & Onwards
		VAC: Materials Characterisation						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To recall the fundamentals of Materials Surface.
2. To understand about the morphology and thermal characterization techniques.
3. To classify the working principle of thermal analysis techniques.
4. Can able to explain about microscopy technique to observe microstructure.
5. To enable the students to interpret the surface characterization.

COURSE OUTCOME (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Students can recall the importance and classification of Characterization Techniques	K1
CO2	Student can describe the uses of vacuum systems in MaterialCharacterization techniques	K2
CO3	Student can classify the working of Thermal Analysis techniques	K3
CO4	Student can analyze microscopy techniques to observe the microstructure	K4
CO5	Evaluate the diffraction of method used in crystal structure	K5

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: Materials Characterization	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	Introduction to materials and methods – Fundamentals of Materials Characterization – Basic operation – Sample preparation and interpretation of data. Basic failure analysis of materials using different characterization equipment.	6
II	Thermal Analysis techniques: Principle - Working and application of DTA – TGA - TMA - DSC.	6

III	Spectroscopic Techniques for chemical analysis: UV-Visual (UV-VIS) – IR - FTIR - EDS – WDS - X-ray Fluoroscopy (XRF) - Atomic absorption spectrometer (AAS).	6
IV	Diffraction method: Brags Law - X-ray diffraction methods - Determination of crystal structure - lattice parameter - crystallite size - merits and demerits.	6
V	Surface characterization: XPS (ESCA) – UPS - Auger Electron Spectroscopy - Electron Probe Micro Analysis (EPMA) - LEED.	6

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. *F. Weinberg Editor, Tools & Techniques in Physical Metallurgy, Vol. I & II, Marcel Dekker*
2. *John P. Sibilia, A guide to Material Characterization & Chemical Analysis, VCH Publishers, 1988.*

REFERENCE BOOKS

1. *J.M. Walls, Editor, Methods of Surface Analysis : Techniques & Applications, Cambridge University Press, 1990.*
2. *B.D. Cullity, Elements of X-ray diffraction, Addison-Wesley Publishing Company, INC,.*

WEB RESOURCES

Web Link: https://www.energy.gov/eere/education/eere-energy-101-video-series

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

Follows common pattern of Internal Assessment, suggested in the Regulations.

ASSESSMENT PATTERN (if deviation from common pattern)

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Ms. R. Amirthavalli)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
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Co-ordinator
Curriculum Development Cell
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Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 & Onwards
		VAC: IoT and its Applications						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To import the concepts of Internet of Things (IoT)
2. To understand the Programming concept used for different devices for new applications.
3. Can able to analyze communication protocols.
4. To enable the students to examine an architecture and implement various applications.
5. Able to evaluate the opinions on IoT applications.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Enumerate the concept of Internet of Things (IoT)	K1
CO2	Understand the communication protocols used for IoT applications.	K2
CO3	Correlate the most appropriate IoT Devices and Sensors based on Case Studies.	K3
CO4	Diagnose the implementation of various applications	K4
CO5	Evaluate the architecture reference model.	K5
K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate		

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: IoT and its Applications	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	The Internet of Things Today – Time for Convergence – Towards the IoT Universe – Internet of Things Vision – IoT Strategic Research and Innovation Directions – IoT Applications – Future Internet Technologies – Infrastructure – Networks and Communication.	6
II	M2M Value Chains – IoT Value Chains – An emerging industrial structure for IoT – M2M to IoT – An Architectural Overview – Building an architecture – Main design principles and needed capabilities.	6

III	State of the Art – Introduction State of the art – Architecture ReferenceModel – Introduction – Reference Model and architecture – IoT reference Model – IoT Reference Architecture – Functional View – Information View –Deployment and Operational View.	6
IV	Introduction IoT applications for industry: Future Factory Concepts –Brownfield IoT – Smart Objects – Smart Applications – IoT for Retailing Industry – Opinions on IoT Application – Home Management – E-Health.	6
V	Overview of Governance – Privacy and Security Issues – Contribution fromFP7 Projects – Security – Privacy and Trust in IoT – Data-Platforms for Smart Cities.	6

Teaching methods: Power Point Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (Unit–I to V)

REFERENCE BOOKS

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1 st Edition, Apress Publications, 2013.
2. Dhotre I.A, "IoT & its Applications", Technical Publications, 2021.

WEB RESOURCES

Web Link: https://github.com/connectIOT/iottoolkithttps://www.arduino.cc/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr. V. Senthil)	(Dr. V. BALAPRAKASH)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science
Coimbatore-641 028.

Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 & Onwards
		VAC: Electric Vehicle Design						Semester:	I / II / III
Hrs/Week:	2	L	2	1	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To enhance the student's to remember the proper assembly and design of electric vehicle.
2. Helps to learn and describe different components of vehicle design.
3. To derive the dynamics of vehicle motion
4. Can able to examine hybrid electric vehicle.
5. To get strong knowledge to explain the vector control of AC motors.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember fundamentals of Vehicle mechanics and Laws of Motion	K1
CO2	Understand the Dynamics of Vehicle Motion	K2
CO3	Analyze the working of DC and AC machines	K3
CO4	Able to examine Hybrid Electric Vehicle for commercial needs	K4
CO5	Evaluate vector control of AC motors	K5
K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate		

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: Electric Vehicle Design	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	Electric vehicle system – Components of an Electric vehicle system – Historical perspective of EV system – EV Advantages – EV Market. Vehicle mechanics – Laws of Motion.	6
II	Vehicle Kinetics – Dynamics of Vehicle Motion – Propulsion power – Velocity and Acceleration – Propulsion system design. Energy Source: Battery – Alternative Energy Sources.	6
III	Motor and engine ratings – EV and HEV motor requirements – DC machines – AC machines and their types – PM and SR machines – Switched Reluctance Machines.	6

IV	AC drives – Vector control of AC motors – SR motor drives – Electric Vehicle Drivetrain – EV transmission configurations – Ideal Gear box – EV motor sizing- Aluminium air battery.	6
V	Hybrid Electric Vehicle – Types – Internal combustion engines – Design of an HEV – Hybrid Drivetrains – Rated Vehicle velocity – Initial Acceleration – Maximum velocity – Maximum Gradability.	6

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Iqbal Husain, "Electric and Hybrid Vehicles Design Fundamentals", CRC Press, 2003. (Unit –I to V).

REFERENCE BOOKS

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.
2. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003.

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/108/102/108102121/
https://nptel.ac.in/courses/108/103/108103009/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
(Mr. N. Suresh) Name & Signature of the Staff	(Dr. V. BALAPRAKASH) Name & Signature	Name & Signature

Co-ordinator
Curriculum Development Cell
Hindusthan College of Arts & Science
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 & Onwards
		VAC: Ocean Electronics						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To import the concepts of Ocean Electronics
2. To equip the students to explore the design knowledge on Ocean Electronics.
3. To get familiar with Oceanographic Instruments.
4. To enable the students to learn about under water wireless communication.
5. To get strong knowledge about architecture of oceanographic wireless sensor networks

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall the concept of Remote sensing	K1
CO2	Understand and synthesize the characteristics of sensorsystems	K2
CO3	Classify the features of underwater communication and wireless sensor networks	K3
CO4	Diagnose and implement Oceanographic Instruments	K4
CO5	Evaluate under water mobile communication	K5

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: Ocean Electronics	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	Introduction to Remote Sensing – Remote Sensing Vs SONAR – Applications of Remote Sensing – NADIR Radar System – Microwave Radiometer – Applications of Telemetry	6
II	Introduction to Sensors – Scanner Sensor Systems – Spatial Resolution, pixel size and scale – Marine Observation Satellite Sensors (MOS) – Measurement of Ocean Colour – Surface Currents	6
III	Underwater wireless Communication – Acoustic Communication – Optical Communication – LASER sensor architecture – MEMS approach – Underwater mobile communication	6

IV	Oceanographic wireless sensor networks – Common WSN Architecture – General sensor node – Energy Harvesting – Wireless underwater sensor network – Acoustic sensor network	6
V	Oceanographic Instruments – Instruments and measured parameters – Oceanographic Instrumentation – Marine magnetometer – Submersible Incubation Device – Deep Ocean Tsunami Detection Buoy	6

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. S.R. Vijayalakshmi & S. Muruganand, "Ocean Electronics", Overseas India Private Limited, 1st Edition. (Unit–I to V)

REFERENCE BOOKS

1. *V.Chander & P.R.S. Pillai, "Ocean Electronics", Allied Publishers Private Limited, 1st Edition.*
2. *Erik Dahlman, "5G: The Next Generation Wireless Access Technology", First Edition, Academic Press, 2018.*

WEB RESOURCES

Web Link: https://nptel.ac.in/courses/114/105/114105002/
https://freevideolectures.com/subject/ocean-engineering/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mrs. R. Nshalashi) Name & Signature of the Staff	(Dr. V. BALAPRAILAKSHMI) Name & Signature	Name & Signature

Co-ordinator
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Hindusthan College of Arts & Science,
Coimbatore-641 028.

Head of the Department
Department of Physics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	Course Title						Batch:	2021-2022 & Onwards
		VAC: Artificial Intelligence using Raspberry Pi						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To recall the programming concepts of Artificial Intelligence
2. To get thorough knowledge in understanding of Raspberry Pi.
3. Can able to determine the features of Raspberry Pi
4. To design and implement various applications.
5. Can able to evaluate machine learning algorithm.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the concept of artificial Intelligence	K1
CO2	Describe neural networks used in Raspberry Pi	K2
CO3	Classify the features of Office database used in animal identification	K3
CO4	Design and examine various algorithms used in machine learning	K4
CO5	Evaluate Hopfield network used in realtime applications	K5

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

21PHPV01/ 21PHPV02/ 21PHPV03/ 21PHPV04	VAC: Artificial Intelligence using Raspberry Pi	Sem: I / II / III
Unit No.	**Topics**	**Hours**
I	AI Historical Origins –Intelligence - Strong AI vs. Weak AI, Broad AI vs. Narrow AI – Reasoning -AI Categories - AI and Big Data.	6
II	Boolean Algebra -Expert Systems -Raspberry Pi Configuration - Installing Prolog on a Raspberry Pi -Introduction to Fuzzy Logic -Problem Solving - Machine Learning -Neural Networks -Evolutionary Computing.	6

III	Office Database - Animal Identification - tic-tac-toe - Cold or Flu Diagnosis - Expert System with Raspberry Pi GPIO Control : Installing PySWIP - Hardware Setup -Rpi.GPIO Setup - Expert System with LED Control.	**6**
IV	Machine Learning: -Demo: Color Selection –Algorithm -Roulette Wheel Algorithm -Demo: Autonomous Robot: Autonomous Algorithm -Test Run - Additional Learning.	**6**
V	Hopfield Network –Demo: Numerical Figure Recognition Demonstration - Autonomous Robot Car Using ANN -Python Control Script for the Obstacle-Avoiding -Robot Car -Light-Seeking Robot.	**6**

Teaching methods: Power Point Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Beginning Artificial Intelligence with the Raspberry Pi, Authors, Donald J. Norris, Barrington, New Hampshire, USA ISBN-13 (pbk): 978-1-4842-2742-8,Apress. *(Unit–I to V)*

REFERENCE BOOKS

1. Francis X. Govers , "Artificial Intelligence for Robotics: Build intelligent", First Edition, 2018.
2. Russell, "Artificial Intelligence: A Modern Approach", Pearson Education, Third Edition, 2015.

WEB RESOURCES

Web Link: https://www.raspberrypi.org/raspberry-pi-store/

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	M	S	S
CO3	S	S	M	S	S	M	S
CO4	M	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of internal assessment, suggested in the Regulations

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mr. N. Suresh)	(Dr. V. Balaprakash)	
Name & Signature of the Staff	Name & Signature	Name & Signature

Co-ordinator
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