SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI - 600044.

Re accredited with A+ Grade by NAAC

MASTER OF PHYSICS
(Shift –I)

Under the faculty of Science

(PG DEPARTMENT OF PHYSICS)

CHOICE BASED CREDIT SYSTEM (CBCS)
OUTCOME BASED EDUCATION (OBE)

(Effective from the Academic Year 2020-21)

CONTENT PAGE

RULES AND REGULATIONS

DEPARTMENT OF PHYSICS

Revised Syllabus of 2020 - 2021
(PG PHYSICS)

OBJECIVES OF THE COURSE:

PG REGULATIONS

1. ELIGIBILITY FOR ADMISSION: B. Sc. Physics

2. ELIGIBILITY FOR THE AWARD OF DEGREE:

A candidate shall be eligible for the award of the Degree only if she has undergone the prescribed course of study in a College affiliated to the University for a period of not less than two academic years, passed the examinations all the four-Semesters prescribed earning a minimum of 91 Credits (in Parts-I & II)

3. DURATION:

a. Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters and the second academic year the third and fourth semesters.

b. The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days for each semester.

4. COURSE OF STUDY:

The main Subject of Study for Master Degree Courses shall consist of the following

PART – I CORE SUBJECTS, PROJECT/ELECTIVES

PART – II SOFT SKILLS & INTERNSHIP

1. Skill based subjects (Four) -

   a) Teaching Skills

   b) Research Skills

   c) Soft Skill – SWAYAM COURSE (MOOC)

   d) Soft Skill – SWAYAM COURSE (MOOC)

Recommended Credits Distribution: (Total should not be less than 91 Credits)

Course Type	**No. of Papers**	**Credits / Paper**	**Credits**
Core (Theory)	15	4	60
Core (Practical)			
Core (Project)			
Elective	5	3	15
Internship	1	2	2
Skill based courses	2	3	6
Swayam Courses	2	4	8
Total			**91**

5. ATTENDANCE

CATEGORY-A: ATTENDANCE REQUIREMENT

All candidates must put in 75% and above of attendance for Arts, Science, Commerce courses both UG/PG including MBA/MCA Degree courses for appearing the University Examination. (Theory/Practical)

CATEGORY –B: CONDONATION OF SHORTAGE OF ATTENDANCE

If a candidate fails to put in the minimum attendance (Percentage stipulated), the Principals shall condone the shortage of attendance up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) for all UG/PG courses. (i.e. Arts Science, Commerce, MBA and MCA) after collecting the prescribed fee of RS.250/-each for Theory/Practical examination separately, (Theory Rs.250/- Per semester/Per Candidate: Practical Rs.250/- Per semester/ Per Candidate) towards the condonation of shortage of attendance.

CATEGORY-C: NOT ELIGIBLE FOR CONDONATION OF SHORTAGE OF ATTENDANCE

Candidates who have secured less than 65% but more than 50% of attendance are NOT ELIGIBLE for condonation of shortage of attendance and such candidates will not be permitted to appear for the regular examination, but will be allowed to proceed to the next year/next semester of the course and they may be permitted to take next University examination by paying the prescribed condonation fee of Rs.250/- each for Theory/Practical separately. Names of such candidates should be forwarded along with their attendance details in the prescribed format mentioning the category(3copies). Degree Wise/Year wise/Branch wise/semester wise/together with the fees collected from them. So as to enable them to get permission from the University and to attend the Theory/Practical examination subsequently without any difficulty.

CATEGORY-D: DETAINED STUDENTS FOR WANT OF ATTENDANCE

Candidate who have put in less than 50% of attendance have to repeat the course (by re-joining) for which they lack attendance without proceeding for II/III year as the case may be. Until they re-join the course and earn the required attendance for that particular semester/year, no candidates shall be permitted to proceed to the next year/next semester of the course under any circumstances. They have to obtain prior permission from the University to re-join the course.

Provided in case of candidates who are admitted form the academic year 2003 -2004 earning less than 50% of attendance in any one of the semesters due to any extraordinary circumstances such as medical ground, such candidates shall produce Medical Certificate issued by the authorized, Medical Attendant (AMA), duly certified by the Principal of the college shall be permitted to proceed to the next semester and to complete the course of study. Such candidates shall have to repeat the semester, which they have missed by re-joining after completion of final semester of the course, by

paying the fee for the break of study ad prescribed by the University from time to time.

CATEGORY-E: CONDONATION OF SHORTAGE OF ATTENDANCE FRP MARRIED WOMEN STUDENTS

In respect of married women students undergoing UG/PG course, the minimum attendance for condonation (Theory/Practical) shall be relaxed and prescribed ad 55% instead of 65% if they conceive during their academic career. Medical certificate form the Doctor attached to the Government Hospital (D.G.O) and the prescribed fee of Rs.250%- therefor together with the attendance details shall be forwarded to this off ice to consider the condonation of attendance mentioning the category.

0% Attendance

The candidates who have earned 0% of attendance, have to repeat the course (by re-joining) without proceeding to succeeding semester and they have to obtain prior permission form the University to re-join the course immediately for which applications issued for the academic year.

6. BREAK IN STUDY

After enrolling into any of the courses offered by the college a student is allowed to be absent continuously for period of FIVE years (Max. Condonable period- from the day of enrolment) after which she forfeits her admission.

A student who wants to continue her study within the condonable break period can rejoin in the same semester in the EXISTING VACANCY after getting the permission from the Principal and subsequently from University of Madras. Such students should also get a letter from the respective Head of the Department stating that she is not repeating any paper which she has already completed in other semesters.

7. TRANSFER OF STUDENTS AND CREDITS:

Transfer from other Autonomous or Non-Autonomous college or from other University is allowed for the same program with same nomenclature provided there is a vacancy in the respective program of study and the student has passed all the examinations under the previous system. **Students with standing arrears are NOT eligible for transfer.**

The marks obtained in the previous system will be converted and grades will be assigned as per the University norms.

Such students **are eligible** for classification.

Such student is NOT eligible for ranking, prizing and medals on qualifying the PG degree.

8. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTERS

1) Candidate shall register their names for the First Semester Examination after the admission in the M.Sc. Physics Course.

2) Candidates shall be permitted to proceed from the first semester up to the final Semester irrespective of their failure in any of the Semester Examinations subject to the condition that the candidate should register for all arrear subjects of earlier semesters along with current (subject) semester subjects.

3) Candidates shall be eligible to proceed to the subsequent semester, only if they earn sufficient attendance as prescribed by the University/College.

9. PASSING REQUIREMENTS

1. There shall be no passing minimum for Internal. But 0 also should not be awarded. In case a student absents herself for all the CIA exams and ends in getting 0 in internal in a particular subject, she will be awarded 1 or 2 marks for attendance.

2. For all subjects (Theory/Practical/Project) the passing requirement is as follows: i) candidate should secure not less than 50% of marks in End Semester Examination (ESE) and not less than 50% in aggregate of the total internal and external marks.

3. A candidate who passes in all subjects earning 91 credits within the maximum period of four years reckoned from the date of admission to the course shall be declared to have qualified for the degree.

4. A student who fails in either Project work or Viva-voce shall be permitted to redo the project work for evaluation and re-appear for the Viva-voce on a subsequent occasion, if so recommended by the examiners.

5. Grading shall be based on overall marks obtained (Internal + External)

10. MEDIUM OF INSTRUCTION AND EXAMINATIONS

The medium of instruction and examinations for the papers of Part I & II shall be the language concerned. For part I subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instruction. For modern languages, the medium of instruction and examination will be in the languages concerned.

11. SUBMISSION OF RECORD NOTE BOOKS FOR PRACTICAL EXAMINATIONS

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations.

12. CLASSIFICATION OF SUCCESSFUL CANDIDATES

1. A Candidate who qualifies for the Degree and secures CGPA between 9.0 – 10.0 shall be declared to have passed the examination in FIRST CLASS - EXEMPLARY provided she has passed the examination in every subject she has registered as well as in the project work in the first appearance.

2. A Candidate who qualifies for the Degree and secures CGPA between 7.5 – 8.9 shall be declared to have passed the examination in FIRST CLASS WITH DISTINCTION provided she has passed the examination in every subject he/she has registered as well as in the project work in the first appearance.

3. A candidate who qualifies for the degree as per the regulations for passing requirements and secures CGPA between 6.0 – 7.4 shall be declared to have passed the examination in FIRST CLASS

4. A candidate who qualifies for the degree as per the regulations for passing requirements and secures CGPA between 5.0 –5.9 shall be declared to have passed the examination in SECOND CLASS

5. Only those candidates who have passed all the papers including practical and project work in the first appearance shall be considered for the purpose of RANKING.

13. RANKING

1. Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking / Distinction.

2. Provided in the case of candidates who pass all the examinations prescribed for the course with a break in the First Appearance due to lack of attendance are only eligible for classification.

14. GRADING SYSTEM

The term grading system indicates a SEVEN (7) point scale of evaluation of the performance of students in terms of marks obtained in the Internal and External Examination, Grade points and letter grade.

Minimum Credits to be earned:

For TWO year PG Programme: Best 91 Credits (Part I: Major/Elective, Part –II: Soft skills)

Conversion of Marks to Grade Points and Letter Grade

(Performance in a Course / Paper)

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
40-49	4.0-4.9	U	Re-appear
ABSENT	0.0	AAA	ABSENT

15. CLASSIFICATION & CALCULATION OF GPA AND CGPA

For a Semester :

GRADE POINT AVERAGE [GPA]

$$GPA = \frac{\text{Sum of the multiplication of grade points by the credits of the courses}}{\text{Sum of the credits of the courses in a semester}}$$

For the entire programme:

CUMULATIVE GRADE POINT AVERAGE [CGPA]

$$CGPA = \frac{\text{Sum of the multiplication of grade points by the credits of the courses}}{\text{Sum of the credits of the courses of the entire programme}}$$

For entire programme

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class - Exemplary *
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction *
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
0.0 and above but below 5.0	U	Re-appear

* The candidates who have passed in the first appearance and within the prescribed semester of the PG Programme (Major, Elective/Project and Non-Major Elective courses alone) / M.Phil. are eligible.

16. ESE REVALUATION

A student is eligible to appeal for revaluation of the paper only **if she secures a minimum of 10 in the internal tests (CAT) of that paper** if the internal maximum marks is 25 and **a minimum of 6 in the internal tests (CAT) of that paper** if the internal marks is 15. This has to be done within 10 days from the publication of results. She also has to pay the prescribed fee. The revaluation will be done by an external examiner appointed by the Principal.

17. ARREAR / REPEAT EXAMINATIONS

1. A candidate having arrear paper(s) shall have the option to appear along with the regular semester papers.

2. Candidates who fail in any of the papers in Part I & II of PG degree examinations shall complete the paper concerned within **four** years from the date of admission to the said course.

18. SUPPLEMENTARY / INSTANT EXAMINATION

1. Final year students (PG – II year 4th semester) are **only** eligible to apply for Supplementary / Instant Examination.

2. Students who have only one paper as arrear in the final semester are allowed to take up supplementary / instant examination.

3. Supplementary / Instant Examination will not be conducted for practical papers and projects.

19. CONCESSIONS FOR DIFFERENTLY - ABLED STUDENTS

1. Students who are mentally disabled, learning disability and mental retardation, who are slow learners, who are mentally impaired having learning disorder and seizure disorder and students who are spastic and cerebral palsy the following concessions shall be granted obtaining prior permission from the University
    a. One-third of the time of paper may be given as extra time in the examination.
    b. Leniency in overlooking spelling mistakes

2. Students who are visually challenged
    a. Exempted from paying examination fees.
    b. A scribe shall be arranged by the college and the scribe be paid as per the college decision.

20. MALPRACTICE

The College views malpractice of any kind very seriously. The college has a Malpractice committee consisting of four senior staff members. Students found to be directly or indirectly involved in malpractice of any kind during examinations will be subject to penalty of very high proportions.

21. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMME TO QUALIFY FOR A DEGREE:

1. A student who for whatever reasons is not able to complete the programme within the normal period (N) or minimum duration prescribed for the programme, may be allowed **TWO** year period beyond the normal period to clear the backlog to be qualified for the degree. (Time span is N + 2 years for completion of the programme)
2. In exceptional cases like major accidents and child birth, an extension of **ONE** year be considered beyond maximum span of time that is **N + 2 + 1**. Students qualifying during the extension period are **NOT** eligible for ranking.

22. REGULATORY BODIES

Under autonomy, the college is free to frame its curriculum and conduct examinations. These functions are monitored by the **Board of Studies, Board of Examiners and the Academic Council.**

Board of Studies

Separate Board of studies are constituted for each programme offered by a department. Each Board of Studies will meet at least once a year to design courses, modify syllabi / examination pattern and recommend the same to the Academic Council.

The Board of Studies is composed of:

- Head of the Respective Department (Chair Person)
- One subject expert from within parent University-as nominated by the Vice-Chancellor from a panel of recommended members. (University Nominee)
- Two senior staff members of each specialization apart from Chair person.
- Two subject experts from outside the parent University.
- One representative from the Industry / Corporate sector / allied area
- One alumnus
- One student representative from current batch (preferably a meritorious final year student)

The tenure of the external experts is for TWO years.

Board of Examiners

A list of board of examiners is obtained by circulating the details of courses offered by the college to other colleges and through the list provided by the departments. Single valuation is done for UG courses and double valuation, one Internal and one External, for PG courses.

Academic Council

The Academic Council is composed of:

- The Principal (Chairman)
- All heads of the department in the college
- Four senior teachers of the college representing different categories of teaching
- Four representatives from the Industry / Corporate sector / allied area relating to placement / Commerce / Law / Education / Medicine / Engineering nominated by the Governing Body
- Three nominees of the University of Madras
- A faculty member nominated by the principal (Member Secretary)

The term of the nominated members shall be TWO years.

20. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Post graduates of various disciplines would be fully equipped

PEO1: To hone their critical intelligence, professional behaviour and strive towards creative endeavour.

PEO2: To augment research and entrepreneurial skills supplemented with rich skills of communication, teamwork and leadership to excel in their profession.

PEO3: To imbibe a deep sense of rationality and in depth knowledge of the various contemporary issues that would elevate their comprehension in the global context.

21. PROGRAMME OUTCOMES (POs)

PO 1-Identify and analyze the complex problems reaching substantiated conclusions using domain knowledge.

PO 2-Apply investigative research, specialize in problem identification, formulate research design, utilise analytical tools, draw valid inferences and provide suggestions leading to nation building initiatives.

PO 3-Strengthen professional ethics and career planning with systematic building of intrapersonal and interpersonal skills to participate in the intellectual diasporas.

PO 4-Establish oneself as a self-reliant, empowered individual to have an inclusive, healthy and compassionate understanding towards life and society.

PO 5-Equipped with technical / managerial expertise to innovate and critically analyse various attributes which constitute pivotal issues in a multidisciplinary scenario.

PO 6-Emerge as innovators and pioneers to create new avenues of employment catering to the global trends as well as demands.

22.PROGRAMME SPECIFIC OUTCOMES (PSOs)

The post graduate students of Physics would be fully equipped:

PSO1: Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.

PSO2: To compare, analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.

PSO3: To impart depth in understanding the laws, theorems, physical behaviour of microscopic and macroscopic bodies.

PSO4: To strengthen student's capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.

PSO5: To facilitate a thorough proficiency in theories which describe the nature of physical phenomenon and to establish them by experiments.

PSO6: To make the students evolve as well-rounded individuals with right attitude to life with social responsibility.

23. QUESTION PAPER PATTERN:

QUESTION PAPER PATTERN FOR OBE

(2020-21 onwards)

Theory

PG –Question paper Pattern- conventional on- paper mode

Bloom's Category Level	Sections	Marks	Word limit	Total	Meaning of K's
K1, K2	Multiple Choice Questions 15 Questions X 2 =30	30	Correct choice	75	K 1 & K2 - Understanding Level K 3 - Apply Level K 4 - Analyze Level K 5 – Evaluate Level K 6 – Create Level
K3, K4	Section B 5 Questions out of 7 questions *5 Marks	25	Short answers {approx. 500 Words)		
K4, K5,k6	Section C 1 out of 3 Questions *10 Marks + Compulsory Question 10 Marks	20	Elaborate answers (approx. 1000 Words)		

*** 75 marks to be converted as 60 marks.**

PG QUESTION PAPER PATTERN FOR OBE ONLINE ASSESSEMENT (2020 - 2021)

Bloom's Category Level	Sections	**Marks**	Description of answer	**Total**	**Meaning of K's**
INTERNAL SETTING					
K1,K2,K3	**Section A** Multiple Choice Questions 25 Questions *1 Marks (No Choice)	25X1=25	Choose the write option.	50	K 1 & K2 - Understanding Level K 3 - Apply Level K 4 - Analyze Level K 5 – Evaluate Level K 6 – Create Level
EXTERNAL SETTING					
K2,K3,K4 ,K5,K6	**Section B** 5 out of 7 Questions *5 Marks	25	Short answers/500 Words		

*** 50 marks to be converted as 60 marks.**

BLOOM'S CATEGORY LEVEL (ANNEXURE chart)

S.no	K component scale	Verbs for question
I.	**K 1& K2 Verbs**	Verbs to be used for questioning are "choose, find, identify, indicate, match, name, state, what, when, where, which, who, cite, label, reproduce. define, list, quote, revise, explain, show, sketch, illustrate, interpret, describe, substitute, convert, give example, rephrase
2.	**K2 &k3**	The questions may contain the verbs such as explain, show, sketch, illustrate, interpret, describe, substitute, convert, exam Fle, rephrase, apply, relate, solve, classify, predict, compute, prepare
3.	**K4**	The questions may contain verbs - Apply, relate, solve, classify, predict, compute, prepare.
4.	**K5**	The questions may contain any of the following verbs : Ascertain, diagnose, distinguish, infer, associate, examine, differentiate, reduce, discriminate, dissect, determine, justify, organize, recommend, solve.
5	**K6**	The questions may contain any of the following verbs: Appraise, conclude, critique, judge, assess, contrast, deduce, weigh. Compare, criticize, evaluate.

Question paper pattern for Continuous Assessment Test (CAT)

(The online assessment pattern)

P.G PROGRAMME

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV

COLLEGE FOR WOMEN

M.Sc DEGREE EXAMINATION, NOVEMBER 2020.

2020-2021 YEAR III &IV SEMESTER

CAT – I/II/III

Sub Title: Max. Marks: 50

Sub Code: Date:

Time: 2hrs.

Question paper Pattern-Two Components: (Max marks=50) - 3hrs

I. **Multiple Choice Questions (MCQ) - 20 marks (10x2=20)**

II. **Google Class Room (GCR) - 30 marks (**Structured)

A. **Section A: 5 out of 6 – each carries 2 marks (5x2=10)**

B. **Section B: 4 out of 5 – each carries 5 marks (4x5=20)**

- The answers for the questions for QP uploaded in GCR will be as uploads (images of hand written answer sheets converted to .pdf) in Google Class Room.
- The duration for each GCR session (answering and uploading) would be 3 hours (maximum).
- The structured component (30 marks) SHOULD be conducted in GCR as per the CAT schedule.MCQ (10X2=20) CAN be conducted out of schedule also but should be completed during the CAT examination scheduled.

Note: The GCR question paper and MCQ assessment links to be shared with the COE office for approval and validity on or before the respective allotted dates.

PROGRAMME PROFILE

(PG PHYSICS)

TOTAL CREDITS: 91 **TOTAL TEACHING HRS PER SEMESTER: 450 HRS**

PART	COURSE	TITLE OF THE PAPER	CODE	L	T	H	C
I SEMESTER							
I	CORE	MATHEMATICAL PHYSICS	20PPHCT1001	4	2	6	4
I	CORE	CLASSICAL MECHANICS AND RELATIVITY	20PPHCT1002	4	2	6	4
I	CORE	QUANTUM MECHANICS I	20PPHCT1003	4	2	6	4
I	CORE	INTEGRATED ELECTRONICS AND MICROPROCESSOR	20PPHCT1004	4	2	6	4
I	CORE	PRACTICAL I(General)	20PPHCP2001	2	1	3	-
I	CORE	PRACTICAL II (Electronics)	20PPHCP2002	2	1	3	-
II	SKILL BASED ELECTIVE	TEACHING SKILLS	18PSSTS1001	2		2	3
II SEMESTER							
I	CORE	QUANTUM MECHANICS II	20PPHCT2005	4	2	6	4
I	CORE	ELECTROMAGNETIC THEORY AND PLASMA PHYSICS	20PPHCT2006	4	2	6	4
I	CORE	COMPUTATIONAL METHODS AND C PROGRAMMING	20PPHCT2007	4	2	6	4
I	ELECTIVE	SPECTROSCOPY	20PPHET2001	3	2	5	3
I	CORE	PRACTICAL I(General)	20PPHCP2001	2	1	3	4
I	CORE	PRACTICAL II(Electronics)	20PPHCP2002	2	1	3	4
II	SKILL BASED ELECTIVE	SWAYAM (MOOC)	18MOOC2002	2		2	4
II		INTERNSHIP	17PPHIP3001				2
III SEMESTER							
I	CORE	STATISTICAL MECHANICS	08PPHCT3008	4	2	6	4
I	CORE	NUCLEAR AND PARTICLE PHYSICS	08PPHCT3009	4	2	6	4
I	ELECTIVE	NANOSCIENCE AND TECHNOLOGY	08PPHCE3002	3	2	5	3
I	ELECTIVE	CRYSTAL PHYSICS	12PPHCE3003	3	2	5	3
I	CORE	PRACTICAL III (General)	13PPHCP4003	2	1	3	-
I	CORE	PRACTICAL IV(Electronics)	18PPHCP4004	2	1	3	-
II	SKILL BASED ELECTIVE	RESEARCH SKILLS	18PSSRS3003	2		2	3

IV SEMESTER							
I	CORE	CONDENSED MATTER PHYSICS	08PPHCT4010	4	2	6	4
I	ELECTIVE	MICROPROCESSOR 8086 AND MICROCONTROLLER 8051	17PPHCE4004	3	2	5	3
I	ELECTIVE	MATERIAL SCIENCE	08PPHCE4005	3	2	5	3
I	CORE	PRACTICAL III (General)	13PPHCP4003	2	1	3	4
I	CORE	PRACTICAL IV (Electronics)	18PPHCP4004	2	1	3	4
I	CORE	PROJECT	13PPHPR4001	3	3	6	4
II	SKILL BASED ELECTIVE	SWAYAM (MOOC)	18MOOC4004	2		2	4

L=Lecture Hrs; T=Tutorial Hrs; H= Hrs per week; C=Credits

RUBRICS FOR CONTINUOUS ASSESSMENT

Assignment	✓
Seminar	✓
Field visit	
Participatory Learning	
Group Discussion	✓
Flipped/Blended Learning	

Assessment Model (from 2020 – 21 onwards)
Post graduation programme
40% Internal 60% External

S.No	Assessment Component	Marks	Weighted %
A.	**Theory**		
1	**INTERNAL ASSESSMENTS**		
	Continuous Assessment Test (best two out of three)	2 x 50 = 100	15
2	Quiz/Group Discussion/Seminar/Assignment/Role Play/ Case Study/ Open Book/ snap Test/ Video Presentation/ Review (any three to be considered)	3 x 10 = 30	15
3	MCQ (one test to be conducted online during the semester)	20	10
4	**EXTERNAL ASSESSMENT**		
	End semester examinations	75	60
	Grand Total		**100**
B	**Practical**		
1	INTERNAL ASSESSMENTS		
	Continuous Assessment Test (best two out of three)	2 x 50 = 100	15
2	Record + Observation	10 +10 = 20	15
3	MCQ (one test to be conducted online during the semester)	20	10
4	**EXTERNAL ASSESSMENT**		
	End semester Examinations	60	60
	Grand Total		**100**

DEPARTMENT OF PG PHYSICS

SDNB VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI–600044.

(PG PHYSICS)

COURSE FRAME WORK

SEMESTER I

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
I	20PPHCT1001	CORE THEORY	MATHEMATICAL PHYSICS	6	4	40	60	100
I	20PPHCT1002	CORE THEORY	CLASSICAL MECHANICS AND RELATIVITY	6	4	40	60	100
I	20PPHCT1003	CORE THEORY	QUANTUM MECHANICS I	6	4	40	60	100
I	20PPHCT1004	CORE THEORY	INTEGRATED ELECTRONICS AND MICROPROCESSOR	6	4	40	60	100
I	20PPHCP2001	CORE PRACTICAL	PRACTICAL I(General)	3	-	-	-	-
I	20PPHCP2002	CORE PRACTICAL	PRACTICAL II(Electronics)	3	-	-	-	-
I	18PSSTS1001	SKILL BASED ELECTIVE	TEACHING SKILLS	2	3	50		50

SEMESTER I

MATHEMATICAL PHYSICS

TOTALHOURS: 90 HRS **SUB CODE: 20PPHCT1001**
CREDIT:4 **L-T-P:60-30**

COURSE OBJECTIVES

1. Focuses to enable the students to apply the mathematical concepts in physics.
2. Rendering students to solve problems with different methods of matrix.
3. Expertise in special functions and polynomials.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	Understand the basic principles and carry the knowledge forward which can be applied in future research.
CO2	Gain well versed knowledge in the advanced mathematical methods and tools which can be used to analyze the nature of the problems in physics.
CO3	Strike a balance between formalism and applications.
CO4	Include applications of boundary value problems of mathematics towards modern physics.
CO5	Enable them to improve their logical and analytical skills.

SYLLABUS

UNIT 1: **Linear Vector Spaces** **18 Hrs**

Linear operators – Vectors in n-dimensions – Matrix representation of vectors and operators in a basis - Linear independence, dimension - Inner product - Schwarz inequality - Orthonormal basis - Gram-Schmidt Process – Eigen values and Eigen functions of operators/matrices – Hermitian and unitary operators/matrices – Cayley-Hamilton theorem - Diagonalizing matrix.

UNIT 2: Linear Differential Equations and Green's Function **18 Hrs**

Second order linear differential equations – Wronskian - Orthogonality of Eigen functions - Illustration with Legendre, Laguerre, and Hermite polynomials – Expansion of polynomials - Dirac delta function. One-dimensional Green's function –Eigen function expansion of the Green's function - Reciprocity theorem.

UNIT 3: Complex Variables **18Hrs**

Functions of a complex variable - Single and multi-valued functions - Analytic functions - Cauchy - Riemann conditions - Singular points - Cauchy's theorem and integral formulae - Taylor and Laurent expansions - Zeros and poles - Residue theorem and its applications

UNIT 4: Laplace and Fourier Transforms **18Hrs**

Laplace transforms - Solution of linear differential equations with constant coefficients - Fourier integral - Fourier transforms (Infinite), Fourier sine and cosine transforms - Convolution theorems.

UNIT 5: Group Theory **18Hrs**

Basic definitions - Lagrange's Theorem - Invariant subgroup - Homomorphism and Isomorphism between groups - Representation of a group - Unitary representations - Schur's lemmas - Orthogonality theorem - Character table – C_{2v},C_{3v}.

TEXT BOOKS:

1. **Mathematical physics,** Sathyaprakash, 2012, 6th Edition, Sulatan Chand and sons, India
2. **Mathematical physics,** P.K. Chattopadhyay, 2013 2nd Edition, New Age International publishers
3. **Mathematical Methods for Physicists**, G. Arfken and H. J. Weber, 2001, 5th Edition, Harcourt (India), New Delhi.
4. **Chemical Application of Group Theory,** F. A. Cotton, 3rd Edition, John Wiley and Sons, New York.
5. **Mathematical Physics,** B.D.Gupta, 2009, 4th Edition, Vikas publications.

BOOKS FOR REFERENCE:

1. **Mathematical Methods in Classical and Quantum Physics,** TulsiDass and S. K. Sharma, 1998**,** Universities Press (INDIA), Hyderabad.
2. **Advanced Engineering Mathematics**, E. Kreyszig, 2011, 9th Edition, Wiley, New York.
3. **Advanced Engineering Mathematics,** M. D. Greenberg, 1998, 2nd Edition, International Ed., Prentice - Hall International, New Jersey.
4. **Advanced Engineering Mathematics,** C. R. Wylie and L.C. Barrett, 1995, 6th Edition, International Edition, McGraw-Hill, New York.
5. **Matrices and Tensors in Physics,** A. W. Joshi, 2017, 4th Edition, Wiley Eastern, Madras.

E-LEARNING RESOURCES:

1. http://www.mpipks-dresden.mpg.de/jochen/methods/outline/html
2. http://phy.syr.edu/trodden/courses/mathmethods/
3. http://dmoz.org/Science/Physics/Mathematical_Physics/
4. http://www.thphys.nuim.ie/Notes/engineering/frame-notes.html
5. http://www.thphys.nuim.ie/Notes/frame-notes.html

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K4	K5	K1	K5	K3	K1
CO2	K5	K6	K3	K2	K6	K3
CO3	K1	K6	K5	K2	K4	K3
CO4	K6	K5	K4	K1	K4	K1
CO5	K2	K4	K1	K3	K5	K2
Average	**K4**	**K5**	**K3**	**K3**	**K4**	**K2**

Paper 2: CLASSICAL MECHANICS AND RELATIVITY

TOTALHOURS: 90 HRS **SUB CODE: 20PPHCT1002**
CREDIT:4 **L-T-P:60-30**

COURSE OBJECTIVES

1. Acquire knowledge of the principles of classical mechanics and relativity.
2. To make learning of classical theory in two body problems and small oscillation.
3. To describe Lagrangian and Hamiltonian equation of motion

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To develop familiarity with the physical concepts and facilitate with the mathematical methods of classical mechanics.
CO2	To develop skills in formulating physics problems and gain knowledge in relativistic concepts.
CO3	To emphasize the analyzing solution and explore its consequences towards various means.
CO4	To expand and evaluate the student's physical intuition and thinking process through the understanding of the theory.
CO5	To acquire knowledge of real time problems in macroscopic view and applying it to the microscopic level.

SYLLABUS

UNIT 1: **Lagrangian and Hamiltonian Formulations** **18 hrs**

Hamilton's variational principle - Lagrange's equations of motion – Canonical momenta – Cyclic coordinates and conservation of corresponding momenta – Legendre transformation and Hamiltonian - Hamilton's equations of motion - Two-body central force problem –Kepler Problem and Kepler's laws.

UNIT 2: Mechanics of Rigid Bodies **18hrs**

Rigid body motion – Kinematics – Euler angles – Infinitesimal rotations – Rate of change of a vector – Coriolis force - Dynamics - Angular momentum and kinetic energy - Moment of inertia tensor - Euler's equations of motion - Torque-free motion - Symmetrical top.

UNIT 3: Canonical Transformation **18hrs**

Canonical transformations and their generators – Simple examples - Poisson brackets – Equations of motion in Poisson bracket formalism - Symmetries and conservation laws - Hamilton-Jacobi theory - Application to harmonic oscillator problem.

UNIT 4: Small Oscillations **18hrs**

Formulation of the problem - Transformation to normal coordinates - Frequencies of normal modes - Linear triatomic molecule.

UNIT 5: Relativity **18hrs**

Lorentz transformations - Four vectors - Lorentz invariance of the four products of two four vectors - Invariance of Maxwell's equations - Relativistic Lagrangian and Hamiltonian for a free particle.

BOOKS FOR STUDY:

1. **Classical Mechanics,** 2002, H. Goldstein 3rd Edition, C. Poole and J. Safko, Pearson Education, Asia, New Delhi.
2. **Classical Mechanics**, Upadhyaya, Himalaya Publishing Co., New Delhi, 2014.
3. **Classical Mechanics**, G.Aruldhas, , PHI Learning Pvt.Ltd, New Delhi, Second Printing Aug ,2009.
4. **Classical Mechanics**, S. N. Biswas, Books and Allied Ltd., Kolkata, 2000.
5. **Classical Mechanics**, C. R. Mondal, Prentice-Hall of India, New Delhi, 2008.

BOOKS FOR REFERENCE:

1. **Classical Mechanics**, L. D. Landau and E. M. Lifshitz, Pergomon Press, Oxford, 2002.
2. **Classical Mechanics**, K. R. Symon, 3rd Edition, Addison Wesley, London , 2013.
3. **Quantum Electrodynamics**, R. P. Feynman, CRC Press2018.
4. **Principles of Classical Mechanics**, J. L. Synge and B. A. Griffith, Mc Graw-Hill, New York, 2009.
5. **Introduction to Special Theory of Relativity**, R. Resnick, Wiley Eastern, New Delhi ,2008**.**

E-LEARNING RESOURCES:

1. http://astro.physics.sc.edu/selfpacedunits/unit56.html
2. http://www.phy.auckland.nz/staff/smt/453310SC.html
3. http://www.damtp.cam.ac.uk/user/tong/dynamics.html
4. http://farside.ph.utexas.edu/teaching/301/lectures/lectures.html
5. http://www.lancs.ac.uk/depts/physics/teaching/py332/phys332.html

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K6	K5	K5	K2	K1	K2
CO2	K4	K6	K6	K5	K4	K1
CO3	K4	K5	K5	K6	K5	K1
CO4	K6	K5	K5	K3	K4	K2
CO5	K1	K4	K6	K3	K5	K1
Average	**K4**	**K5**	**K5**	**K4**	**K3**	**K2**

Paper 3: QUANTUM MECHANICS - I

TOTALHOURS: 90 HRS **SUB CODE: 20PPHCT1003**
CREDIT:4 **L-T-P:60-30**

COURSE OBJECTIVES

1. Make the students to understand the concepts of quantum physics.
2. Relate the knowledge of mathematics to the formalism of quantum mechanics.
3. Launch applications of quantum mechanics in microscopic particle regime.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To understand the central concepts and basic formalisms of quantum mechanics from classical point of view.
CO2	Enhances the mathematical implementation to solve problems in various dimensions.
CO3	To establishing the relations and validating various results to give concise physical interpretations, and arguments for the validity of the methods.
CO4	To integrate several components of theories with applications to problems.
CO5	To solve present tools and test ideas on problems involving many body systems.

SYLLABUS

UNIT 1: **Basic formalism** **18 hrs**

Interpretation and conditions on the wave function - Postulates of quantum mechanics and the Schroedinger equation - Ehrenfest's theorem- Stationary states - Hermitian operators for dynamical variables - Eigenvalues and eigen functions - Uncertainty principle.

UNIT 2: One Dimensional Problems and Three-Dimensional Problems **18 hrs**

Particle in a box - Square-well potential - Barrier penetration - Simple harmonic oscillator - Ladder operators method.
Orbital angular momentum and spherical harmonics - Central forces and reduction of two-body problem - Particle in a spherical well - Hydrogen atom.

UNIT 3: General Formalism **18 hrs**

Hilbert space - Dirac notation - Representation theory - Co-ordinate and momentum representations - Time evolution – Schrodinger, Heisenberg, and Interaction pictures- Symmetries and conservation laws - Unitary transformations associated with translations and rotations - Parity and time reversal.

UNIT 4: Approximation methods **18 hrs**

Time-independent perturbation theory for non-degenerate and degenerate levels - Variation method, simple applications - WKB approximation - Connection formulae (no derivation) - WKB quantization rule - Application to simple harmonic oscillator.

UNIT 5: Angular Momentum and Identical particles **18 hrs**

Eigenvalue spectrum from angular momentum algebra - Matrix representation - Spin angular momentum - Non-relativistic Hamiltonian including spin - Addition of angular momenta - Clebsch - Gordan Coefficients.
Symmetry and anti-symmetry of wave functions - Spin and Pauli matrices.

BOOKS FOR STUDY:

1. **A Textbook of Quantum Mechanics,** P. M. Mathews and K. Venkatesan, Tata McGraw-Hill, New Delhi,2017.
2. **Quantum Mechanics,** L. I. Schiff, *3*rd Edition, International Student Edition, Mac Graw-Hill Kogakusha, Tokyo, 2013.
3. **Quantum Mechanics Concepts and Applications,** Nouredine Zettli, wiley publication, 2009
4. **Quantum Mechanics,** G. Aruldhas, Prentice Hall of India, New Delhi, 2002.
5. **The Principles of Quantum Mechanics**, P. A. M. Dirac, Oxford University Press, London, 2002.
   .

BOOKS FOR REFERENCE:

1. **The Foundations of Quantum Mechanics,** J. S. Bell, Gottfried and M.Veltman, World Scientific, Singapore, 2001.
2. **Quantum Mechanics,** V. Devanathan, Narosa Publishing House, New Delhi, 2005.
3. **Quantum Electrodynamics,** R. P. Feynman, CRC Press, 2018.
4. **Quantum Mechanics: Theory and Applications,** A. Ghatak and S. Lokanathan, 4th Edition, Macmillan India, 2009.
5. **Angular Momentum Techniques in Quantum Mechanics,** V. Devanathan, Kluwer Academic Publishers,2010.

E-LEARNING RESOURCES:

1. http://www.edx.org//
2. http://minty.caltech.edu/Ph125a/
3. http://www.classcentral.com
4. http://people.deas.harvard.edu/~jones/ap216/lectures/lectures.html
5. http://www.ks.uiuc.edu/Services/Class/PHYS480/

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K3	K6	K5	K3	K3	K1
CO2	K4	K5	K5	K3	K3	K2
CO3	K4	K6	K4	K6	K5	K1
CO4	K5	K6	K5	K5	K4	K2
CO5	K5	K6	K4	K3	K5	K2
Average	**K4**	**K6**	**K5**	**K4**	**K4**	**K2**

Paper 4: INTEGRATED ELECTRONICS AND MICROPROCESSOR

TOTALHOURS: 90 HRS **SUB CODE: 20PPHCT1004**
CREDIT:4 **L-T-P:60-30**

COURSE OBJECTIVES

1. To introduce structures and working principles of devices.
2. To provide basic ideas of op-amp and its applications.
3. To familiar with the evolution of 8085 microprocessors.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To understand the concepts of theories and circuits and implemented over devices.
CO2	To analyze logics and impact them to design circuits.
CO3	To design the electronic circuits to solve mathematical equations.
CO4	To implement the knowledge of integrated chips and develop programming with microprocessor.
CO5	To compute microprocessor extended towards peripheral systems.

SYLLABUS

UNIT 1: Semiconductor Devices **18 hrs**

FET, MOSFET, UJT, SCR, TRIAC – Structure and constructional features – Working principle and I-V Characteristics – FET as Common Source and Common Drain amplifier -Biasing of FET and MOSFET- UJT relaxation oscillator – SCR, TRIAC for power control.
IC Technology – Monolithic, Thin film and Hybrid technologies – Limitations in IC Technology – VLSI

UNIT 2: Digital Electronics **18 hrs**

Design of Asynchronous feedback technique counters – Design of synchronous counters – Design of random sequence counters – Serial parallel registers – Shift registers – Applications.
Binary weighted resistor D/A converter – R-2R ladder DAC – FLASH, Counter type, successive approximation and dual slope ADC**.**

UNIT 3: Applications of Op-Amps **18 hrs**

Analog Integrator, differentiator – Design of analog circuits for solution of differential equation and simultaneous equations using Op-Amps. Active filter circuits–Low Pass , High Pass, Band Pass. Butter worth Filter circuits. Timer 555–Monostable and Astable operations.

UNIT 4: 8085, Programming and Interfacing **18 hrs**

Registers and flags-Instruction set-Addressing modes – Assembly language programs. Interfacing Memory and I/O – Memory system – Timing diagram for Memory READ and Memory WRITE cycles.
IN and OUT Instructions– Difference between I/O mapped I/O memory mapped I/O – Simple Polled I/O and Hand shaking operations.

UNIT 5: INTERFACING PERIPHERAL I/O SYSTEMS **18 hrs**

Programmable peripheral device 8255 – Interfacing keyboard – Matrix Scanning – Interfacing multiplexed 7 segment display – DAC and ADC Interface-Stepper motor interface – clockwise, anticlockwise and wiper action.

BOOKS FOR STUDY:

1. **Semiconductor Devices - Physics and Technology,** S. M. Sze, Wiley, New York , 2008.
2. **Integrated Electronics,** Millman and Halkias,2010.
3. **OpAmps and integrated circuits EEE,** R. A. Gaekwad, 2015,
4. **Semiconductor Optoelectronic Devices,** P. Bhattacharya, 2nd Edition. Printice-Hall of India, New Delhi, 2002.
5. **Digital Electronics and Logic Design, Printice-Hall of India,** B. Somnath Nair, New Delhi 2002.

BOOKS FOR REFERENCE:

1. **Fundamentals of Microprocessor 8085 – Architecture, Programming and Interfacing,** V. Vijayendran, Viswanathan, Chennai, 2002.
2. **Fundamentals of Microprocessors and Micro Computers,** B. Ram, Dhanpat Rai Publications, New Delhi, 2010.
3. **Electronic Devices and Circuit Theory**, R. L. Boylestad and L. Nashelsky, 8th Edition, Pearson Education, 2001.
4. **Introduction to Semiconductor Devices**, M. S. Tyagi Wiley, New York, 2017.
5. **OpAmp and linear integrated circuits,** R. F. Coughlin and F. F. Driscol, , 1996 Printice Hall of India, New Delhi, 2009.

E-LEARNING RESOURCES:

1. https://en.wikipedia.org/wiki/Field-effect_transistor
2. https://en.wikipedia.org/wiki/Operational_amplifier
3. https://en.wikipedia.org/wiki/Function_generator
4. http://www.classcentral.com
5. http://www.edx.org//

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K5	K6	K5	K5	K4	K1
CO2	K5	K6	K6	K3	K5	K2
CO3	K5	K5	K6	K6	K6	K2
CO4	K6	K5	K3	K6	K6	K2
CO5	K6	K5	K6	K6	K5	K1
Average	**K5**	**K5**	**K5**	**K5**	**K5**	**K2**

DEPARTMENT OF PG PHYSICS

SDNB VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI–600044.

(PG PHYSICS)

COURSE FRAME WORK

SEMESTER II

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
II	20PPHCT2005	CORE THEORY	QUANTUM MECHANICS II	6	4	40	60	100
II	20PPHCT2006	CORE THEORY	ELECTROMAGNETIC THEORY AND PLASMA PHYSICS	6	4	40	60	100
II	20PPHCT2007	CORE THEORY	COMPUTATIONAL METHODS AND C PROGRAMMING	6	4	40	60	100
II	20PPHET2001	ELECTIVE THEORY	SPECTROSCOPY	5	3	40	60	100
II	20PPHCP2001	CORE PRACTICAL	PRACTICAL I (General)	3	4	40	60	100
II	20PPHCP2002	CORE PRACTICAL	PRACTICAL II (Electronics)	3	4	40	60	100
II	18MOOC2002	SKILL BASED ELECTIVE	SWAYAM (MOOC)	2	4	50		50
	17PPHIP3001		INTERNSHIP		2	40	60	100

SEMESTER II

Paper 5: QUANTUM MECHANICS - II

TOTALHOURS: 90 HRS **SUB CODE: 20PPHCT2005**
CREDIT:4 **L-T-P:60-30**

COURSE OBJECTIVES

1. To gain knowledge on scattering theory.
2. To understand the formulation of Relativistic wave equation.
3. To study the formulation of quantum field theory.

COURSE OUTCOMES: On completion of the course the students will be able to…

CO No.	CO Statement
CO1	Explain the basic theories and extended to microscopic units.
CO2	Understand the concepts of perturbation and to evaluate the problems with certain approximation.
CO3	Give concise physical interpretation and arguments for validity.
CO4	Integrate several components of quantum system to assess problems.
CO5	Establish application towards field equations.

UNIT 1: **Scattering Theory** **18 Hrs**

Scattering amplitude - Cross sections - Born approximation - Partial wave analysis -Effective range theory for S-wave - Transformation from center of mass to laboratory frame.

UNIT 2: Perturbation Theory **18 Hrs**

Time dependent perturbation theory - Constant and harmonic perturbations - Transition probabilities - Adiabatic approximation - Sudden approximation - The density matrix - Spin density matrix and magnetic resonance - Semi-classical treatment of an atom with electromagnetic radiation - Selection rules for dipole radiation

UNIT 3: Relativistic Quantum Mechanics **18 Hrs**

Klein-Gordon equation - Dirac equation - Plane-wave solutions - Interpretation of negative energy states - Antiparticles - Spin of electron - Magnetic moment of an electron due to spin - Energy values in a Coulomb potential.

UNIT 4: Dirac Equation **18 Hrs**

Covariant form of Dirac equation - Properties of the gamma Matrices - Traces -Relativistic invariance of Dirac equation – Probability density-current four vector – Bilinear covariants - Feynman's theory of positron (Elementary ideas only without propagation formalism).

UNIT 5: Second Quantization **18 Hrs**

Second quantization of Klein-Gordon field - Creation and annihilation operators - Commutation relations.

BOOKS FOR STUDY:

1. **A Text book of Quantum Mechanics,** P. M. Mathews and K. Venkatesan, Tata McGraw-Hill, New Delhi ,2017.
2. **Quantum Mechanics,** L. I. Schiff,3rd Edition, International Student Edition, Mac Graw-Hill Kogakusha, Tokyo , 2003.
3. **Quantum Mechanics**, V. Devanathan**,** Narosa Publishing House, New Delhi, 2005.
4. **Quantum Mechanics,** V. K. Thankappan, 2nd Edition, Wiley Eastern Ltd, New Delhi, 2005.
5. **Relativistic Quantum Mechanics**, J.D. Bjorken and S.D. Drell, MacGraw-Hill New York 2010.

BOOKS FOR REFERENCE:

1. **The Principles of Quantum Mechanics,** P. A. M. Dirac, , Oxford University Press, London, 2003.
2. **Quantum Mechanics**, S. N. Biswas, Books and Allied, Kolkata, 2009.
3. **Quantum Mechanics,** G. Aruldhas, Prentice-Hall of India, New Delhi,2002.
4. **The Foundations of Quantum Mechanics,** J. S. Bell, Gottfried and M.Veltman, World Scientific, 2001.
5. **Angular Momentum Techniques in Quantum Mechanics,** V. Devanathan, Kluwer Academic Publishers, Dordrecht 2010.

E-LEARNING RESOURCES:

1. http://www.edx.org//
2. http://minty.caltech.edu/Ph125a/
3. http://www.classcentral.com
4. http://people.deas.harvard.edu/~jones/ap216/lectures/lectures.html
5. http://www.ks.uiuc.edu/Services/Class/PHYS480/

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K3	K4	K6	K3	K5	K2
CO2	K3	K6	K5	K3	K4	K2
CO3	K1	K3	K5	K5	K6	K1
CO4	K1	K6	K4	K5	K5	K1
CO5	K2	K5	K5	K4	K5	K2
Average	**K2**	**K5**	**K5**	**K4**	**K5**	**K2**

Paper 6: ELECTROMAGNETIC THEORY AND PLASMA PHYSICS

TOTALHOURS: 90 HRS **SUB CODE: 20PPHCT2006**
CREDIT:4 **L-T-P:60-30**

COURSE OBJECTIVES

1. Deal with the fundamental principles of Electrostatistics, Magneto statistics and Electrodynamics.
2. Get familiarize with Maxwell's Equations and its applications.
3. To get an outline in plasma physics.

COURSE OUTCOMES: On completion of the course the students will be able to…

CO No.	CO Statement
CO1	To revise the basis and fundamental theories of classical electrostatics.
CO2	To analyze the concept of Electrodynamical field.
CO3	Give concise physical interpretation and arguments for validity.
CO4	Integrate several components of quantum system to assess problems.
CO5	Establish application towards field equations.

SYLLABUS

UNIT 1: Electrostatics **18 hrs**

Laplace equation – Boundary conditions and uniqueness theorem – Laplace equation in three dimension – Solution in Cartesian and spherical polar co ordinates-Polarization and displacement vectors - Boundary conditions - Dielectric sphere in a uniform field – Molecular polarizability and electrical susceptibility – Electrostatic energy in the presence of dielectric – Multipole expansion.

UNIT 2: Magnetostatics **18 hrs**

Biot-Savart Law - Ampere's law - Magnetic vector potential and magnetic field of a localised current distribution- Magnetostatic energy - Magnetic induction and magnetic field in macroscopic media - Boundary conditions - Uniformly magnetised sphere.

UNIT 3: Maxwell Equations **18 hrs**

Faraday's laws of Induction - Maxwell's displacement current - Maxwell's equations - Vector and scalar potentials - Gauge invariance - Wave equation and plane wave solution- Coulomb and Lorentz gauges - Energy and momentum of the field - Poynting's theorem - Lorentz force.

UNIT 4: Wave Propagation **18 hrs**

Plane waves in non-conducting media - Linear and circular polarization, reflection and refraction at a plane interface - Waves in a conducting medium - Propagation of waves in a rectangular wave guide- In homogeneous wave equation and retarded potentials

UNIT 5: Elementary Plasma Physics **18 hrs**

The Boltzmann Equation - Simplified magneto-hydrodynamic equations - Electron plasma oscillations - The Debye shielding problem - Plasma confinement in a magnetic field - Magneto-hydrodynamic waves - Alfven waves and magnetosonic waves**.**

BOOKS FOR STUDY:

1. **Introduction to Electrodynamics**, D. J. Griffiths, , 3rd Edition, Prentice-Hall of India, New Delhi.
2. **Principles of Electrodynamics,** B. Chakraborty, Books and Allied, Kolkata, 2002.
3. **Foundations of Electromagnetic Theory,** J. R. Reitz, F. J. Milford and R. W. Christy, , 3rd edition, Narosa Publication, New Delhi, 2003.
4. **Classical Electrodynamics,** J. D. Jackson, Wiley Eastern Ltd. New Delhi, 2009.
5. **Fundamentals of Plasma Physics,** J. A. Bittencourt**,** Pergamon Press, Oxford, 2008.

BOOKS FOR REFERENCE:

1. **Classical Electricity and Magnetism**, W. Panofsky and M. Phillips, Addison Wesley, London, 2008.
2. **Electromagnetics with Applications,** J. D. Kraus and D. A. Fleisch Edition, WCB McGraw-Hill, New York, 2010.
3. **The Feynman Lectures on Physics,** R. P. Feynman, R. B. Leighton and M. Sands, Narosa, New Delhi, 2008.
4. **Principles of Electrodynamics,** V.Gupta, S. Kumar , S.Chand, 2002
5. **Principles of Electrodynamics**, Melvin Schwertz, Dover Publication, 2003

E-LEARNING RESOURCES:

1. http://www.plasma.uu.se/CED/Book/index.html
2. http://www.thphys.nuim.ie/Notes/electromag/frame-notes.html
3. http://www.thphys.nuim.ie/Notes/em-topics/em-topics.html
4. http://dmoz.org/Science/Physics/Electromagnetism/Courses_and_Tutorials/
5. http://www.edx.org//

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K3	K5	K5	K4	K2	K1
CO2	K6	K5	K5	K3	K4	K2
CO3	K3	K5	K6	K3	K3	K2
CO4	K6	K5	K5	K5	K5	K1
CO5	K5	K3	K4	K3	K2	K2
Average	**K5**	**K5**	**K5**	**K4**	**K3**	**K2**

Paper 7: COMPUTATIONAL METHODS AND C PROGRAMMING

TOTALHOURS: 90HRS **SUB CODE: 20PPHCT2007**

CREDIT:4 **L-T-P: 60-30**

COURSE OBJECTIVES

1. To understand the various concepts of computational methods.
2. To gain knowledge in numerical integration and differentiation.
3. To solve mathematical problems using C-programming.

COURSE OUTCOMES: On completion of the course the students will be able to…

CO No.	CO Statement
CO1	Study the concepts of nonlinear algebraic equations and extend it to three dimensions.
CO2	Analyze the theoretical concepts and formulate the results in interpolation and curve fitting.
CO3	Apply advanced knowledge of mathematics in numerical techniques.
CO4	Attain a comprehensive introduction to the C-programming language and structured design.
CO5	Extent the numerical techniques with programming language.

SYLLABUS

UNIT 1: Solution of Equation **18 hrs**

Determination of zeros of polynomials –Roots of nonlinear algebraic equations and transcendental equations – Bisection and Newton-Raphson methods – Convergence of solutions.

UNIT 2: Linear Systems **18 hrs**

Solution of simultaneous linear equations – Gaussian elimination – Matrix inversion – Eigen values and eigenvectors of matrices – Power and Jacobi Methods.

UNIT 3: Interpolation and Curve Fitting **18 hrs**

Interpolation with equally spaced and unevenly spaced points (Newton forward and backward interpolations, Lagrange interpolation) – Curve Fitting-Fitting a straight line –fitting a second order parabola– Polynomial least – squares fitting.

UNIT 4: Differentiation, Integration and Solution of Differential Equations **18 hrs**

Numerical differentiation – Numerical integration – Trapezoidal rule – Simpon's rule – Error estimates– Numerical solution of ordinary differential equations – Euler and RungeKutta methods.

UNIT 5: Programming With C **18 hrs**

Flow-charts – Integer and floating-point arithmetic expressions – Built-in functions – Executable and non-executable statements – Subroutines and functions – Programs for the following computational methods: (a) Zeros of polynomials by the bisection method, (b) Zeros of polynomials/non-linear equations by the Newton-Raphson method, (c) Lagrange Interpolation, (d) Trapezoidal and Simpson's Rules, (e) Solution of first order differential equations by Euler's method.

BOOKS FOR STUDY:

1. **Computer Oriented Numerical Methods,** V.Rajaraman, 4th Edition, PHI New Delhi, 2018 .
2. **Numerical Methods for Scientific and Engineering Computation,** M.K. Jain, S.R. Iyengar and R.K. Jain, New Age Publishers , 2016 6th Edition.
3. **Introductory Methods of Numerical Analysis,** S.S. Sastry, Pretence Hall India Pvt Ltd, 2005
4. **Numerical Methods,** E. Balagurusamy, McGraw Hill Education, 2017.
5. **Programming in ANSI C,** E.Balagurusamy, McGraw Hill Education, 2017

BOOKS FOR REFERENCE:

1. **Elementary Numerical Analysis- An Algorithmic Approach,** S.D. Conte and C. de Boor, SIAM Society for Industrial and Applied Mathematics, 2017
2. **Applied Numerical Analysis,** B.F. Gerald and P.O. Whitley, , Pearson India, 2007.
3. **Numerical Analysis,** F. Schield , Schaum Series, MgGraw Hill, 2002.
4. **Numerical Recipes in C,** W.H. Press, S.A. Teukolsky, W.T. Vetterling, B.F. Flannery, 2nd Edition (Re-print), Cambridge University Press, 2002 .
5. **Numerical Recipes in Fortran,** S.A. Teukolsky, W.T. Vetterling, B.F. Flannery,W.H. Press,2009.

E-LEARNING RESOURCES:

1. http://www.sst.ph.ic.ac.uk/angus/Lecturs/compphys/comphys.html
2. http://www.library.cornell.edu/nr (numerical recipes online book on C & FORTRAN)
3. http://www.edx.org//
4. http://minty.caltech.edu/Ph125a/
5. http://www.classcentral.com

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K3	K5	K4	K3	K4	K2
CO2	K6	K6	K4	K3	K3	K2
CO3	K6	K6	K6	K4	K5	K1
CO4	K3	K3	K4	K3	K2	K1
CO5	K5	K4	K3	K5	K5	K2
Average	**K5**	**K5**	**K5**	**K4**	**K4**	**K2**

ELECTIVE I: SPECTROSCOPY

TOTALHOURS: 90 hrs **SUB CODE: 20PPHET2001**

CREDIT:4 **L-T-P: 60-30**

COURSE OBJECTIVES

1. To develop a physical understanding of atomic and molecular physics.
2. To derive the information of complex molecules, form their spectra.
3. Detailed understanding of various instrumentation techniques.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To impart basic knowledge of electromagnetic region and elaborate it to rotational level.
CO2	To understand vibrational spectroscopy applied in infrared region.
CO3	To study the vibrational and rotational level and to elucidate the structure of molecules.
CO4	To learn the physics behind the concept of resonance in spectroscopy and study the environment of any molecule.
CO5	To understand the concepts of NQR its instrumentation with applications.

SYLLABUS

UNIT 1: Microwave Spectroscopy **18 hrs**

Rotational spectra of diatomic molecules - Polyatomic molecules - Linear and symmetric top molecules - Hyperfine structrure and quadrupole moment of linear molecules - Experimental techniques - Stark effect.

UNIT 2: Infrared Spectroscopy **18 hrs**

Vibrations of diatomic and simple polyatomic molecules - Anharmonicity – Fermi Resonance – Hydrogen Bonding – Normal Modes of Vibration in a crystal – Solid State Effects – Interpretation of Vibrational Spectra – Instrumentation techniques – FTIR spectroscopy

UNIT 3: Raman Scattering **18 hrs**

Vibrational and Rotational Raman spectra – Mutual Exclusion principle – Raman spectrometer – Polarization of Raman Scattering light. Structure Determination through IR and Raman spectroscopy – Phase transitions – Resonance Raman Scattering

UNIT 4: NMR and ESR Spectroscopy **18 hrs**

Bloch equations -Quantum theory of NMR –Steady state solutions- Design of CW NMR Spectrometer – Chemical Shift-Interpretation of proton NMR spectrum of 1-nitro propane.
Quantum Theory of ESR – Design of ESR Spectrometer – Hyperfine Structure – Triplet state study of ESR – Applications-Structural determination-Study of free radicals.

UNIT V: NQR and Massbauer Spectroscopy **18 hrs**

Quadrupole Nucleus-Principle of Nuclear Quadrupole Resonance-Transition for axially and non-axially symmetric system-NQR instrumentation-Regenerative continues wave oscillator method.
Recoilless emission and absorption-Experimental technique-source and absorber-Mossbauer Spectrometer-Isomer Shift-Quadrupole Interaction-Magnetic hyperfine interaction-applications.

BOOKS FOR STUDY:

1. **Fundamentals of Molecular Spectroscopy**, C. N. Banwell and E. M. McCash, , 4th Edition Tata McGraw Hill, New Delhi,2015.
2. **Molecular Structure and Spectroscopy**, G. Aruldas, Prentice Hall of India Pvt. Ltd. New Delhi, 2001.
3. **Vibrational Spectroscopy and Applications,** D. N. Satyanarayana, New Age International Publication, 2004.
4. **Spectroscopy,** H.Kaur, Pragathi prakashan publication, 5th edition, meerut,2009.
5. **Spectroscopy**, B.K. Sharma,krishna's Educational Publishers, 23rd Edition, 2014.

BOOKS FOR REFERENCE:

1. **Molecular and Atomic Spectroscopy**, R. Wilfred Sugumar, 1st Edition, 2008,.
2. **Elements of Organic Spectroscopy**, Y. R. Sharma, S. Chand Publishers, Revised Edition, 2014.
3. **Raman Spectroscopy**, D. A. Lang, Mc Graw-Hill International, 2007.
4. **Vibrational Spectroscopy and Applications**, G. Saxena, New Age International Publication,2004.
5. **Spectroscopy**, D. D. Jyaji and M. D Yadav , Amol Publications, 2009.

E-LEARNING RESOURCES:

1. http//:www.edu.rsc.org
2. http//:www.acs.org
3. http//:www.ncbionetwork.org
4. http//:www.cdl.edb.hkeycity.net
5. http//:www.educationonline.ku.edu

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K6	K5	K4	K4	K5	K2
CO2	K5	K6	K4	K5	K4	K2
CO3	K6	K6	K5	K4	K5	K2
CO4	K6	K5	K4	K5	K5	K1
CO5	K6	K4	K5	K5	K5	K1
Average	**K6**	**K5**	**K4**	**K5**	**K5**	**K2**

PRACTICAL – I (At the end of I year)
(GENERAL)

TOTALHOURS: 90 Hrs **SUB CODE: 20PPHCP2001**
CREDIT:4 **L-T-P: 60-30**

External Examination: 4 hrs., Marks:60 (10 marks for record & 50 marks for experiment)
Internal Examination: 40 Marks

Any **TEN** Experiments:

1.Cornu's method – Young's modulus by Elliptic fringes.
2.Young's modulus – Hyperbolic fringes
3.Stefan's constant.
4.Band gap energy - Thermistor / Semiconductor
5.Hydrogen spectrum - Rydberg's constant.
6.Coefficient of linear expansion – Air wedge method.
7.Permittivity of a liquid using an RFO.
8.L-G Plate.
9.Lasers: Study of Laser Beam Parameters
10. Arc Spectrum - Copper.
11. Determination of strain hardening coefficients.
12. Viscosity of liquid – Meyer's disc.
13. F. P. Etalon using spectrometer.
14. Arc spectrum – Iron.
15. Edser and Butler fringes – Thickness of air film.
16. B – H loop using Anchor ring.
17. Specific charge of an electron – Thomson's method.

PRACTICAL – II (At the end of I year)
(ELECTRONICS)

TOTALHOURS: 90 Hrs **SUB CODE: 20PPHCP2002**
CREDIT:4

External Examination: 4 hrs., Marks:60 (10 marks for record & 50 marks for experiment)

Internal Examination: 40 Marks

Any **SIX** Experiments:

ELECTRONICS:

1. FET CS amplifier – frequency response, input impedance, output impedance
2. Study of attenuation characteristics of Wien bridge network & Wien bridge oscillator using op.amp.
3. Study of attenuation characteristics of phase shift network & phase shift oscillator using op.amp.
4. Op.amp. – Schmitt trigger
5. Op. amp. – astable & monostable multivibrators
6. Study of R-S, clocked R-S & D flip-flops using NAND / NOR gates
7. Study of J-K, D & T flip-flops using IC 7476 / 7473
8. Clock generators using IC 7400 and 7413
9. Op.amp. – solving simultaneous equations
10. Op.amp. – 4-bit D/A & A/D converters using R-2R ladder network
11. Op.amp. – active filters
12. IC 555 timer – astable & monostable multivibrator
13. IC 555 timer – Schmitt trigger
14. IC 7476 – shift register, ring counter & Johnson counter
15. Arithmetic operations using IC 7483
16. IC 7490 as scalar and seven segment display using IC 7447

Any **SIX** Experiments:

MICROPROCESSOR 8085:

1. Microprocessor 8085 – addition & subtraction of 8- & 16-bit numbers
2 .Microprocessor 8085 – multiplication (8-bit & 16-bit) & division (8-bit)
3. Sum of a set of N data (8-bit numbers)
4. Picking up the smallest & largest number in an array & sorting in ascending & descending order
5. LED interface – single LED on / off, binary, BCD, ring & Johnson Counters
6. Interfacing of seven segment display
7. Microprocessor 8085 – counter under switch control
8. D/A conversion & waveform generation using op.amp.
9.. Square & square root of 8-bit numbers
10..Code conversion (8- & 16- bit numbers) :
11.a) binary to BCD b) BCD to binary
12.Clock program – 12 / 24 hrs.
13. DAC 0800 interface & waveform generation
14. ADC using DAC & Op.amp. comparator
15. ADC 0809 interface
16 Hex keyboard interface
17. Stepper motor interface

DEPARTMENT OF PG PHYSICS

SDNB VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI–600044.

(PG PHYSICS)

COURSE FRAME WORK

SEMESTER III

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
III	08PPHCT3008	CORE THEORY	STATISTICAL MECHANICS	6	4	40	60	100
III	08PPHCT3009	CORE THEORY	NUCLEAR AND PARTICLE PHYSICS	6	4	40	60	100
III	08PPHCE3002	CORE ELECTIVE	NANOSCIENCE AND TECHNOLOGY	5	3	40	60	100
III	12PPHCE3003	CORE ELECTIVE	CRYSTAL PHYSICS	5	3	40	60	100
III	13PPHCP4003	CORE PRACTICAL	PRACTICAL III (General)	6	4	-	-	-
III	18PPHCP4004	CORE PRACTICAL	PRACTICAL IV(Electronics)	6	4	-	-	-
III	18PSSRS3003	SOFT SKILL	RESEARCH SKILLS		3	50		50

SEMSTER III

PAPER 8: STATISTICAL MECHANICS

TOTAL HOURS: 90HRS **SUB CODE: 08PPHCT3008**

CREDIT: 4 **L-T-P:60-30**

COURSE OBJECTIVES

1. To understand the basic principles of statistical mechanics and its application to realistic problems.
2. Realize fundamentals of solid structure of materials.
3. Strong knowledge on structure on of magnetic materials and its classifications.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To Learn relationship between equilibrium distributions and kinetic processes leading to equilibrium.
CO2	To Become aware of the richness and complexity of statistical behaviour exhibited by interacting systems and various approaches related to thermodynamics in various statistical systems.
CO3	To Apply in and various approaches macroscopic and microscopic systems.
CO4	To develop statistical description of system to real statistical problems using classical and quantum distributions.
CO5	To Examine appropriate limiting behaviors in various statistical systems and to develop statistical description of system and use it to obtain thermodynamic quantities of interest.

SYLLABUS

UNIT 1: Phase Transitions **18 hrs**

Gibb's phase rule - Phase transitions and Ehrenfest's classifications – Third law of Thermodynamics. Order parameters - Landau theory of phase transition - Critical indices.

UNIT 2: Statistical Mechanics and Thermodynamics **18 hrs**

Microcanonical ensemble - Phase space – Entropy - Connection between statistics and thermodynamics- Entropy of mixing and Gibb's paradox.

UNIT 3: Canonical and Grand canonical Ensembles **18 hrs**

Trajectories and density of states - Liouville's theorem - Canonical and grand canonical ensembles (Qualitative treatment only) - Partition function - Calculation of statistical quantities - Energy and density fluctuations.

UNIT 4: Classical and Quantum Statistics **18 hrs**

Density matrix - Statistics of ensembles - Statistics of indistinguishable particles - Maxwell-Boltzman statistics - Fermi-Dirac statistics – Ideal Fermi gas – Degeneracy - Bose-Einstein statistics - Plank radiation formula - Ideal Bose gas - Bose-Einstein condensation

UNIT 5: Real Gas, Ising Model and Fluctuations **18 hrs**

Ising model - Mean-field theories of the Ising model in three, two and one dimensions - Exact solutions in one-dimension. Correlation of space-time dependent fluctuations - Fluctuations and transport phenomena - Brownian motion - Langevin theory.

BOOKS FOR STUDY :

1. **Statistical Mechanics,** R.K. Pathria, P.D. Beale, 3rd Edition., Elsevier, 2011.
2. **Statistical Mechanics**, S.K.Sinha, 1990, Tata Mc Graw – Hill,New Delhi
3. **Statistical Mechanics,** K. Huang, 2nd Edition., Wiley, 2008.
4. **Heat and Thermodynamics**, M. Zemansky, and R. Dittman, 8th Edition., McGraw-Hill Education, 2011.
5. **Thermodynamics and Statistical Mechanics,** J.M. Seddon and D. Julian, 3rd Ed., RSC publication, 2001.

BOOKS FOR REFERENCE:

1. **Statistical Mechanics**, K. Huang, 2002, Taylor and Francis, London
2. **Thermal Physics**, A. B. Gupta, H. Roy, 2002, Books and Allied, Kolkata.
3. **Statistical Mechanics**, M. Glazer and J. Wark, 2001, Oxford University Press, Oxford.
4. **Statistical Physics - Statics, Dynamics and Renormalization,** L. P. Kadanoff, 2001,World Scientific, Singapore.
5. **Thermodynamics, Kinetic Theory and Statistical Thermodynamics**, F. W. Sears, and G. L. Salinger, 1998, 3rd Edition, Narosa, New Delhi.

E-LEARNING RESOURCES:

1. http://www.nyu.edu/classes/tuckerman/stat.mech/lectures.html
2. http://www.abo.fi/~mhotokka/mhotokka/lecturenotes/sm.html
3. http://www-f1.ijs.si/~vilfan/SM/cont.html
4. http://web.mit.edu/8.334/www/lectures/
5. http://cs.physics.sunysb.edu/verbaarschot/html/lectures/phy306-05/notes.html

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K4	K4	K6	K3	K2	K2
CO2	K5	K4	K6	K4	K5	K1
CO3	K5	K5	K6	K5	K5	K2
CO4	K66	K6	K6	K5	K5	K2
CO5	K5	K6	K5	K5	K6	K1
Average	**K5**	**K5**	**K6**	**K4**	**K5**	**K2**

PAPER 9: NUCLEAR AND PARTICLE PHYSICS

TOTALHOURS: 90 HRS **SUB CODE: 08PPHCT3009**

CREDIT: 4 **L-T-P: 60-30**

COURSE OBJECTIVES

1. Elementary knowledge on nucleus, nucleus models, reaction, and elementary particles.
2. Deliberate the fundamental concepts in nuclear physics.
3. Identify with various theories and mechanisms of nuclear decay.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To Understand the concepts of nucleus and its properties to apply quantum theory of a particle and measure the properties of quantum system.
CO2	To Expand and evaluate the concepts of nuclear structures in nuclear reactions.
CO3	To Analyze the properties of stable nucleus and explore different types of nuclear models.
CO4	To Applying the decay concepts to study decay rates and extended to neutrino physics of parity conservation violation.
CO5	To Learn the concepts of elementary particles and symmetries.

SYLLABUS

UNIT 1 – NUCLEAR INTERACTIONS **18HRS**

Nucleon-nucleon interaction – Tensor forces – Meson theory of nuclear forces – Yukawa potential – Nucleon-Nucleon scattering – Effective range theory – Spin dependence of nuclear forces – Charge independence and charge symmetry of nuclear forces – Isospin formalism

UNIT 2 – NUCLEAR REACTIONS **18HRS**

Types of reactions and conservation laws – Energetics of nuclear reactions –Dynamics of nuclear reactions – Q-value equation – Scattering and reaction cross sections – Compound nucleus reactions – Direct reactions – Resonance scattering – Breit-Wigner one level formula.

UNIT 3 – NUCLEAR MODELS **18HRS**

Liquid drop model – Bohr-Wheeler theory of fission – Experimental evidence for shell effects – Shell model – Spin-orbit coupling - Magic numbers – Angular momenta and parities of nuclear ground states– Magnetic moments and Schmidt lines – Collective model of Bohr and Mottelson.

UNIT 4 – NUCLEAR DECAY **18HRS**

Beta decay – Fermi theory of beta decay – Shape of the beta spectrum – Total decay rate - Mass of the neutrino – Angular momentum and parity selection rules – Allowed and forbidden decays – Comparative half-lives – Neutrino physics – Non-conservation of parity– Internal conversion – Nuclear isomerism

UNIT 5 – ELEMENTARY PARTICLE PHYSICS **18HRS**

Types of interaction between elementary particles – Hadrons and leptons – Symmetries and conservation laws – Elementary ideas of CP and CPT invariance – Classification of hadrons – SU(2) and SU(3) multiplets – Quark model - Gell-Mann-Okubo mass formula for octet and decuplet hadrons – Charm, bottom and top quarks

BOOKS FOR STUDY :

1. **Introducing Nuclear Physics**, K.S. Krane, Wiley,2008, India.
2. **Nuclear Physics: Theory & Experiments,** R.R. Roy and B.P. Nigam, New Age International, 2005.
3. **Introduction to Elementary Particles,** D. Griffiths, 2nd Ed., Academic Press, 2008.
4. **Introductory Nuclear Physics,** S.S.M. Wong, 2nd Ed., Wiley VCH, 2004.
5. **Nuclear Physics in a Nutshell,** C.A. Bertulani, 1st Ed., Princeton University Press, 2007.

BOOKS FOR REFERENCE:

1. **Concept of Nuclear Physics,** B.L. Cohen, McGraw-Hill, 2003.
2. **Nuclear & Particle Physics: An Introduction,** B. Martin, Willey, 2006.
3. **Nuclear Physics: Experimental and Theoretical,** H.S. Hans, 2nd Ed., New Academic Science Ltd., 2010.
4. **Basic Ideas and Concepts in Nuclear Physics,** K. Heyde, 2nd Ed., Overseas Press, India, 2005.
5. **Nuclear Physics,** I. Kaplan, Addison Wesley, (Indian Ed., from Narosa Publishing House, New Delhi), 2002.

E-LEARNING RESOURCES:

1. http://ocw.mit.edu/OcwWeb/Physics/8-701Spring 2004/Lecture notes
2. http://faraday.physics.utoronto.ca/General Interest/D.Bailey/SubAtomic/ Lectures/ Lect.html
3. http://www.edx.org//
4. http://minty.caltech.edu/Ph125a/
5. http://www.classcentral.com

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K6	K5	K6	K5	K6	K1
CO2	K6	K5	K5	K4	K6	K2
CO3	K5	K5	K6	K4	K5	K1
CO4	K6	K5	K6	K4	K5	K2
CO5	K3	K4	K5	K5	K4	K2
Average	**K5**	**K5**	**K6**	**K4**	**K5**	**K2**

ELECTIVE II: NANOSCIENCE AND TECHNOLOGY

TOTALHOURS: 90 HRS **SUB CODE: 08PPHCE3002**

CREDIT:3 **L-T-P: 60-30**

COURSE OBJECTIVES

1. Knowledge on basic concepts of nanophysics and have an idea on general characterization techniques of nanomaterials.
2. Learn the structures, properties, characterization, and applications of nanomaterials.
3. To develop knowledge on the field of nanoscience and technology with special focus on the methods of synthesis.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To understand the basic concepts in nanoscience.
CO2	To Comprehend the principles of nanotechnology.
CO3	To explore the field of nanomaterials.
CO4	To Became aware of knowledge over tools of nanotechnology.
CO5	To Frame to acquire knowledge towards the applications of nanoscience in medical field.

SYLLABUS

UNIT 1: INTRODUCTION TO NANOTECHNOLOGY 18 HRS

Introduction to nano structured materials- Size dependent property of Nanostructures- Types of Bonds- Covalent- Coordinate- Vanderwaal's and Hydrogen Bonds- Polymers- Ceramics- Biosystems- Molecular recognition.

UNIT 2: TOP DOWN APPROACH 18 HRS

Quantum dots, quantum wire and quantum well – principles- quantum confinement of electrons in semiconductor nano structures- synthesis- Electronic structure of Nanocrystals- Applications- Single electron devices- Nano MOSFET- Heterogeneous Nano structures.

UNIT 3: BOTTOM UP APPROACH 18 HRS

Carbon Nanotubes- synthesis- Mechanism of Growth-Properties- Applications- Self assembled monolayers- Growth process- Phase transitions-monolayers- Applications

UNIT 4: TOOLS OF NANOTECHNOLOGY 18 HRS

SEM, TEM, STM, AFM and Nano Lithography: E- Beam Lithography, Dip pen Lithography, Nano liftoff Lithography- Optical Microscopy: confocal Microscopy, Scanning Near Field Optical Microscopy- X Ray diffraction- Clean Room- Clean Room Practices

UNIT 5: NANOSCIENCE IN HEALTH CARE 18 HRS

Introduction to Nano Biology- Biological Imaging- Immuno fluorescent Biomarker- Imaging- Immunogold labeling- Diagnostic applications of Immuno targeted nano particles- Targeted Drug delivery- Materials for use in diagnostic and therapeutic applications: Gold Nano particle, Quantum dot and Magnetic nano particle.

BOOKS FOR STUDY:

1. **A Text book on Nanotechnology**, Mark Ratner and Daniel Ratner, Pearson Education ,2001.
2. **A Handbook of Nanoelectronics**, Branda paz, Dominant Publishers and Distributors, New Delhi, 2006.
3. **Nano:The essentials**, T. Pradeep, Tata Mcgraw hill Publishing Co. Ltd., New Delhi.2010.
4. **Introduction to Nanotechnology**, Charles Poole and Jr., Frank. J.Owens, Illustrated, John Wiley and Sons,2003.
5. **Introduction to Spintronics**, P. Bandyopadhyay, M.Cahay, 2nd Ed., CRC Press, 2015.

BOOKS FOR REFERENCE

1. **Textbook of Nanoscience and Nanotechnology**, B.S. Murty, P. Shankar, B. Raj, B.B. Rath, J.Murday, Springer-Verlag Berlin Heidelberg, 2013.
2. **Springer Handbook of Nanotechnology,** B. Bhushan, Springer-Verlag Berlin Heidelberg, 2004.
3. **Introduction to Nanoscience and Nanotechnology,** G. L. Hornyak, H.F. Tibbals, J. Dutta, J. J. Moore, CRC Press, 2008.
4. **Nanostructures and Nanomaterials: Synthesis, Properties, and Applications**, G. Cao, Y. Wang, 2nd Ed., Imperial College Press, 2004
5. **Complex-shaped Metal Nanoparticles: Bottom-Up Syntheses and Applications**, T.K. Sau, A.L. Rogach 1st Ed., Wiley-VCH, 2012.

E LEARNING RESOURCES

1. http://www.edx.org//
2. http://minty.caltech.edu/Ph125a/
3. http://www.classcentral.com
4. http://nanotechnow.com/naotechnologybasics.com/nanotechnologylinks.com/nononet.rice.edu
5. https://www.loc.gov/rr/scitech/selected-internet/nanotechnology.html

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K3	K5	K4	K5	K5	K2
CO2	K5	K6	K6	K4	K4	K1
CO3	K6	K5	K6	K4	K6	K2
CO4	K6	K5	K5	K4	K4	K2
CO5	K6	K5	K6	K5	K6	K1
Average	**K5**	**K5**	**K5**	**K4**	**K5**	**K2**

ELECTIVE III: CRYSTAL PHYSICS

TOTALHOURS: 90 HRS **SUB CODE: 12PPHCE3003**
CREDIT:3 **L-T-P: 60-30**

COURSE OBJECTIVES

1. Understand the fundamental principles and concepts of crystal physics.
2. Basic knowledge on crystal and its growth.
3. Know the theoretical and experimental aspects involved in crystal growth.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To understand the basics of nucleus and the concepts of nucleation.
CO2	To Analyze the experimental studies of crystal growth methods.
CO3	To Acquire the ideas on types of characterization of crystals and its applications.
CO4	To recognize the crystal structure determination and reciprocal lattice.
CO5	To study the concepts of crystallography.

SYLLABUS

UNIT I: CRYSTAL GROWTH PHENOMENA 18 HRS

Nucleation- Homogeneous and Hetrogeneous nucleation-Gibbs Thomson equation for vapour- Energy of formation of a nucleus- Spherical nucleus- cylindrical nucleus- Cap shaped nucleus- Disc shaped nucleus.

UNIT II: CRYSTAL GROWTH –EXPERIMENTAL 18 HRS

Classification of methods of growth.

Solution growth

Solution, solubility and supersolubility-supersaturation-Methods of crystallization- slow cooling method-slow evaporation method-Temperature gradient method.

Gel growth

Principle of Gel Growth-Various types of gel-structure of gel-Importance of gel technique-Single diffusion method.

Melt growth

Growth from melt-The Bridgman and related techniques.

Epitaxial growth

Liquid phase epitaxy-Tipping technique. Vapour phase epitaxy- Principles of method and apparatus. Molecular beam epitaxy.

UNIT III: CHARECTERIZATION 18 HRS

Powder XRD- FTIR- UV-Visible-Thermal characterization- Micro-hardness- Etching.

UNIT IV: CRYSTAL STRUCTURE DETERMINATION 18 HRS

Braggs law in one dimension-Concept of reciprocal lattice-Construction of X ray diffractometer-Steps in crystal structure determination- Soft wares for structure determination and visualization- WinGX.

UNIT V: CRYSTAL STRUCTURE ANALYSIS 18 HRS

Conformation of Molecules – Five membered and six membered rings – Packing of molecules- Bonding in solids - Types of Bonding- Covalent bond-Ionic bond-Vanderwaals bond-Hydrogen bond- Bond order-Bond length- Bond energy-electronegativity.

BOOKS FOR STUDY

1. **A Text book on Crystal Physics** , W A Wooster , Cambridge University , 2016.
2. **Elementary Crystallography**, D. Velmurugan, MJP Publishers. 2011
3. **Principles of instrumentation analysis**, Koog Holler and Crouch, 6th edition, Thomson books/cole publications, 2012
4. **Solid State Physics**, N.W. Ashcroft and D.M. Mermin, Holt, Rinehart and Winston, 2016.
5. **Crystal Physics**, G.S.Zhdanov, Academic Press, 2003

BOOKS FOR REFERENCE

1. **Introduction to solid state physics**, chjarles kittel,Wiley publication 2019.
2. **Solid State Physics ,** S.O.Pillai, New age international ,2020.
3. **Solid State Physics** , A.J.Dekker , Lakmi publications ,2008
4. **Solid State Physics , structure and properties of materials** ,M.A.Wahab- Narosa publishing house , 2015.
5. **X-ray diffraction in crystal imperfect crystal and amorphous bodies** , A. Guinier , Dover publications ,2003.

E LEARNING RESOURCES

1. http//:www.insights.emeritus.org
2. http//:www.libgudies.madison.edu
3. http://www.iidcr.org
4. http://www.carleton.edu
5. http://www.slactandfoline.com

Mapping of CO with PSO:

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CO3	K5	K5	K4	K5	K5	K2
CO4	K4	K4	K5	K4	K5	K2
CO5	K3	K5	K3	K4	K3	K1
Average	**K4**	**K5**	**K4**	**K4**	**K5**	**K2**

DEPARTMENT OF PG PHYSICS

SDNB VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI–600044.

(PG PHYSICS)

COURSE FRAME WORK

SEMESTER IV

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
IV	08PPHCT4010	CORE THEORY	CONDENSED MATTER PHYSICS	6	4	40	60	100
IV	17PPHCE4004	CORE ELECTIVE	MICROPROCESSOR 8086 AND MICROCONTROLLER 8051	5	3	40	60	100
IV	08PPHCE4005	CORE ELECTIVE	MATERIAL SCIENCE	5	3	40	60	100
IV	13PPHCP4003	CORE PRACTICAL	PRACTICAL III (General)	6	4	40	60	100
IV	18PPHCP4004	CORE PRACTICAL	PRACTICAL IV (Electronics)	6	4	40	60	100
IV	13PPHPR4001		PROJECT		4	40	60	100
IV	18MOOC4004		SWAYAM (MOOC)			50		50

PAPER 10: CONDENSED MATTER PHYSICS

TOTALHOURS: 90HRS **SUB CODE: 08PPHCT4010**

CREDIT:4 **L-T-P: 60-30**

COURSE OBJECTIVES

1. To provide in depth knowledge of crystal structure properties of crystal and superconductivity.
2. Applying the reciprocal lattice to the crystal structure.
3. Acquire knowledge on functional materials like superconductors and magnetic materials.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To Understand the fundamental principles and concepts of crystal physics. Applying the reciprocal lattice to the crystal structure and explain how it gives rise to band structure and Brillouin zone.
CO2	To enhance students familiar with lattice vibrations.
CO3	To Expand and evaluate the energy band structure of metal and semiconductors.
CO4	To gain basic knowledge about magnetism and ferromagnetic domains.
CO5	To Acquire knowledge on functional materials like superconductors.

SYLLABUS

UNIT 1: Crystal structure **18hrs**

Types of lattices - Miller indices – Symmetry elements and allowed rotations - Simple crystal structures – Atomic Packing Factor- Crystal diffraction - Bragg's law – Scattered Wave Amplitude - Reciprocal Lattice (sc, bcc, fcc) – Diffraction Conditions - Laue equations - Brillouin zone - Structure factor - Atomic form factor - Inert gas crystals - Cohesive energy of ionic crystals - Madelung constant - Types of crystal binding (general ideas).

UNIT 2: Lattice Dynamics **18hrs**

Lattice with two atoms per primitive cell - First Brillouin zone - Group and phase velocities - Quantization of lattice vibrations - Phonon momentum - Inelastic scattering by phonons - Debye's theory of lattice heat capacity - Thermal Conductivity - Umkalapp processes.

UNIT 3: Theory of Metals and Semiconductors **18hrs**

Free electron gas in three dimensions - Electronic heat capacity - Wiedemann-Franz law - Band theory of metals and semiconductors - Bloch theorem - Kronig-Penney model - Semiconductors - Intrinsic carrier concentration – Temperature Dependence - Mobility - Impurity conductivity – Impurity states - Hall effect.

UNIT 4: Magnetism **18hrs**

Diamagnetism - Quantum theory of paramagnetism - Rare earth ion - Hund's rule - Quenching of orbital angular momentum - Adiabatic demagnetization - Quantum theory of ferromagnetism - Curie point - Exchange integral - Heisenberg's interpretation of Weiss field - Ferromagnetic domains - Bloch wall - Spin waves - Quantization - Magnons - Thermal excitation of magnons - Curie temperature and susceptibility of ferrimagnets - Theory of antiferomagnetism - Neel temperature.

UNIT 5: Superconductivity **18hrs**

Experimental facts: Occurrence - Effect of magnetic fields - Meissner effect – Critical field – Critical current - Entropy and heat capacity - Energy gap-Type I and II Superconductors.
Theoretical Explanation: Thermodynamics of super conducting transition - London equation - Coherence length – Isotope effect - Cooper pairs - BCS Theory - Single particle tunneling - Josephson tunneling - DC and AC Josephson effects - High temperature Superconductors - SQUIDS.

BOOKS FOR STUDY:

1. **Introduction to Solid State Physics,** C. Kittel, 8th Ed., J. Wiley and Sons, 2005.
2. **Solid state Physics,** M.A.Wahab, 2nd Ed., Narosa Publishing House, 2006.
3. **Condensed Matter in a Nutshell,** G.D. Mahan,1st Ed., Princeton University Press, 2010.
4. **Introductory Solid State Physics,** H. P. Myers, , 2nd Edition, Viva Book, New Delhi,1998.
5. **Solid State Physics,** S. O. Pillai, , New Age International, New Delhi,2002.

BOOKS FOR REFERENCE:

1. **Solid State Physics,** A.J. Dekker, Macmillan, 2009.
2. **Elementary Solid State Physics,** M.A. Omar, Addison-Wesley, 2009.
3. **Problems in Solid State Physics with Solutions,** F. Han, World Scientific, 2011.
4. **Solid State Physics ,** R.K.Puri , S.Chand ,2008.
5. **Solid State Physics** , Neil W , Cengage publications ,2014.

E-LEARNING RESOURCES:

1. http://ocw.mit.edu/OcwWeb/Physics/8-701Spring 2004/Lecture notes
2. http://faraday.physics.utoronto.ca/General Interest/D.Bailey/SubAtomic/ Lectures/ Lect.html
3. http//:www.libgudies.madison.edu
4. https://www.classcentral.com/
5. http://www.edx.org//

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K4	K6	K6	K4	K5	K2
CO2	K5	K5	K5	K4	K4	K1
CO3	K6	K5	K5	K4	K5	K2
CO4	K3	K4	K4	K4	K4	K1
CO5	K6	K5	K4	K4	K5	K2
Average	**K5**	**K5**	**K5**	**K4**	**K5**	**K2**

ELECTIVE IV: MICROPROCESSOR 8086 AND MICROCONTROLLER 8051

TOTALHOURS:90 HRS **SUB CODE: 17PPHCE4004**
CREDIT: 3 **L-T-P: 60-30**

COURSE OBJECTIVES

1. Realize the architecture of microprocessors and methodology of programming.
2. Explore the interfacing using the microcontroller.
3. Acquire knowledge on microprocessor in different applications.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To study the basic concepts for analyzing the peripheral devices.
CO2	To understand the architecture of 8086 microprocessor.
CO3	Be familiar with the basic concepts of architecture and assembly language programming of 8086 microprocessor.
CO4	To gain knowledge about microcontroller family and educate clear idea in 8051 microcontroller.
CO5	To write a program with interfacing concepts.

SYLLABUS

UNIT 1: Peripheral and interfacing devices **18 hrs**

Interval timer (8254/8253), DMA controller-programmable peripheral interfaces-8155, 8255.

UNIT 2: 8086 Architecture **18 hrs**

8086 Architecture – Min.Mode, Max.Mode – Software Model – Segmentation- Segmentation of address – Pipe line Processing – Interrupts in 8086 – Interrupt types and 8086 response – NMI- Internal Interrupts – Interrupt Priorities.

UNIT 3: 8086 Programming **18 hrs**

Addressing Modes – Instruction Set- Constructing Machine Code – Instruction Templates for MOV Instruction– Data Transfer Instructions– Arithmetic, Logic, Shift, rotate instructions- Flag Control instructions- Compare, Jump Instructions– Loop and String instructions -Assembly programs- Block move, Sorting– Code Conversion: Binary to BCD, BCD to Binary.

UNIT 4: Microcontroller 8051 **18 hrs**

Introduction – 8- & 16-Bit Microcontroller families –Flash series – Embedded RISC Processor – 8051 Microcontroller Hardware – Architecture of 8051- Key features of 8051-Memory organization- data and program memory- Internal RAM organization – Special function registers- Control Registers-Internal registers – Addressing modes – Assembly Language Programming – Arithmetic, Logic & Sorting operations.

UNIT 5: Interfacing I/O and Memory With 8051 **18 hrs**

Interfacing I/O Ports, External memory, Counters & Timers. Serial data input/Output, Interrupts – Interfacing 8051 with ADC, DAC, LED display, Keyboard, Sensors and Stepper motor.

TEXT BOOKS:

1. **Microprocessors and Interfacing programming and Hardware,** Douglas V. Hall (TataMc Graw Hill) 2012.
2. **The 8086 /8088 Microprocessors - Programming, Software, Hardware and application,** W.A. Triebel and Avatar Singh, Prentice Hall of India, New Delhi, 2009.
3. **The 8051 Micro Controller Architecture, Programming and Applications**. Kenneth J. Ayala, 3rd Edition, Penram International, 2014.
4. **Design with PIC Microcontrollers,** John B. Peatman, 7th Indian reprint, Pearson Education 2004.
5. **The 8051 Microcontroller and Embedded Systems Using Assembly** , C.Muhammad Ali Mazidi, Pearson Education, 2012.

BOOKS FOR REFERENCE:

1. **Operational amplifiers with linear integrated circuits**, W.D. Stanley, 4th Ed., Pearson Education India, 2002.
2. **Digital Principles and Design,** D.D. Givone, Tata McGraw-Hill, 2002.
3. **Microprocessor Architecture, Programming & Applications with 8085,** R.S. Gaonkar, Prentice Hall, 2002.
4. **Electronic devices,** T.L. Floyd, 9th Ed., Pearson Education. Ltd., 2013.
5. **Microprocessor Architecture, Programming and Applications with 8085**, Ramesh Gaonkar, Penram International, 2013.

E-LEARNING RESOURCES:

1. https://www.yumpu.com/en/document/view/21922965/8086-microprocessors-peripherals-vtu-e-learning
2. https://www.circuitstoday.com/4-books-to-learn-8051-microcontroller
3. http//:www.libgudies.madison.edu
4. http://www.edx.org//
5. https://www.classcentral.com/

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	K4	K5	K5	K5	K4	K2
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CO4	K5	K5	K5	K4	K5	K1
CO5	K6	K5	K5	K6	K6	K1
Average	**K5**	**K5**	**K5**	**K4**	**K5**	**K2**

ELECTIVE V: MATERIALS SCIENCE

TOTALHOURS: 90 HRS **SUB CODE: 08PPHCE4005**
CREDIT:3 **L-T-P: 60-30**

COURSE OBJECTIVES

1. Gain basic knowledge on the nature of ceramics, polymers, and composites.
2. Basic knowledge on dielectrics and magnetism.
3. Analyze the various types of magnetic materials.

COURSE OUTCOMES: on completion of the course the students will be able to…

CO No.	CO Statement
CO1	To make students familiar with advanced materials
CO2	Become aware of knowledge towards polymers
CO3	To educate the concepts of Dielectric and extended towards its applications
CO4	Understand the fundamental principles and concepts of crystal growth techniques
CO5	To gain basic knowledge about magnetic materials

SYLLABUS

UNIT 1: CERAMICS AND COMPOSITES **18 hrs**

Structural features – production of ceramics – forming and post forming process – mechanical properties – commercial ceramic system: Si-Al system technical ceramics – Zr and Si alloys – cement and concrete – composite materials – continuous and discontinuous fibre composites.

UNIT 2: POLYMERS: **18 hrs**

Classification of polymers – structural features – mechanism – thermoplastics – rubber and elastomers – physical, chemical and mechanical properties – cellular plastics – liquid crystal polymers.

UNIT 3: DIELECTRICS: **18 hrs**

Electrical polarization – mechanism of polarization – optical, molecular and interfacial polarizability – classification of dielectric materials – piezoelectric, pyroelectric and ferroelectric materials – temperature and frequency effects on dielectric materials – applications of these materials.

UNIT 4: ELECTRONIC MATERIALS: **18 hrs**

Purification of electronic materials – single crystal growth – pulling method – wafer manufacture – oxidation – photolithography – doping technique – epitaxial growth – metallization – circuits and process simulation and integration – junction formation – junction lasers.

UNIT 5: MAGNETIC MATERIALS: **18 hrs**

Classification of magnetism – origin and size of domain structure – hard magnetic materials – permanent magnetic alloys – magnetic steels and Al-Ni / Al-Ni-Co alloys – fine particle alloys – rare earth cobalt alloys – applications of permanent magnets – soft magnets – Si-Fe and nanocrystalline magnetic metals – microwave ferrites and garnets – magnetic bubbles.

BOOKS FOR STUDY :

1. **Materials Science and Engineering**, V. Raghavan, 2003, 4th Edition, (Printice-Hall India, New Delhi,2012.
2. **Science of engineering materials**, C.M. Srivastava and C. Srinivasan, 1987,New Age Intl, New Delhi, 2013.
3. **Material Science**, J. C. Anderson, K.D. Leaver, R.D. Rawlings and J.M. Alexander, 4th Edition, Chapman & Hall. London,2009 .
4. **Materials Science**, M. Arumugam, 3rd Edition, Anuradha Agencies,2002.
5. **Solid State Physics,** S. O. Pillai, , New Age International, New Delhi,2002.

BOOKS FOR REFERNCE:

1. **Materials Science**, G.K. Narula, K.S.Narula and V.K.Gupta, , Tata McGraw-Hill, 2008.
2. **Elements of Materials Science and Engineering**, Lawrence H. Van Vlack, 6th Edition, second ISE reprint, Addison-Wesley, 2009
3. **Solid state Physics** – **An introduction to principles of Material Science**, H. Iabch and H.Luth, 2nd Edition, Springer, 2001.
4. **Solid State Physics ,** R.K.Puri , S.Chand ,2008.
5. **Solid State Physics** , Neil W , Cengage publications ,2014.

E LEARING RESOURCES

1. http://www.elearningindustry.com
2. http://www.edx.org
3. http://www.learnphy.com
4. http://www.doitpom.ac.uk
5. http://www.openculture.org

Mapping of CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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CO2	K6	K5	K5	K4	K4	K1
CO3	K6	K5	K6	K5	K5	K2
CO4	K6	K5	K5	K5	K5	K2
CO5	K3	K5	K3	K4	K5	K2
Average	**K5**	**K5**	**K4**	**K4**	**K5**	**K1**

Practical III (At the end of II year)
GENERAL

TOTALHOURS:90 hrs **SUB CODE: 13PPHCP4003**
CREDIT: 4 **L-T-P: 60-30**

External Examination: 4 hrs., Marks:60 (10 marks for record & 50 marks for experiment)
Internal Examination: 40 Marks

Any **TEN** Experiments:

1. GM counter – Characteristics, inverse square law, absorption coefficient.
2. GM counter - Feather's analysis : Range of Beta rays.
3. Michelson Interferometer – Wavelength, separation of wavelengths, thickness of mica sheet.
4. Hall effect.
5. Molecular spectra – ALO band .
6. Susceptibility by Quincke's method.
7. Susceptibility by Guoy's method.
8. Ultrasonics – Compressibility of a liquid.
9. Dielectric measurements in Microwave test bench.
10. B-H curve using CRO.
11. Miscibility measurement usingUltrasound Diffraction Method
12. Conductivity measurement using four probe method.
13. Solar constant – Lee's Disc
14. Solar Spectrum – Fraunhoffer lines
15. Thickness of enamel coating wire – Air wedge.
16. Measurement of Curie temperature.
17. Raman spectroscopy.
18. Impedance measurement –LCR bridge.

PRACTICAL IV (ELECTRONICS)

TOTALHOURS: 90 hrs **SUB CODE: 18PPHCP4004**
CREDIT: 4 **L-T-P: 60-30**

Microprocessor 8086

Any **TEN**Experiments:

1. Addition & subtraction
2. Multiplication & division
3. Multibyte addition & subtraction
4. Sorting in ascending & descending order
5. Generation of Fibonacci series
6. LCM of n data bytes in an array
7. GCD of n data bytes in an array
8. Matrix multiplication

Microcontroller 8051 Experiments:

9. Addition & subtraction
10. Multiplication & division
11. Sorting in ascending & descending order
12. LED interface
13. Stepper motor interface
14. Choosing maxima and minima
15. Multibyte addition and subtraction

C Programming:

16. Zeros of the Legendre Polynomials $P_n(x)$ (or roots of the equation $P_n(x) = 0$ or nodes of the Gauss-Legendre quadrature), $2 \leq n \leq 6$, with Algorithm, Flow-chart, C PROGRAM, and output.

17. Newton forward interpolation with Algorithm, Flow-chart, C PROGRAM, and output.
18. Newton backward interpolation with Algorithm, Flow-chart, C PROGRAM, and output.
19. Numerical integration by the trapezoidal rule, with Algorithm, Flow-chart, C PROGRAM, and output.
20. Numerical integration by Simpson's rule, with Algorithm, Flow-chart, C PROGRAM and output.
21. Numerical solution of ordinary first-order differential equations by the Euler method, with Algorithm, Flow-chart, C PROGRAM, and output.
22. Solving simultaneous equations.

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Amendments in the regulations from 2020 – 2021 onwards

PG

Changes in Part-II

Semester – I

Title	Internal Marks	External Marks	Credits
Skill based Elective-Teaching Skills	50	-	3

Semester – II

Title	Internal Marks	External Marks	Credits
Soft Skills – SWAYAM (MOOC)	50	-	4

Semester – III

Title	Internal Marks	External Marks	Credits
Skill based elective -Research Skills	50	-	3

Semester – IV

Title	Internal Marks	External Marks	Credits
Extra Disciplinary– SWAYAM (MOOC)	50	-	4