LEARNING OUTCOMES–BASED CURRICULUM FRAME WORK (LOCF)

In the

POST GRADUATE PROGRAMME M.Sc., PHYSICS

FOR THE STUDENTS ADMITTED FROM THE ACADEMIC YEAR 2022-2023 AND ONWARDS

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICAS

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
(Affiliated to Bharathiar University and Accredited by NAAC)
COIMBATORE-641028
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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-longlearning.

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 2022-2023 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									
22PHP01	DSC	Mathematical Physics	4	5		3	50	50	100
22PHP02	DSC	Classical Mechanics	4	5		3	50	50	100
22PHP03	DSC	Electromagnetic Theory	4	5		3	50	50	100
22PHP04	DSC	Integrated Electronics	4	4		3	50	50	100
22PHP05	DSC	**Practical I:** General Physics–I	3		5	5	50	50	100
22PHP06	DSC	**Practical II:** General Electronics	3		5	5	50	50	100
22PHP07	SEC	Internship / Institutional Training / **Mini-Project**	2	-			100	-	100
22PHPE01	AEE	Open Elective – I	2	3			100		100
22PHPV01	ACC	VAC-I	1*	2			50	-	50**
22PHPJ01	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**		**500**	**300**	**800**
Semester – II									
22PHP08	DSC	Thermodynamics and Statistical mechanics	4	5		3	50	50	100
22PHP09	DSC	Condensed Matter Physics	4	5		3	50	50	100
22PHP10	DSC	Quantum Mechanics	4	5		3	50	50	100
22PHP11	DSC	8051 Microcontroller	4	4		3	50	50	100
22PHP12	DSC	**Practical III:** General Physics –II	3		5	5	50	50	100
22PHP13	DSC	**Practical IV:** Advanced Electronics	3		5	5	50	50	100
22PHP14	SEC	Internship / Institutional Training / **Mini-Project** / Extension Activity	2	-			100	-	100
22PHPE02	AEE	Open Elective – II	2	3			100		100
22PHPV02	ACC	VAC-II	1*	2			50	-	50**
22PHPJ02	SEC	**Online Courses**	Grade*				-	-	C/NC

22PHPJ03	SEC	**Aptitude / Placement Training**	Grade*	2			50		50**
		Total	**26**	**26**	**10**		**500**	**300**	**800**
Semester – III									
22PHP15	DSC	Nuclear and Particle Physics	4	4		3	50	50	100
22PHP16	DSC	Atomic and Molecular Spectroscopy	4	5		3	50	50	100
22PHP17	DSC	Communication systems	4	5		3	50	50	100
22PHP18	DSC	**Practical III:** Advanced Physics	3		5	5	50	50	100
22PHP19A / 22PHP19B	DSE	Elective –I	3	3			50	50	100
22PHP20A / 22PHP20B	DSE	Elective –II	3	3			50	50	100
22PHP21	DSC	**Practical IV:** Communication Systems	2		4	5	50	50	100
22PHP22	SEC	Internship / Institutional Training / **Mini-Project /** Extension Activity	2	-			100	-	100
22PHPE03	AEE	Open Elective-III	2	3			50	50	100
22PHPV03	ACC	VAC-III	1*	2			50	-	50**
22PHPJ04	SEC	**Aptitude / Placement Training**	Grade*	2			50		50**
22PHPJ05	SEC	**Online Courses**	Grade*				-	-	-
22PHPJ06	SEC	SDR – Student Development Record	2*	-	-	-	-	-	-
		Total	**27**	**27**	**9**		**500**	**400**	**900**
Semester – IV									
22PHP23A / 22PHP23B	DSE	Elective – III	3	5		3	50	50	100
22PHP24A / 22PHP24B	DSE	Elective – IV	3	5		3	50	50	100
22PHP25	SEC	**Self-Study Course**	3	-	-		-	100	100
22PHP26	SEC	**Project Work /Student Research**	6	-			100	100	200
		Total	15	10			200	300	500
		Grand Total	94 + 5* Extra Credits				1700	1300	3000 + 300**

- * 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%

ABSTRACT FOR SCHEME OF EXAMINATIONS

(For the Candidates admitted during the academic year 2022- 2023 and onwards)

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 & VAC / JOC		
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 Campus to Corporate Start-up Business Research Methodology and IPR General Studies for Competitive Examinations IIT JAM Examination (for Science only) CUCET Examination Special Tamil Special English	
	Courses offered by the Departments to other Programmes	

Note: VAC / JOC courses can be added along with the above open electives

List of Elective Papers/DSE (Can choose anyone of the paper as electives)		
Electives / **DSE-I**	Course Code	Title
	22PHP19A	Nano Science and Technology
	22PHP19B	Experimental Techniques and Data Analysis
Electives / **DSE-II**	22PHP20A	Laser and Optics
	22PHP20B	Plasma Physics
Electives / **DSE-III**	22PHP23A	Solid state Physics
	22PHP23B	Electronic Instrumentation
Electives / **DSE-IV**	22PHP24A	Materials Characterization
	22PHP24B	Computational Physics

Syllabus Coordinator
Dr. D. SIVAGAMI

Academic Council – Member Secretary

Dr.V.BALAPRAKASH,M.Sc.,M.Phil.,Ph.D., NET.,
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BOS-Chairman/Chairperson

PRINCIPAL

PRINCIPAL
Hindusthan College of Arts & Science (Autonomous),
Hindusthan Gardens, Behind Nava India,
Coimbatore - 641 028.

PG Scheme of Evaluation (Internal & External Components)

(For the students admitted during the academic year 2022-2023 and onwards)

1. Internal Marks

Components	Marks
Test	15
Model Exam	15
Internal Assessment components	20 #
TOTAL	50

 # List of components for Internal Assessment

S.No	Components
1	Multiple choice questions
2	Video teach
3	Co-operative or Collaborative Learning
4	Mini Project/Assignment
5	Case study
6	Seminar
7	Role Play
8	Management Games

(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	15
Test - II	15
Observation	10
Application*	10
Total	50

b) Components for Practical E.E.

Components	Marks
Experiments/Exercise	40
Record	5
Viva	5
Total	50

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

Internships/Industrial Training (I.E)		Mini Project (I.E)	Major Project Work		
Component	**Marks**		**Component**	**Marks**	**Total Marks**
Work diary	25	-	I.E a)Attendance	20	
Report	50	50	b)Review	30	100
Viva-voce	25	50	c) Report	25	
			d)MocViva-Voce/ Presentation	25	
Total	100	100	**E.E***		
			a) Final report	60	100
			b)Viva-voce	40	
				Total	200

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

4. Value Added Courses and Aptitude/Placement courses:

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

5. Guideline for Open Elective

Two tests(each 2 hours) of 50 marks each 15 out of 8 descriptive type questions 5x10=50 Marks	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's4 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 programmes. It must be enclosed in the practical record.

For all **PG/MBA/MCA** *Programmes* *(2022-2023Regulations)*

QUESTION PAPER PATTERN FOR CIA EXAM

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

HINDUSTHAN COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)

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

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

BRANCH: ----------

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

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

Section-A (4 x 4=16 Marks)

Answer **ALL** Questions

ALL questions carry **EQUAL** Marks

(Q.No: 1 to 4 Either Or type)

Section-B (3 x 8=24 Marks)

Answer any **THREE** Questions out of **FIVE** Questions

ALL questions carry **EQUAL** Marks

(Q.No: 5 to 9)

Section-C (1 x 10=10 Marks)

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

(Q.No: 10)

QUESTION PAPER PATTERN FOR MODEL / END SEMESTER EXAM

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

HINDUSTHAN COLLEGE OF ARTS & 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)

Blue Print of Question Paper for all PG Programmes

(For the academic year 2021-22, 2022-23)

FOR CIA I - QUESTION PATTERN — **Max. Marks:50**

Sec	Question No	Type	No of Question	Questions to be answered	Mark per question	K-level
A	1 to 4	Either or Type (a or b)	8	4	4 (4x4=16)	2 Questions will be in K1 4 Questions will be in K2 2 Questions will be in K3
B	5 to 9	Open choice	5	3	8 (3x8=24)	2 Questions will be in K3 2 Questions will be in K4 1 Questions will be in K5
C	10	Compulsory	1	1	10 (1x10=10)	1 Question will be in K5

FOR MODEL/ESE - QUESTION PATTERN — **Max. Marks:60**

Sec	Question No	Type	No of Questions	Questions to be answered	Mark per question	K-level
A	1 to 5	Either or Type (a or b)	10	5	4 (5x4=20)	2 Questions will be in K1 4 Questions will be in K2 4 Questions will be in K3
B	6 to 10	Open choice	5	3	10 (3x10=30)	2 Questions will be in K3 2 Questions will be in K4 1 Questions will be in K5
C	11	Compulsory	1	1	1 (1x10=10)	1 Question will be in K5

Distribution of section-wise marks with K levels for PG 2021-22, 2022-23

CIA - PG								
Sec.	K1	K2	K3	K4	K5	Total questions	Questions to be answered	Total marks
A- Either or type	2	4	2			8	4	4X4=16
B - Open choice			2	2	1	5	3	3X8=24
C- Compulsory Question					1	1	1	1X10=10
Total Marks	8	16	16	16	18			84
% of marks without choice	9.52	19.05	19.05	119.05	21.43			100

Model Exam - PG								
Sec.	K1	K2	K3	K4	K5	Total questions	Questions to be answered	Total marks
A- Either or type	2	4	4			10	5	5X4=20
B - Either or type			2	2	1	5	3	3X10=30
C – Compulsory Question					1	1	1	1X10=10
Total Marks	8	16	36	20	20			100
% of marks without choice	8	16	36	20	20			100

PG Programme Regulations for the academic year 2022-2023

1. Internal marks components for all the candidates admitted from the academic year 2022-2023 and onwards is as follows.

For Theory courses

Components	Marks
Test	15
Model Exam	15
Internal Assessment components	20
TOTAL	50

For Practical courses

Components	Marks
Test –I	15
Test – II	15
Observation/Excercise	10
Application*	10
TOTAL	50

2. Pattern of question paper for External Examination will be maximum of 60 marks for all theory courses. The marks obtained will be converted into 50 marks as per the scheme.
3. Passing minimum marks for all PG programme is 50 % in internal and 50% in External and the composition of total 50 marks out of 100 marks.
4. 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. Distribution of marks for major project work for all PG Programmes will be of 50:50 pattern for both Internal and External in total of 200 marks.
5. Internship / Institutional Training / Mini-Project/ Extension Activity is related to the discipline. The students can be permitted to complete the Internship / Institutional Training / Mini-Project/ Extension Activity before the end of respective semesters (end of I, II and III semester) and submit a report.

Internship / Institutional Training/ Extension Activity	Not more than seven days
Mini project	During the course of study for not more than seven days.

6. For fully internal subjects, Two test will be conducted one at the time of CIA I and the other will be during Model Examinations.
7. Retest for the failure candidates in the above case should be conducted immediately before the End Semester Examinations.
8. For the Theory cum Practical blended courses, 50:50 Internal and External pattern will be followed for theory examination and Fully Internal pattern will be followed for Practical examination. For theory part, External examination will be conducted as regular pattern (max of 70 marks) and it will be converted into 25 marks.

Course	Internal Marks		External marks		Total marks (Max. marks 50)	
	Min.	Max.	Min.	Max.	Min.	Max.
Theory	12.5	25	12.5	25	25	50
Practical	25	50	-		25	50

For Practical components for Theory cum Practical courses (Fully Internal)

Components	Marks
Test I	10
Test II	10
Experiment/Exercise	20
Record	5
Viva	5
Total	**50**

The Internal mark 50 will be converted into 25.

11. For the candidates admitted under the Fast Track System (FTS) must register their names to their concerned department heads and get approval from the COE office at the beginning of the II semester.

12. Self Study will be a Core Paper of the department for which the examination pattern of other theory subjects is followed.

13. Online courses is incorporated as a non-credit skill enhancement course for the III and IV 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).

14. 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).

15. Open elective courses:

Departments can offer list of subjects which teaches moral ethics to the young community for the better future. The topics relevant to Indian ethics, Culture, Women rights, Yoga, Green farming, Indian constitution etc., as an open elective courses. These courses can be offered by the department or other department as inter department courses. Marks earned for this subject will not be included for the CGPA calculation.

Regulations of Fast Track System (FTS)

- From the academic year 2021-22, our college is offering Fast Track System (FTS) for all UG and PG programmes. In this system, we are offering two courses under the course type of Discipline Specific Elective (DSE) in the sixth semester for all UG programmes and fourth semester for all PG programmes, which are equivalent and related with **National Programme on Technology Enhanced Learning/Study Webs of Active-Learning for Young Aspiring Minds** (NPTEL/SWAYAM) courses.

- The students have the option of taking two subjects of the sixth semester of their programme through NPTEL/SWAYAM portal from the list given by NPTEL and can complete the online course before fifth semester and submit the received original certificates to the COE office for getting approval. If the student completes these courses before the beginning of the sixth semester (UG)/fourth semester (PG), the candidate can be considered and exempted to write the examination from the assigned DSE courses in the sixth semester/fourth semester. They should complete only the self study course and project work during the VI/IV semester as assigned in the scheme. The candidate who completes the online courses and submits the successful course completion credentials, the credit transfer will be considered as per our Scheme of Examination for qualifying the degree. **The minimum duration of the registered online course must be 12 weeks.** Course duration of less than 12 weeks will not be considered.

- For all PG programmes, the candidates who were admitted during the academic year 2021-2022 under the Fast track system, for the self study course, the internal mark component will be as follows. For others regular internal pattern follows.

TEST	Max. Marks	Mode
CIA I	50 (50x1=50)	Online objective type
Model Exam.	50 (50x1=50)	Online objective type

Out of these two tests, the total marks will be converted into 40 marks as Internal.

- For all UG programmes, the candidates who were admitted during the academic year 2021-2022 under the Fast track system, for the self study course, the internal mark component will be as follows. For others regular internal pattern follows.

TEST	Max. Marks	Mode
CIA I	50 (50x1=50)	Online objective type
CIA II	50 (50x1=50)	Online objective type
Model Exam.	50 (50x1=50)	Online objective type

Out of three tests, the total mark will be converted into 30 marks as Internal.

- For the students admitted in Fast Track System, must enroll their names to the concerned department heads and get approval from the COE office at the beginning of III semester for all UG Programmes and at the beginning of II semester for all PG programmes.

- The students who cleared and got certified for online courses under the fast track system, the grade obtained will be converted into average marks of range. The received certificates must be submitted to the COE office for approval of the Controller and the Principal. The FTS courses will be treated as fully external.

DEPARTMENT OF PHYSICS				CLASS: I M.Sc.				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22PHP01	MATHEMATICAL PHYSICS	4	5	50	50	100

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

Course Objectives

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

Unit	Course Contents	Hours	K Level
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.	13	Up to K5
II	**Complex Variable Theory** Functions of a Complex Variable-Single and Multivalued Functions –Cauchy-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.	13	Up to K5
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.	13	Up to K5
IV	**Fourier Series & Laplace Transforms** Fourier Series-Dirichlet's Theorem-Change of Interval-Complex Form Fourier Series in the Interval (0, ∞)-Uses of Fourier Series Laplace Transform: Definition–Properties Translation Property. Inverse Laplace Transform-Properties, example problems.	13	Up to K5
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.	13	Up to K5

Note: The Questions should be asked in the ratio of 30% for problems and 70 % for theory.

Book for Study

1. SatyaPrakash, "**Mathematical Physics**", Sultan Chand & Sons, 2021. (Unit:1 to 2)
2. B.D. Gupta, "**Mathematical Physics**", Vikas Publishing House, 3rd Edition, 2006.

   (Unit: 3 to 5)

Books for Reference

1. B.S. Rajput, "**Mathematical Physics**", Pragati Prakashan, Meerut, 17th Edition, 2004.
2. M.K. Venkataraman, "**Numerical Methods in Science & Engineering**", National Publishing, Chennai, 1986.
3. A.W. Joshi, "**Elements of group theory for Physicists**", Wiley Eastern, 2002.
4. P.K. Chattopadhayay, **"Mathematical Physics"**, NewAge International, NewDelhi, 2013.
5. P.P. Gupta, Yadav & Malik, **"Mathematical Physics"**, Kedarnath Ramnath-Meerut, 1984.

Web Resources (any two web resources)

1. ***https://nptel.ac.in/courses/115/106/115106086/***
2. ***https://www.khanacademy.org/math/algebra-home/alg-complex-numbers***

Pedagogy: Chalk & Talk, Exercise, Assignments & Power Point Presentation.

Rationale for Nature of the Course: Mathematical methods can be used to solve the problems in physics.

Activities to be given

1. Assignment on Linear space.
2. Preparing the students to appear various exams by giving advanced exercise and workout problems on relevant mathematical methods.

Name of the Course Designer: Mrs.R. Vishalashi

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K – Level
CLO 1	Remember the concept of Special functions in mathematical physics.	Up to K5
CLO 2	Understand the principles of complex variable theory.	Up to K5
CLO 3	Apply the functions of linear space in various applications.	Up to K5
CLO 4	Analyze the basic concept of Fourier transform and Laplace transform in theoretical mechanics and quantum mechanics.	Up to K5
CLO 5	Evaluate the concept of group theory in Quantum mechanics and electromagnetism.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	2	3	2	2	2
CLO 2	3	3	2	2	2	2	2
CLO 3	3	2	2	2	2	2	2
CLO 4	3	2	2	2	2	2	2
CLO 5	3	3	2	2	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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

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

DEPARTMENT OF PHYSICS				CLASS: I M.Sc.				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**Ext**	**Total**
I	DSC	22PHP02	CLASSICAL MECHANICS	4	5	50	50	100

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

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 in rigid body.

Unit	Course Contents	Hours	K Level
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.	13	Up to K5
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 - Principle of Least Action and Proof-Canonical Transformations-Generating Function and different forms.	13	Up to K5
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.	13	Up to K5
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-Effects of Coriol is force on the moving bodies.	13	Up to K5
V	**Rigid body dynamics**	13	Up to

	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.		K5

Note: The Questions should be asked in the ratio of 20% for problems and 80 % for theory.

Book for Study

1. S.L.Gupta, V. Kumar & H.V.Sharma, "**Classical Mechanics**", Pragati Prakashan, Meerut, 2003. (Unit: 1 and 2).
2. J.C. Ubadhyaya, "**Classical Mechanics**", Himalaya Publishing House, 2012. (Unit:3,4 and 5)

Books for Reference

1. Kamal Singh &S.P. Singh, "**Elements of Statistical Mechanics**", S.Chand & Company, NewDelhi, 1999.
2. H. Goldstein, "**Classical Mechanics**", Addison Wesley, London, 1996.
3. G. Aruldhas, "**Classical Mechanics**", PHI Learning, 2013.
4. Kibble, T. W.; Berkshire, "**Classical Mechanics**" Imperial College Press, 2004.
5. Morin, David, "**Introduction to Classical Mechanics: With Problems and Solutions**" Cambridge University Press, 2005.

Web Resources (any two web resources)

1. **https://nptel.ac.in/courses/115/105/115105098/**
2. **https://nptel.ac.in/courses/112104114**

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: This course can be used for how matter and forces exist and interact in a macroscopic objects.

Activities to be given

1. Assignment on Hamiltonian theory.
2. Preparing the students to appear professional courses by giving advanced theory and workout problems on relevant mechanics.
3. Prepare advanced problems on classical mechanics.

Name of the Course Designer: Mr.N. Suresh

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K – Level
CLO 1	Remember the Lagrangian formalism.	Up to K5
CLO 2	Understand Hamiltonian formalism and the physical parameters.	Up to K5
CLO 3	Analyze the Hamilton-Jacobi Method and theoretical problems of classical mechanics.	Up to K5
CLO 4	Apply the concept of planar and spatial motion of a rigid body.	Up to K5
CLO 5	Evaluate two body problems and rigid body dynamics.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CLO 1	3	3	2	3	2	2	2
CLO 2	3	2	2	2	2	2	2
CLO 3	3	2	2	2	2	2	2
CLO 4	3	2	2	2	2	2	2
CLO 5	3	3	2	2	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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.

DEPARTMENT OF PHYSICS				CLASS: I M.Sc.				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22PHP03	ELECTROMAGNETIC THEORY	4	5	50	50	100

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

Course Objectives

1. To learn the 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.

Unit	Course Contents	Hours	K Level
I	**Electrostatics** The electric charge-Electric charge density-Coulomb's law-Electric intensity-Electric potential-Gauss law- Multipole Expansion of a charge distribution-Dielectric and its polarization-External field of a dielectric medium-The electric field inside a dielectric-Electric displacement, dielectric constant, polarisibility, electronic polarisibility, ionic and atomic polarisibility, Polarisation of Non-polar molecules, Polarization of polar molecules-Electrostatic energy.	13	Up to K5
II	**Electrostatics in macroscopic media** Introduction- Boundary Conditions-Method of separation of variables in Cartesian coordinates- Method of separation of variables in cylindrical coordinates-Image method-Point charge near an infinite grounded conducting plane-Point charge near a conducting sphere-Method of separation of variables in spherical coordinates-Green's function method.	13	Up to K5
III	**Magnetostatics** Current Density-Ampere's law of force, Biot-Savart Law-Ampere's Circuital Law-Force on current carrying conductors and charges: Force between two parallel wires, Force on a point charge moving in a magnetic field-Magnetic scalar potential-Magnetic vector potential-Multiple expansion of a current distribution or vector potential A-Magnetic dipole in a uniform field-Magnetisation and magnetization current-Magnetic intensity-Magnetic circuit.	13	Up to K5

IV	**Electromagnetics** Introduction-Equation of Continuity-Maxwell's postulate, Displacement Current-Physical interpretation of Maxwell's postulate-Maxwell's equations and their empirical basis-Derivation of Maxwell's equation-Maxwell's equations in integral form-Maxwell's equations in some particular cases-Electromagnetic energy, Poynting's theorem-Poynting Vector-The wave equation-Plane electromagnetic waves in free space.	13	Up to K5
V	**Relativistic Electrodynamics** Four Vectors- Lorentz transformations of space and time in four vector form-Transformation for Charge and Current Densities-Transformation of for Electromagnetic Potentials A andϕ–Lorentz condition in Covariant Form-Invariance(covariance) of Maxwell's field equations in terms of four vectors- Electromagnetic Field Tensor-Maxwell's equations in covariance four tensor form-Lorentz transformation of electric and magnetic fields-Lorentz force on a charged particle.	13	Up to K5

Note: The Questions should be asked in the ratio of 20% for problems and 80 % for theory.

Book for Study

1. K.K. Chopra & G.C. Agarwal, **"Electromagnetic Theory"**, Nath & Co. 1984 (Unit: 1 to 3)
2. Satyaprakash, **"Electromagnetic Theory & Electrodynamics"** -Kedarnath Ramnath & Co. Meerut, 2021 (Unit: 4 to 5)

Books for Reference

1. J.D. Jackson, **"Classical Electrodynamics"**, Wiley Eastern, 3rd Edition, 2004.
2. David J Griffiths, **"Introduction to Electrodynamics"**, Pearson, 4th edition, 2012.
3. Julius Adams Stratton, **"Electromagnetic Theory"**, A John wiley & Sons, Inc Publication, 2007.
4. Tai L. Chow, **"Introduction to Electromagnetic Theory: A Modern Perspective"**, Jones and Bartlett Publishers, 2006.
5. George E. Owen, **"Introduction to Electromagnetic Theory"**, Dover Publications, 1963.

Web Resources

1. https://nptel.ac.in/courses/108/104/108104087/
2. https://archive.nptel.ac.in/courses/115/101/115101004/

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: Can be understanding the properties of light, its propagation through objects, scattering and absorption effects, and changes in the state of polarization.

Activities to be given

1. Assignment on electrostatics on macroscopic media.
2. Preparing the students to appear professional courses by giving advanced theory and workout concepts related to electromagnetic wave theory.
3. Prepare advanced techniques on electromagnetic wave.

Name of the Course Designer: Dr.D. Sivagami

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K – Level
CLO 1	Remember the fundamentals of Electromagnetic wave theory.	Up to K5
CLO 2	Understand the Propagation behavior of electromagnetic waves.	Up to K5
CLO 3	Apply the wave theory of oscillators and radiation systems.	Up to K5
CLO 4	Solve problems in electromagnetic interactions.	Up to K5
CLO 5	Evaluate the concept of Relativistic electro dynamics.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	3	3	2	2	2
CLO 3	3	3	3	3	2	2	2
CLO 4	2	3	2	2	2	2	2
CLO 5	3	3	3	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr.D.Sivagami)	(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.

DEPARTMENT OF PHYSICS				CLASS: I M.Sc.				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22PHP04	INTEGRATED ELECTRONICS	4	4	50	50	100

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

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 knowledge on analog and digital Communication.
4. To provide a good understanding on the design of sequential logic circuits.
5. To evaluate different parameters of registers and counters.

Unit	Course Contents	Hours	K Level
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	Up to K5
II	**Operational Amplifier (Op-Amp) and its Applications** Op-Amp characteristics – DC & AC characteristics–Inverting and non-inverting amplifier-Differential amplifier-Log and antilog Amplifier-Instrumentation Amplifier-Integrator-Differentiator-Active filters (first and second order)-Phase Shift and Wien bridge oscillators-Introduction to Timer (555)-block diagram and pin-out diagram-Monostable and Astable mode of operation of timer (555).	10	Up to K5
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	Up to K5
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.	11	Up to K5
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.	11	Up to K5

Note: The Questions should be asked in the ratio of 20% for problems and 80 % for theory.

Book for Study

1. R.S. Sedha, "**Applied Electronics**", S. Chand & Company 2016. (Unit: 1 to 2)
2. V. Vijayendran, "**Introduction to Integrated Electronics: Digital and Analog**", S. Printers & Publishers, 2009. (Unit: 3 to 5)

Books for Reference

1. D. Pleach, A.P. Malvino and G. Saha, "**Digital Principles and Applications**", Tata McGraw- Hill Education PvtLtd, NewDelhi, 6th Edition, 2009.
2. J. Millman &C.C. Halkias, "**Electronic Devices and Circuits**", Tata McGrawHill, NewDelhi, 1985.
3. G. Kennedy, "**Electronic Communication Systems**", Tata McGrawHill, NewDelhi, 3rd Ed., 1994.
4. Jacob Millman, "**Integrated Electronics: Analog and Digital Circuits and Systems**", McGraw-Hill Education (India) Pvt Limited, 2010.
5. Anil K. Maini, "**Digital Electronics: Principles and Integrated Circuits**", Wiley Pvt Ltd. 2008.

Web Resources

1. **https://nptel.ac.in/courses/108/108/108108111/**
2. **https://onlinecourses.nptel.ac.in/noc22_ee55/preview**

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: Can be professionals in preparing advanced circuits to design an analog and digital circuits.

Activities to be given

1. Assignment on pulse code modulation.
2. Preparing the students to appear professional courses by giving advanced theory and workout logics based on analog and digital concepts.
3. Prepare advanced techniques on the design of circuits.

Name of the Course Designer: Ms.R. Amirthavalli

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Remember the basic concepts of semiconductor devices and its fabrication.	Up to K5
CLO 2	Understand the AC and DC characteristics of Operational Amplifiers.	Up to K5
CLO 3	Analyze the working of various Analog and Digital modulation schemes.	Up to K5
CLO 4	Examine the behavior of various combinational and sequential logic circuits.	Up to K5
CLO 5	Evaluate the parameters of registers and counters.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CLO 1	3	3	2	2	2	2	2
CLO 2	3	3	3	2	2	2	2
CLO 3	3	2	2	2	2	2	2
CLO 4	3	2	2	2	2	2	2
CLO 5	3	3	2	2	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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

DEPARTMENT OF PHYSICS				CLASS: I M.Sc.				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
I	DSC	22PHP05	PRACTICAL I: GENERAL PHYSICS–I	3	5	50	50	100

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

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 Contents

(Any 10 Experiments)

1. Determination of Young's Modulus of the given material by Elliptical Fringes method.
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 by air wedge method.
5. Determination of ultrasonic velocity in a given liquid for fixed frequency.
6. Determination of Young's modulus of the given material by Hyperbolic Fringes.
7. Determination of viscosity of a liquid by Mayer's oscillating disc.
8. Determination of 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 of the given material by Forbe's method.
11. Determination of susceptibility of a given liquids by Quinke's method.
12. Determination of the charge of a single electron by Millikan oil drop method.
13. Determination of wavelength of light used for forming the diffraction fringes at a prism table.

Book for Study

1. General Physics Laboratory Manual, Department of Physics, NITT.

Books for Reference

1. R.A. Dunlap, **"Experimental Physics: Modern Methods"**, Oxford University Press, New Delhi, 1988.
2. E.V. Smith, **"Manual for Experiments in Applied Physics"**, Butterworths, 1970.
3. D. Malacara (ed.), **"Methods of Experimental Physics"**, Series of Volumes, Academic Press Inc. 1988.

Web Resources

1. https://nptel.ac.in/courses/115/106/115106090/
2. https://nptel.ac.in/courses/115105110

Pedagogy: Practical Demonstration

Rationale for Nature of the Course: Can be able to do practical work on new concepts. The student will be able to understand the fundamental physics behind many scientific discoveries through hands on experience.

Activities to be given:

1. An experiment is applied for a suitable applications.
2. To motivate the students towards practical work by involving them in. "process-oriented performance.

Name of the Course Designer: Dr.D. Sivagami

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Understand the basics of experimental physics.	Up to K5
CLO 2	Interpret the concepts of practical physics.	Up to K5
CLO 3	Analyze the experiment knowledge level to present-day requirements in industries and research fields.	Up to K5
CLO 4	Develop the physical discovery of each experiment with background.	Up to K5
CLO 5	Evaluate the physics concepts using experimental.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	3	2	2	2	2
CLO 3	3	3	2	2	2	2	2
CLO 4	3	3	2	3	2	2	2
CLO 5	3	3	3	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Dr. D. Sivagami)	(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.

DEPARTMENT OF PHYSICS				CLASS: I M.Sc.				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**Ext**	**Total**
I	DSC	22PHP06	PRACTICAL II: GENERAL ELECTRONICS	3	5	50	50	100

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

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 Contents

(Any 10 Experiments)

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. 8x1 multiplexer design
15. RS & JK flip-flop

Book for Study

1. Electronics Laboratory Manual, Department of Physics, NITT.

Books for Reference

1. B.K. Jones, "**Electronics for Experimentation and Research**", Prentice-Hall, 1986.
2. P.B. Zbar, A.P. Malvino and M.A. Miller, "**Basic Electronics: A Text-Lab Manual**", Tata Mc-Graw Hill, New Delhi, 1994.

Web Resources (any two web resources)

1. https://nptel.ac.in/courses/108/108/108108111/
2. https://nptel.ac.in/courses/108105132

Pedagogy: Practical demonstration

Rationale for Nature of the Course: Can be able to design electronic circuits.

Activities to be given

1. An experiment is applied for a suitable applications.
2. To motivate the students towards practical work by involving them in. "process-oriented performance.

Name of the Course Designer: Mr.N. Suresh

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Understand the basic knowledge of simple electronics circuits.	Up to K5
CLO 2	Apply the theoretical concepts by doing experiments.	Up to K5
CLO 3	Analyze the behavior of UJT and power electronics components.	Up to K5
CLO 4	Understand the design knowledge towards real time applications.	Up to K5
CLO 5	Evaluate the concepts of waveform generation and special function ICs.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	2	2	2	2	2
CLO 3	3	3	3	2	2	2	2
CLO 4	3	3	2	3	2	2	2
CLO 5	3	3	3	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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

DEPARTMENT OF PHYSICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22PHP08	THERMODYNAMICS AND STATISTICAL MECHANICS	4	5	50	50	100

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

Course Objectives

1. To study the basics of thermodynamics and 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.

Unit	Course Contents	Hours	K Level
I	**Equilibrium Thermodynamics, Classical Statistics** Review of Classical Thermodynamics – Law of Thermodynamics – 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.	13	Up to K5
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 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.	13	Up to K5
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.	13	Up to K5

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.	13	Up to K5
V	**Phase Changes** 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.	13	Up to K5

Note: The Questions should be asked in the ratio of 20% for problems and 80 % for theory.

Book for Study

1. Brijlal, **"Heat and Thermodynamics and Statistical Physics"**, S. Chand and Co. 1st Edition 2018 (Unit:1 to 2)
2. Kupta Kumar and Sharma Elementary **"Statistical Mechanics"**, Prakathi & Prakash, 2019.(Unit:3 and 4)
3. Sathyaprakash, **"Statistical Mechanics"**, Kedar Nath Ram Nath Publishers, 2021. (Unit:5)

Books for Reference

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.
4. Gould, Harvey and Tobochnik, **"Statistical and Thermal Physics"**, Princeton University Press. 2010.
5. Swendsen, Robert **"An Introduction to Statistical Mechanics and Thermodynamics"**. Oxford University Press 2012.

Web Resources (any two web resources)

1. https://nptel.ac.in/courses/115/103/115103113/
2. https://archive.nptel.ac.in/courses/112/104/112104220/

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: Can be describe how the energy in a system changes and whether the system can perform useful work on its surroundings.

Activities to be given

1. Assignment on Microcanonical system
2. Preparing the students to appear professional courses by giving advanced theory of thermodynamics.
3. Prepare advanced techniques available in statistical mechanics.

Name of the Course Designer: Mr.R. Murugan

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Understand Equilibrium of thermodynamics.	Up to K5
CLO 2	Interpret the Ensemble approach of canonical functions.	Up to K5
CLO 3	Analyze the applications of quantum statistics.	Up to K5
CLO 4	Apply the concepts of Fermi Energy in thermodynamics.	Up to K5
CLO 5	Evaluate the thermodynamics properties in phase transitions.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	2	3	2	2	2
CLO 2	3	3	2	3	2	2	2
CLO 3	3	2	3	2	2	2	2
CLO 4	3	3	2	2	2	2	2
CLO 5	3	3	2	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Coordinator
[Dr.D.Sivagami]	[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

DEPARTMENT OF PHYSICS				CLASS: I M.Sc				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**Ext**	**Total**
II	DSC	22PHP09	CONDENSED MATTER PHYSICS	4	5	50	50	100

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

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.

Unit	**Course Contents**	**Hours**	**K Level**
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.	13	Up to K5
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.	13	Up to K5
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–Intrinsic carrier concentration.	13	Up to K5
IV	**Diamagnetism, Para magnetism and Ferromagnetism** Diamagnetism and Antiferromagnetism–Langevin classical	13	Up to K5

	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.		
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.	13	Up to K5

Note: The Questions should be asked in the ratio of 20% for problems and 80 % for theory.

Book for Study

1. S.L. Gupta and V.Kumar, **"Solid State Physics"**, K. Nath & Co. Publishers 2018. (Unit:1 to 3)
2. B.S. Saxena, R.C.Gupta and P.N.Saxena, **"Solid State Physics"**, Pragati Prakashan 2015. (Unit: 4 and 5)

Books for Reference

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

Web Resources

1. https://nptel.ac.in/courses/115/106/115106061/
2. https://archive.nptel.ac.in/courses/115/106/115106061/

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: Can be able to do research in related areas.

Activities to be given

1. Assignment to be given as free electron theory, energy bands and semiconductor crystals.
2. Preparing the advanced technical concepts for SQUID.

Name of the Course Designer: Ms.R. Amirthavalli, Assistant professor

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Understand the basics of Bonding and Crystallography.	Up to K5
CLO 2	Remember the vibration and thermal properties of matter.	Up to K5
CLO 3	Apply the knowledge of free electron model and band structure in metals.	Up to K5
CLO 4	Analyze the behavior of different types of magnetic behaviors.	Up to K5
CLO 5	Evaluate various types of ferroelectric and superconductivity.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	3	3	2	2	2
CLO 3	3	2	3	2	2	2	2
CLO 4	3	3	2	2	2	2	2
CLO 5	3	3	3	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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

DEPARTMENT OF PHYSICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22PHP10	QUANTUM MECHANICS	4	5	50	50	100

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

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 the basics of approximation methods.
4. To acquire knowledge about Time Dependent Perturbation Theory to solve simple problems.
5. To explain the variations of angular momentum.

Unit	Course Contents	Hours	K Level
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.	13	Up to K5
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.	13	Up to K5
III	**Approximate Methods** Time Independent Perturbation Theory in Non-Degenerate Case-Ground State of Helium Atom-Degenerate Case-Stark Effect in Hydrogen-Variation Method & its Application to Hydrogen Molecule-WKB Approximation.	13	Up to K5
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 Selection Rules for Dipole Radiation-Collision-Adiabatic Approximation.	13	Up to K5
V	**Angular Momentum** Orbital Angular Momentum-Spin Angular Momentum-Total Angular Momentum Operators- Commutation Relations of Total Angular Momentum with Components – Ladder	13	Up to K5

	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.		

Note: The Questions should be asked in the ratio of 20% for problems and 80 % for theory.

Book for Study

1. Gupta, Kumar & Sharma, **"Quantum Mechanics"**, 23rd Edition, 2003-2004. (Unit: 1 and 2)
2. Aruldhas, **"Quantum Mechanics"**, PHI learning Pvt. Ltd. 2002. (Unit: 3 to 5)

Books for Reference

1. L.I. Schiff- McGraw Hill, 3rd Edition, 1968 **"Quantum Mechanics"** E. Merzbacher-Wiley and Sons, 3rd Edition, 2004.
2. Claude Cohen-Tannoudji, Bernard Diu, Franck Laloe, **"Quantum Mechanics"**, Volume 1: Basic Concepts, Tools, and Applications, 2nd Edition, Wiley Publishers, 2020.
3. I. M. Rae Alastair **"Quantum Mechanics"**, Publisher: Taylor & Francis Ltd, 1992.
4. P M Mathews, K Venkatesan, **"A Textbook of Quantum Mechanics"**, Tata McGraw Hill, 2010.
5. R. Shankar, **"Principles of Quantum Mechanics"** Springer, 2011

Web Resources (any two web resources)

1. https://nptel.ac.in/courses/122/106/122106034/
2. https://onlinecourses.nptel.ac.in/noc22_ph06/preview

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: Can be able to write the equations for basic theory

Activities to be given

1. Assignment to be given on Schrodinger equation.
2. Preparing quantum equation for advanced theory of quantum mechanics.

Name of the Course Designer: Mrs.R. Vishalashi

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Remember the mathematical foundations of quantum mechanics.	Up to K5
CLO 2	Understand the Schrödinger equation using various approximation methods.	Up to K5
CLO 3	Apply approximation methods to solve the Non-degenerate states.	Up to K5
CLO 4	Analyze Time Dependent Perturbation Theory to solve simple problems.	Up to K5
CLO 5	Evaluate the concept of Angular Momentum.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CLO 1	3	3	2	3	2	2	2
CLO 2	3	3	2	3	2	2	2
CLO 3	3	2	3	3	2	2	2
CLO 4	3	2	3	3	2	2	2
CLO 5	3	3	2	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

Course Designed by	Verified by HOD	Approved by CDC Coordinator
(Mrs. R. Vishalashi)	(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.

DEPARTMENT OF PHYSICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22PHP11	8051 MICROCONTROLLER	4	4	50	50	100

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

Course Objectives

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

Unit	Course Contents	Hours	K Level
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	Up to K5
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	Up to K5
III	**Programming with C** Data Types–Time Delay Programming–I/O Programming–Logic Operations–Arithmetic Operations – Timer Programming–Counter Programming.	10	Up to K5
IV	**8051 Interrupts & Peripherals** 8051 Interrupts – Programming External Hardware Interrupts – 8051 Serial Communication Programming – Programming with Serial Communication Interrupts –Peripheral and Interrupt Programming in C.	11	Up to K5
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.	11	Up to K5

Note: The Questions should be asked in the ratio of 10% for programs and 90 % for theory.

Book for Study

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi and RolinD.McKinlay, "**The 8051 Microcontroller and Embedded Systems Using Assembly and C**" by PHI, 2nd Edition, 2006. (Unit:I to 5)

Books for Reference

1. Ayala, "**The 8051 Microcontroller**", Delmar Cengage Learning, 3rd Edition, 2004.
2. Mazidi, "**The 8051 Microcontroller and Embedded Systems: Using Assembly and C**", Pearson, 2007.
3. Gimenez Salvador Pinillos, "**8051 Microcontrollers**" Springer International Publishing AG, 2019.
4. Manish K Patel, "**The 8051 Microcontroller Based Embedded Systems**" McGraw Hill, 2017.
5. MacKenzie I. Scott, "**The 8051 Microcontroller**", Pearson, 2006.

Web Resources

1. **https://nptel.ac.in/courses/117/104/117104072/**

Pedagogy: Chalk & Talk, Exercise, Assignments & PPTs.

Rationale for Nature of the Course: Can be able to do different program using 8051 microcontroller to solve real world problems.

Activities to be given

1. Assignment to be given on Interrupts & Interfacing.
2. Preparing students to develop their own product.

Name of the Course Designer: Dr.V. Balaprakash

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K – Level
CLO 1	Understand the architecture of 8051Microcontroller.	Up to K5
CLO 2	Analyze the addressing mode and Instructions set.	Up to K5
CLO 3	Apply the use of Interrupts and Communication ports in various real time problems.	Up to K5
CLO 4	Analyze microcontroller based system design for various applications.	Up to K5
CLO 5	Evaluate various embedded systems products for consumer and industrial applications.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	3	3	3	2	2
CLO 3	3	2	3	3	2	2	2
CLO 4	3	2	2	3	2	2	2
CLO 5	3	3	3	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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

DEPARTMENT OF PHYSICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22PHP12	PRACTICAL III: GENERAL PHYSICS–II	3	5	50	50	100

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

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 Contents

(Any 10 Experiments)

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' by Zeeman Effect.
9. Determination of the refractive index of a given liquid byNewton's ring method.
10. Determination of thermal conductivity of rubber using calorimeter.
11. Determination of thermistor characteristics and bandgap measurements.
12. Determination of the value of Stefan's constant using Stefan constant apparatus.
13. Determination of the specific heat capacity of a liquid by Ferguson's method.

Book for Study

1. General Physics Laboratory Manual, Department of Physics, NITT.

Books for Reference

1. R.A. Dunlap, "**Experimental Physics: Modern Methods**", Oxford University Press, New Delhi, 1988.
2. V. Smith, "**Manual for Experiments in Applied Physics**", Butterworths, 1970.
3. D. Malacara (ed.), "**Methods of Experimental Physics**", Series of Volumes, Academic Press Inc. 1988.

Web Resources

1. https://nptel.ac.in/courses/115/105/115105120/
2. https://nptel.ac.in/courses/115105110

Pedagogy: Practical Demonstration

Rationale for Nature of the Course: Can be able to do practical work on new concepts. The student will be able to understand the fundamental physics behind many scientific discoveries through hands on experience.

Activities to be given:

1. An experiment is applied for a suitable applications.
2. To motivate the students towards practical work by involving them in. "process-oriented performance.

Name of the Course Designer: Ms. R. Amirthavalli

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Remember the basics of experimental physics.	Up to K5
CLO 2	Understand the techniques to carry out experimental Physics.	Up to K5
CLO 3	Apply the theoretical concepts to experiments.	Up to K5
CLO 4	Analyze scientific information in concise manner.	Up to K5
CLO 5	Evaluate the data acquired through practical applications.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	2	3	2	2	2
CLO 3	3	2	3	3	2	2	2
CLO 4	3	2	3	2	2		2
CLO 5	3	3	3	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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

DEPARTMENT OF PHYSICS				CLASS: I M.Sc				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours / Week	CIA	Ext	Total
II	DSC	22PHP13	PRACTICAL IV: ADVANCED ELECTRONICS	3	5	50	50	100

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

Course Objectives

1. To study the fundamentals and different modes of operation of Timer.
2. To learn the Operation of Reflex Klystron.
3. To import the programming fundamental of 8051 Microcontroller.
4. To provide knowledge about interfacing various devices with 8051 Microcontroller.
5. To learn the Application of ADC and DAC.

Course Contents

(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.

Book for Study

1. Electronics Laboratory Manual, Department of Physics, NITT.

Books for Reference

1. B.K. Jones, "**Electronics for Experimentation and Research**", Prentice-Hall, 1986.
2. P.B. Zbar, A.P. Malvino and M.A. Miller, "**Basic Electronics: A Text-Lab Manual**", Tata Mc-Graw Hill, New Delhi, 1994.

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/

Pedagogy: Practical demonstration

Rationale for Nature of the Course: The student will be able to understand the fundamental physics behind electronic circuits used in many modern devices through hands on experience.

Activities to be given

1. An experiment is applied for a suitable applications.
2. To motivate the students towards practical work by involving them in. "process-oriented performance.

Name of the Course Designer: Mr.N. Suresh

Course Learning Outcomes

CLOs	On Completion of the Course, the students should be able to	K - Level
CLO 1	Recall the fundaments of Timer.	Up to K5
CLO 2	Understand the working Microwave Amplifiers and Oscillators.	Up to K5
CLO 3	Apply the use 8051 Microcontroller in real world problems.	Up to K5
CLO 4	Analyze various real time application products developed using 8051 Microcontroller.	Up to K5
CLO 5	Evaluate the experimental observations of Microcontrollers.	Up to K5

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	Programme Outcomes (with Graduate Attributes)						
CLOs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CLO 1	3	3	3	3	2	2	2
CLO 2	3	3	3	3	2	3	2
CLO 3	3	3	3	2	2	2	2
CLO 4	3	3	2	2	2	2	2
CLO 5	3	3	3	3	2	2	2

3 – Advance Application 2 – Intermediate Level 1 – Basic Level

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

Head of the Department
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Co-ordinator
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