

**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 2022-24)



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Chromepet, Chennai - 600 044.

to Qualify for a Degree

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RULES AND REGULATIONS

DEPARTMENT OF PHYSICS

Revised Syllabus of 2021 - 2023 (PG PHYSICS)

OBJECTIVES 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



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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 from 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 as 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 as 55% instead of 65% if they conceive during their academic career. Medical certificate from 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 office 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 from 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



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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.



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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]

Sum of the multiplication of grade points by the credits of the courses

$$\text{GPA} = \frac{\text{-----}}{\text{Sum of the credits of the courses in a semester}}$$

For the entire programme:

CUMULATIVE GRADE POINT AVERAGE [CGPA]

Sum of the multiplication of grade points by the credits of the courses

$$\text{CGPA} = \frac{\text{-----}}{\text{Sum of the credits of the courses of the entire programme}}$$



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



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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 Scientific temper leading to critical thinking and research motivation in Physics area.
PSO2	Attain the required skills to the Physics behind the phenomena occurring in nature and surroundings and hence apply them to enhance our life style.
PSO3	Plan and execute an experiment through careful observations, precise measurements, analyses, interpretation and effectively communicate the results by way of presenting a brief lecture on a science topic or writing scientific reports.

23. QUESTION PAPER PATTERN:

QUESTION PAPER PATTERN FOR OBE

(2020-21 onwards)

Theory

PG –Question paper Pattern- conventional on- paper mode



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Bloom's Category Level	Sections	Marks	Word limit	Total	Meaning of K's
K1, K2	Multiple Choice Questions 15 Questions * 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.



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PG QUESTION PAPER PATTERN FOR OBE ONLINE
ASSESSMENT (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, examPle, 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.



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Question paper pattern for Continuous Assessment Test (CAT)

(The online assessment pattern)

P.G PROGRAMME

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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.



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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	22PPHCT1001	4	2	6	4
I	CORE	CLASSICAL MECHANICS AND RELATIVITY	20PPHCT1002	4	2	6	4
I	CORE	QUANTUM MECHANICS I	22PPHCT1003	4	2	6	4
I	CORE	INTEGRATED ELECTRONICS AND MICROPROCESSOR	22PPHCT1004	4	2	6	4
I	CORE	PRACTICAL I(General)	20PPHCP2001	2	1	3	-
I	CORE	PRACTICAL II (Electronics)	22PPHCP2002	2	1	3	-
II	SKILL BASED ELECTIVE	CYBER SECURITY	22PSSCS1001	2		2	3
II SEMESTER							
I	CORE	QUANTUM MECHANICS II	22PPHCT2005	4	2	6	4
I	CORE	ELECTROMAGNETIC THEORY AND PLASMA PHYSICS	20PPHCT2006	4	2	6	4
I	CORE	COMPUTATIONAL METHODS AND C PROGRAMMING	22PPHCT2007	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)	22PPHCP2002	2	1	3	4
II	SKILL BASED ELECTIVE	SWAYAM (MOOC)	18MOOC2002	2		2	4
II		INTERNSHIP	17PPHIP3001				2
III SEMESTER							
I	CORE	STATISTICAL MECHANICS	22PPHCT3008	4	2	6	4
I	CORE	NUCLEAR AND PARTICLE PHYSICS	20PPHCT3009	4	2	6	4
I	ELECTIVE	NANOSCIENCE AND TECHNOLOGY	22PPHCE3002	3	2	5	3
I	ELECTIVE	CRYSTAL PHYSICS	22PPHCE3003	3	2	5	3
I	CORE	PRACTICAL III (General)	22PPHCP4003	2	1	3	-
I	CORE	PRACTICAL IV(Electronics)	22PPHCP4004	2	1	3	-
II	SKILL BASED ELECTIVE	RESEARCH SKILLS	18PSSRS3003	2		2	3
IV SEMESTER							



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I	CORE	CONDENSED MATTER PHYSICS	20PPHCT4010	4	2	6	4
I	ELECTIVE	MICROPROCESSOR AND BASICS OF EMBEDDED SYSTEM	22PPHCE4004	3	2	5	3
I	ELECTIVE	MATERIALS SCIENCE	22PPHCE4005	3	2	5	3
I	CORE	PRACTICAL III (General)	22PPHCP4003	2	1	3	4
I	CORE	PRACTICAL IV (Electronics)	22PPHCP4004	2	1	3	4
I	CORE	PROJECT	20PPHPR4001	3	3	6	4
II	SKILL ENHANCEMENT	COURSE ERA	23PSECR4004	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)



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**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



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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	22PPHCT1001	CORE THEORY	MATHEMATICAL PHYSICS	6	4	40	60	100
I	20PPHCT1002	CORE THEORY	CLASSICAL MECHANICS AND RELATIVITY	6	4	40	60	100
I	22PPHCT1003	CORE THEORY	QUANTUM MECHANICS I	6	4	40	60	100
I	22PPHCT1004	CORE THEORY	INTEGRATED ELECTRONICS AND MICROPROCESSOR	6	4	40	60	100
I	20PPHCP2001	CORE PRACTICAL	PRACTICAL I(General)	3	-	-	-	-
I	22PPHCP2002	CORE PRACTICAL	PRACTICAL II(Electronics)	3	-	-	-	-
I	22PSSCS1001	SKILL BASED ELECTIVE	CYBER SECURITY	2	3	50		50



COURSE DATA SHEET

SEMESTER	I	BATCH	2022-2024
COURSENAME	MATHEMATICAL PHYSICS	COURSE CODE	22PPHCT1001
COURSE UNITS	5	COURSE TYPE	CORE THEORY-1
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

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 Statement	Cognitive Level
CO1	Understand the basic principles and carry the knowledge forward which can be applied in future research.	K1-K3 (Understand and Apply)
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.	K1-K3 (Understand and Apply)
CO3	Strike a balance between formalism and applications.	K1-K4 (Understand, Apply and Analyse)
CO4	Include applications of boundary value problems of mathematics towards modern physics.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	Enable them to improve their logical and analytical skills.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	<p>LINEAR VECTOR SPACE AND MATRICES THEORY</p> <p>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 orthogonalization Process – Eigen values and Eigen functions of operators/matrices – Hermitian and unitary operators/matrices – Cayley-Hamilton theorem - Diagonalizing matrix.</p>	18
2	<p>LINEAR DIFFERENTIAL EQUATIONS AND GREEN'S FUNCTION</p> <p>Second order linear differential equations – Wronskian determinant - 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.</p>	18
3	<p>COMPLEX VARIABLES</p> <p>Functions of a complex variable - Single and multi-valued functions - Analytic functions - Cauchy - Riemann conditions - Singular points - Cauchy's integral theorem and Cauchy's integral formula - Taylor series and Laurent series expansions - Zeros and poles – Cauchy's Residue theorem- evaluation of definite integrals by Contour integration.</p>	18
4	<p>LAPLACE AND FOURIER TRANSFORMS</p> <p>Laplace transforms –derivative of $f(t)$, Integral of $f(t)$, multiplication and division by t- Inverse Laplace transform- multiplication and division by s, partial fractions method- first and second shifting property-Solution of linear differential equations with constant coefficients by Laplace transform - Fourier integral – Fourier sine and cosine integral-Fourier transforms-Fourier sine and cosine transforms- Convolution theorem on Fourier transform.</p>	18
5	<p>GROUP THEORY</p> <p>Basic definitions- subgroups - Lagrange's Theorem - Invariant subgroup - Homomorphism and Isomorphism between groups - Representation of a group -reducible and irreducible representations-Unitary representations - Schur's lemmas I and II – Great Orthogonality theorem –Character table – C_{2v}, C_{3v}.</p>	18
		90



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. Mathematical physics, Sathyaprakash, 2012, 6th Edition, Sultan Chand and sons, India2. Mathematical physics, P.K. Chattopadhyay, 2013 2nd Edition, New Age International publishers3. 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	<ol style="list-style-type: none">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	<ol style="list-style-type: none">1. http://www.mpipks-dresden.mpg.de/jochen/methods/outline/html2. 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.html5. http://www.thphys.nuim.ie/Notes/frame-notes.html

PEDAGOGY (TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources



CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-		2	3	3
CO2	3	2	1	1	1	-		2	3	3
CO3	2	2	1	1	1	-		2	3	3
CO4	2	2	1	1	1	-		2	3	3
CO5	2	2	1	1	1	-		2	3	3
Average (Use only filled in cells for calculation)	2.2	2	1	1	1	-		2	3	3

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	2	Moderately mapped as students able to Identify and analyze the complex problems reaching substantiated conclusions using domain knowledge.
	PO2	2	Moderately mapped as students will be able to apply investigative research, specialize in problem identification, formulate research design, utilize analytical tools.
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	1	Slightly mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovations



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	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
CO2	PO1	3	Strongly mapped as students will be able to gain knowledge on mathematical methods
	PO2	2	Moderately mapped as students will gain knowledge in apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	1	Slightly mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to imbibing innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
CO3	PO1	2	Moderately mapped as students will be able to understand theory and applications
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	1	Slightly mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to



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			innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to imbibing innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
CO4	PO1	2	Moderately mapped as students will be able to understand boundary value problems
	PO2	2	Moderately mapped as students will be apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	1	Slightly mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
CO5	PO1	2	Moderately mapped as students will be apply logical and analytical skills
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	1	Slightly mapped as students will be able to establish oneself as a self-reliant,



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			empowered individual towards life and society.
PO5	1		Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
PO6	-		No direct contribution to innovations
PSO1	2		Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
PSO2	3		Strongly mapped as the students will be able to analyze the problem to be implemented.
PSO3	3		Strongly mapped as the students will be able to analyze the problem to be implemented.



COURSE DATA SHEET

SEMESTER	I	BATCH	2022-2024
COURSENAME	CLASSICAL MECHANICS AND RELATIVITY	COURSE CODE	20PPHCT1002
COURSE UNITS	5	COURSE TYPE	CORE THEORY
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

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 oscillations.
3	To describe Lagrangian and Hamiltonian equation of motion

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

	CO Statement	Cognitive Level
CO1	To develop familiarity with the physical concepts and facilitate with the mathematical methods of classical mechanics.	K1-K3 (Understand and Apply)
CO2	To develop skills in formulating physics problems and gain knowledge in relativistic concepts.	K1-K3 (Understand and Apply)
CO3	To emphasize the analyzing solution and explore its consequences towards various means.	K1-K4 (Understand, Apply and Analyse)
CO4	To expand and evaluate the student's physical intuition and thinking process through the understanding of the theory.	K1-K5 (Understand, Apply, Analyse and Evaluate)
CO5	To acquire knowledge of real time problems in macroscopic view and applying it to the microscopic level.	K1-K5 (Understand, Apply, Analyse and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	UNIT 1: LAGRANGIAN AND HAMILTONIAN FORMULATIONS 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's laws of planetary motion and their deduction.	18
2	MECHANICS OF RIGID BODIES 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	18
3	CANONICAL TRANSFORMATION 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.	18
4	UNIT 4: SMALL OSCILLATIONS Stable, unstable and neutral equilibrium – Two coupled oscillators – solution of the differential equation – normal coordinated and normal modes – Frequencies of normal modes – Linear triatomic molecule.	18
5	RELATIVITY 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.	18
Note (if any)		



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">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.Aruldas, , 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	<ol style="list-style-type: none">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	<ol style="list-style-type: none">1. http://astro.physics.sc.edu/selfpacedunits/unit56.html2. http://www.phy.auckland.nz/staff/smt/453310SC.html3. http://www.damtp.cam.ac.uk/user/tong/dynamics.html4. http://farside.ph.utexas.edu/teaching/301/lectures/lectures.html5. http://www.lancs.ac.uk/depts/physics/teaching/py332/phys332.html

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CO-PO AND CO-PSO MAPPING:									
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	1	2	2	1	1	3	2	3
CO2	2	3	1	1	2	3	1	2	2
CO3	3	2	1	3	3	2	3	2	2
CO4	3	1	3	2	3	1	2	2	3
CO5	3	3	2	1	3	2	3	3	3
Average (Use only filled in cells for calculation)	2.8	2.0	1.8	1.8	2.2	1.6	2.4	2.2	2.6

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly mapped as the students will be able to apply the concepts wherever required.
	PO2	1	low level of correlations as the students will be able to apply their theoretical knowledge.
	PO3	2	Moderately mapped as students will acquire the basic skill for problem solving.
	PO4	2	Moderately mapped as the students learnt to facilitate the mathematical methods of classical mechanics.



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	PO5	1	Low level correlation as the students will be able to find the feasible tool to make them expertise in technical skills.
	PO6	1	Slightly mapped as the students able to understand towards the theorems
	PSO1	3	Strongly mapped as the students will be able to implement the theorems towards problem solving.
	PSO2	2	Moderately mapped as the students will be able to describe the fundamentals.
	PSO3	3	Strongly mapped as the students will be able to apply knowledge of mathematics in real time Classical Mechanics problems.
CO2	PO1	2	Moderately mapped as the students will be able to infer the knowledge to formulate a problem.
	PO2	3	Highly mapped as the students will be able to articulate the ideas.
	PO3	1	Low level of correlation to strengthen professional ethics.
	PO4	1	Less correlation to establish as empowered individuals.
	PO5	2	Less correlation to establish as managerial expertise.
	PO6	3	Strongly correlated to theoretical knowledge as the students will be able to achieve the skills.
	PSO1	1	Low level of correlation to gain the basic domain knowledge.
	PSO2	2	Moderately correlated to gain knowledge in real time problems
	PSO3	2	Highly correlated to gain the skill and pursue higher education.
CO3	PO1	3	Strongly correlated to understand the concepts of Physics and apply it to their work.
	PO2	2	Moderate mapping to integrate several components of theories with applications to problems.
	PO3	1	Conceptual knowledge can be further expanded to understand and solve complex problems.



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	PO4	3	Highly mapped to establish as an empowered individual.
	PO5	3	Strongly correlated to equip with technical and managerial expertise.
	PO6	2	Moderate Mapping as the students able to gain the fundamental knowledge.
	PSO1	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO2	2	Moderately mapped to apply and enhance the life style.
	PSO3	2	Moderately mapped to write and execute scientific reports.
CO4	PO1	3	Strongly mapped to identify the complex problems with domain knowledge.
	PO2	1	Low level of Correlation as the students will be able to gain knowledge.
	PO3	3	Strongly mapped to plan the career with systematic building.
	PO4	2	Moderately mapped to evaluate the students' thinking process.
	PO5	3	Strongly mapped as the students will be able to analyze technically.
	PO6	1	Low level of correlations as the students understands the theory and not able to meet the global trends.
	PSO1	2	Moderate level of acquaintances in Research motivation.
	PSO2	2	Life time enhancement could be moderately applied.
	PSO3	3	Strongly mapped as the students will be able to write the scientific reports and communicate effectively.
CO5	PO1	3	Strongly mapped to analyze the complex problems.
	PO2	3	Strongly mapped acquire knowledge of real time problems.
	PO3	2	Moderately mapped to strengthen professional ethics and career planning.
	PO4	1	Low level of mapping with self-reliant and empowered individual.
	PO5	3	High level of correlation with technical and managerial expertise.



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PO6	2	Moderate mapping to the global trends and demands.
PSO1	3	Strongly mapped with technical expertise.
PSO2	3	Strongly mapped as the students will be able to create new avenues to meet global trends and demands.
PSO3	3	Strongly mapped as the students will be able develop new innovations



COURSE DATA SHEET

SEMESTER	I	BATCH	2022-2024
COURSENAME	QUANTUM MECHANICS -I	COURSE CODE	22PPHCT1003
COURSE UNITS	5	COURSE TYPE	CORE THEORY- 3
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

COURSE OBJECTIVES	
1	Make the students 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 Statement	Cognitive Level
CO1	To understand the central concepts and basic formalisms of quantum mechanics from a classical point of view.	K1 - K5 (Understand, Apply, Analyze and evaluate))
CO2	Enhances the mathematical implementation to solve problems in various dimensions.	K1 - K3 (Understand and Apply)
CO3	To establish the relations and validate various results to give concise physical interpretations, and arguments for the validity of the methods.	K1 - K3 (Understand and Apply)
CO4	To integrate several components of theories with applications to problems.	K1 - K5 (Understand, Apply, Analyze and evaluate)
CO5	To solve present tools and test ideas on problems involving many body systems.	K1 - K4 (Understand, Apply and Analyze)



SYLLABUS

UNIT	TOPICS	HOURS
1	UNIT 1: BASIC FORMALISM Postulates of quantum mechanics - Interpretation and conditions on the wave function - Stationary states - Hermitian operators for dynamical variables - Eigenvalues and eigen functions - Uncertainty principle - Ehrenfest's theorem - Schrodinger equation	18 Hrs
2	UNIT 2: ONE DIMENSIONAL PROBLEMS AND THREE-DIMENSIONAL PROBLEMS Particle in a box - Square-well potential - Barrier penetration - Simple harmonic oscillator - Orbital angular momentum and spherical harmonics - Central forces and reduction of two-body problem - Particle in a spherical well - Hydrogen atom.	18 Hrs
3	UNIT 2: ONE DIMENSIONAL PROBLEMS AND THREE-DIMENSIONAL PROBLEMS Particle in a box - Square-well potential - Barrier penetration - Simple harmonic oscillator - Orbital angular momentum and spherical harmonics - Central forces and reduction of two-body problem - Particle in a spherical well - Hydrogen atom.	18 Hrs
4	UNIT 4: ANGULAR MOMENTUM AND IDENTICAL PARTICLES Commutation rules for angular momentum operator - ladder operators - Eigenvalue spectrum (J^2 and J_z) from angular momentum algebra - Matrix representation of angular momentum (J^2 and J_x , J_y and J_z) - Combination of two angular momenta - Clebsch - Gordan Coefficients ($J_1=J_2=1/2$) - Symmetry and anti-symmetry of wave functions - Spin and Pauli matrices.	18 Hrs
5	UNIT 5: APPROXIMATION METHODS Time independent Perturbation theory in Degenerate case - Time independent Perturbation theory in Non-degenerate cases (First and Second order correction to Energy and wave function) - Variation method - Application to ground state of helium - WKB approximation - Connection formulae (no derivation) - WKB quantization rule - Application to simple harmonic oscillator.	18 Hrs



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none"> A Textbook of Quantum Mechanics, P. M. Mathews and K. Venkatesan, Tata McGraw- Hill, New Delhi, 2017. Quantum Mechanics, L. I. Schiff, 3rd Edition, International Student Edition, Mac Graw-Hill Kogakusha, Tokyo, 2013. Quantum Mechanics Concepts and Applications, Nouredine Zetli, wiley publication, 2009 Quantum Mechanics, G. Aruldas, Prentice Hall of India, New Delhi, 2002. The Principles of Quantum Mechanics, P. A. M. Dirac, Oxford University Press, London, 2002.
Books For Reference	<ol style="list-style-type: none"> The Foundations of Quantum Mechanics, J. S. Bell, Gottfried and M. Veltman, World Scientific, Singapore, 2001. Quantum Mechanics, V. Devanathan, Narosa Publishing House, New Delhi, 2005. Quantum Electrodynamics, R. P. Feynman, CRC Press, 2018. Quantum Mechanics: Theory and Applications, A. Ghatak and S. Lokanathan, 4th Edition, Macmillan India, 2009. Angular Momentum Techniques in Quantum Mechanics, V. Devanathan, Kluwer Academic Publishers, 2010.
E-Learning Resources	<ol style="list-style-type: none"> http://www.edx.org/ http://minty.caltech.edu/Ph125a/ http://www.classcentral.com http://people.deas.harvard.edu/~jones/ap216/lectures/lectures.html http://www.ks.uiuc.edu/Services/Class/PHYS480/

PEDAGOGY (TEACHING METHODOLOGY):

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- Web Resources

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	2	3	3



CO2	2	3	2	3	2	1	2	2	2
CO3	2	2	3	1	2	3	2	3	2
CO4	3	3	2	2	2	2	3	3	2
CO5	2	2	3	3	2	2	2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2	2.2	2.8	2.2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly Mapped to understanding the Concepts
	PO2	2	Moderately Mapped to Enhances the mathematical implementation to solve problems
	PO3	1	Low level of Correlation to apply Concepts to solve the complex problems
	PO4	2	Moderately Mapped that Students will be able to apply relations and validating various results to give concise physical interpretations,
	PO5	3	Strongly Mapped, Students can able to identify, formulate, review, and analyze real world problems to define the conceptual sciences.
	PO6	2	Moderately Mapped to integrate several components of theories with applications to problems.
	PSO1	2	Moderately Mapped to acquire Scientific temper leading to critical thinking and research motivation in Physics area
	PSO2	3	Strongly Mapped to Study of Serializability of Transactions will build logical & analytical skills in student.
	PSO3	3	Strongly Mapped, Students will be able to analyze an application using the concepts
CO2	PO1	2	Moderately Mapped, Students will be able to comprehend basic concepts
	PO2	3	Strongly Mapped to Understand the concepts of Physics and apply it to their work
	PO3	2	Moderately Mapped to integrate several components of theories with applications to problems.
	PO4	3	Strongly Mapped, Students will be able to classify different schemes



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	PO5	2	Moderatly Mapped, Students can use modern tools to simulate combinational multidisciplinary environment to a slighter extent.
	PO6	1	Low level of Correlation ,Students will gain knowledge in classifying different normal forms
	PSO1	2	Moderatly Mapped ,Students will be able to apply the fundamental knowledge
	PSO2	2	Moderatly Mapped, Students in a group develop small project to implement concept
	PSO3	2	Moderatly Mapped, Students can manage to do projects using sequential logic circuits in multidisciplinary environment to a slighter extent and get scope for career development leading to lifelong learning.
CO3	PO1	2	Moderatly Mapped,Students will be able to comprehend basic concepts
	PO2	2	Moderatly Mapped, Students will be able to classify different concurrency
	PO3	3	StronglyMapped, integrating several components of theories with applications to problems.
	PO4	1	Low level of correlation,Students can apply Concepts to solve the complex problems
	PO5	2	Moderatly Mapped, learning will be applied to any solution given by student lifelong.
	PO6	3	StronglyMapped,Students can be aware of applications concerned with cultural, societal and environmental considerations
	PSO1	2	Moderatly Mapped ,to attain the required skills to the Physics behind the phenomena occurring in nature
	PSO2	3	StronglyMapped, Team work plays vital role while carrying out projects using heterogeneous data structures
	PSO3	2	Moderatly Mapped , Students gain knowledge of identifying best methods among various methods will help students to identify research gap
CO4	PO1	3	StronglyMapped to understanding the Concepts
	PO2	3	StronglyMapped, Students will be able to analyze an application using the concepts
	PO3	2	Moderatly Mapped, To integrate several components of theories with applications to problems.
	PO4	2	Moderatly Mapped,To Understand the concepts of Physics and apply it to their work.
	PO5	2	Moderatly Mapped,Students can establish oneself as a self-reliant, empowered individual to have an inclusive, healthy and compassionate understanding



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			towards life and society
	PO6	2	Moderatly Mapped that innovators and pioneers to create new avenues of employment catering to the global trends as well as demands
	PSO1	3	StronglyMapped, Applications concerned with cultural, societal and environmental considerations
	PSO2	3	StronglyMapped,To strengthen student's capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.
	PSO3	2	Moderatly Mapped,Students attain knowledge of identifying best methods among various methods will help students to identify research gap
CO5	PO1	2	Moderatly Mapped To solve present tools and test ideas on problems involving many body systems.
	PO2	2	Moderatly Mapped, Students can able to identify, formulate, review, and analyze real world problems
	PO3	3	StronglyMapped,Students can able to understand the formulation and working
	PO4	3	StronglyMapped,Students can classify different Questions
	PO5	2	Moderatly Mapped, To apply proper normalization for research
	PO6	2	Moderatly Mapped,Students can analyze the transactions to achieve feasibility, viability and sustainability.
	PSO1	2	Moderatly Mapped,Apply the concepts to analyse the performance of research.
	PSO2	3	StronglyMapped, Student can attain the required skills to the Physics behind the phenomena occurring in nature
	PSO3	2	Moderatly Mapped, Students can and execute an experiment through careful observation



COURSE DATA SHEET

SEMESTER	I	BATCH	2022-2024
COURSENAME	INTEGRATED ELECTRONICS AND MICROPROCESSOR	COURSE CODE	22PPHCT1004
COURSE UNITS	5	COURSE TYPE	CORE THEORY IV
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

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 Statement	Cognitive Level
CO1	To understand the concepts of theories and circuits and implemented over devices.	K1-K3 (Understand and Apply)
CO2	To analyze logics and impact them to design circuits.	K1 - K4 (Understand, Apply and Analyze)
CO3	To design the electronic circuits to solve mathematical equations	K1 - K4 (Understand, Apply and Analyze)
CO4	To implement the knowledge of integrated chips and develop programming with Microprocessor.	K1-K3 (Understand and Apply)
CO5	To compute microprocessor extended towards peripheral systems	K1-K3



(Understand and Apply)

SYLLABUS

UNIT	TOPICS	HOURS
1	<p align="center">SPECIAL SEMICONDUCTOR DEVICES & THEIR APPLICATIONS</p> <p>FET,MOSFET,UJT,SCR,TRIAC-Construction and characteristics – UJT Relaxation Oscillator & saw tooth wave generator –SCR,TRIAC for power control - Tunnel diodes – Energy band diagrams – Characteristics – Gunn diode and IMPATT diode – construction and operation – IC Technology – Monolithic -Thin Film & Hybrid technology- Limitation – VLSI</p>	18 hrs
2	<p align="center">DIGITAL ELECTRONICS</p> <p>Parallel binary Adder – 8421 BCD Adder - Decoder:1 of 16 decoder – BCD to decimal decoder – Encoder- Decimal to BCD encoder -Multiplexer-Demultiplexer-PLA.</p> <p>Shift registers- Shift left, Shift right operations- Asynchronous counter- 4 bit ripple counter- decade counter- Synchronous counter- modulus & cascaded counters</p> <p>D/A converter- weighted resistor-R-2R Ladder methods- ADC – accuracy & resolution- FLASH type- Counter type – Successive approximation & dual slope ADC.</p>	18 hrs
3	<p align="center">LINEAR IC'S AND APPLICATIONS</p> <p>Operational Amplifier IC 741: Solution of simultaneous equations and differential equations – Logarithmic and Antilog amplifier – Analog multiplication and division – Schmitt Trigger. Active Filters: First order & 2nd order Butterworth filters design – Band pass filters. Generation of square, triangular waves using 741- Phase Shift & Wien's bridge sine wave generation circuits.</p> <p>Timer IC 555: Astable -monostable multivibrator- Frequency divider- Voltage controlled oscillator (VCO)- Phase locked loop PLL– Frequency Multiplier</p>	18 hrs
4	<p align="center">8085 ARCHITECTURE & PROGRAMMING</p> <p>Architecture- Bus structure- Register Array- ALU- IR register -decoding – Timing- Instruction set – Addressing modes – Assembly language programming- use of Look-up Table- Basic programmes-addition - subtraction – multiplication - division of single byte numbers - square and square root of HEX numbers - code conversion - BCD to BINARY– Binary TO BCD conversions – Sorting - Bubble sort method - ascending,</p>	18 hrs



	descending order - Searching an array for a given byte and Appending a byte – Block move – software Time delay.	
5	<p>INTERFACING MEMORY, I/O DEVICES & PERIPHERAL SYSTEMS</p> <p>Direct I/O & Memory mapped I/O- IN & OUT Instructions -Interfacing 8255 Programmable interface I/O - Memory Map – interfacing of ROM, RAM, and EPROM Chips.</p> <p>Interfacing DAC, ADC- Stepper motor-Clockwise, anti-clockwise rotation & wiper action – 4 Junction Traffic Lights control simulation</p>	18 hrs

TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<p>1.Integrated Electronics, Millman and Halkias, McGraw Hill India 2010.</p> <p>2.OpAmps and integrated circuits EEE, R. A. Gaekwad, Printice Hall Publishers, 2015.</p> <p>3.Electronic Devices and Circuit Theory, R. L. Boylestad and L. Nashelsky, 8th Edition, Pearson Education, 2001.</p> <p>4.Semiconductor Optoelectronic Devices, P. Bhattacharya, 2nd Edition. Printice-Hall of India, New Delhi, 2002.</p> <p>5.Digital Electronics and Logic Design, Printice-Hall of India, B. Somnath Nair, New Delhi 2002.</p>
Books For Reference	<p>1.Fundamentals of Microprocessor 8085 – Architecture, Programming and Interfacing, V. Vijayendran, Viswanathan, Chennai, 2002.</p> <p>2.Fundamentals of Microprocessors and Micro Computers, B. Ram, Dhanpat Rai Publications, New Delhi, 2010.</p> <p>3.Electronic Devices and Circuit Theory, R. L. Boylestad and L. Nashelsky, 8th Edition, Pearson Education, 2001.</p> <p>4.Introduction to Semiconductor Devices, M. S. Tyagi Wiley, New York, 2017.</p> <p>4. 5. OpAmp and linear integrated circuits, R. F. Coughlin and F. F. Driscoll, , 1996 Printice Hall of India, New Delhi, 2009.</p>
E-Learning Resources	<ul style="list-style-type: none"> • 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



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4.<http://www.classcentral.com>
5.<http://www.edx.org/>

PEDAGOGY (TEACHING METHODOLOGY):

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- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources

CO-PO AND CO-PSO MAPPING:									
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	2	3	3	2
CO2	2	2	2	2	2	3	3	2	2
CO3	2	2	2	3	3	2	3	3	3
CO4	2	2	3	3	2	2	3	2	2
CO5	3	2	2	2	3	3	2	2	3
Average (Use only filled in cells for calculation)	2.2	2	2.2	2.4	2.6	2.4	2.8	2.4	2.4

Correlation Level: 1-Low 2-Moderate 3-Strong



JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	2	Students will be able to Acquire Basic Knowledge of the course
	PO2	2	Provides a basic fundamental of circuit design and applications.
	PO3	2	The knowledge of mathematical principles and basics of science will help the students to apply the same to substantially understand the simplification techniques pertaining to combinational logic and will be able to design circuits.
	PO4	2	Science will help the students to apply the same to moderately understand the working of FETs and circuits to analyse their performance.
	PO5	3	Provide design solutions for the given specification for certain applications.
	PO6	2	Students will be able to apply first principles of science to moderately analyze and verify combinational circuit problems.
	PSO1	3	The knowledge of mathematical principles and basics of science will help the students to apply the same to substantially analyze certain circuits
	PSO2	3	Principles and basics of science will help the students to apply the same to analyze the performance of semiconductor devices.
	PSO3	2	Moderately understand the working of semiconductor devices and circuits to analyze their performance and also provide solutions for the given specification for certain applications.
CO2	PO1	2	The students will have a solid foundation in the principles and practices of digital electronics, including counters and registers.
	PO2	2	Use the knowledge of basic concepts, students can design and develop solutions



			for technical problems.
	PO3	2	Basic principles will help the students to understand the concepts of registers easily and to Understand and involve in learning for knowledge enhancement
	PO4	2	Understand the concepts of theories and circuits and implemented over devices.
	PO5	2	Know fundamental concepts of devices which will help in solving problem
	PO6	3	Students will be able to design an application using the concepts
	PSO1	3	Student will draw design circuit to solve given and develop circuit
	PSO2	3	Students understand, analyze and design various combinational and sequential circuits
	PSO3	2	Understand the concepts of theories and circuits and implemented over devices
CO3	PO1	2	Students will be able to design an application using the concepts
	PO2	2	Understand the concepts of theories and circuits and implemented over devices.
	PO3	2	Students understand, analyze and design various combinational and sequential circuits
	PO4	3	Know fundamental concepts of devices which will help in solving problem
	PO5	3	Students understand, analyze and design various combinational and sequential circuits
	PO6	2	Know fundamental concepts of devices which will help in solving problem
	PSO1	3	Students understand, analyze and design various combinational and sequential circuits
	PSO2	3	Understand the concepts of theories and circuits and implemented over devices.



	PSO3	3	Students understand, analyze and design various combinational and sequential circuits
CO4	PO1	2	Student will draw design circuit to solve given and develop circuit
	PO2	2	Understand the concepts of theories and circuits and implemented over devices.
	PO3	3	students can apply the same to moderately understand and verify the working of various flip flops, analyze their functionality in certain applications like registers and counters and will be able to design sequential circuits for the given specification to a moderate extent.
	PO4	3	Know fundamental concepts of devices which will help in solving problem
	PO5	2	Understand the concepts of theories and circuits and implemented over devices.
	PO6	2	Student will draw design circuit to solve given and develop circuit
	PSO1	3	Students will be able to comprehend basic concepts of digital electronics and demonstrate these concepts.
	PSO2	2	The ability to understand, analyze and design various combinational and sequential circuits.
	PSO3	2	Students will be able to design an application using the concepts
CO5	PO1	3	The knowledge of basics of microprocessor will help the students to understand the communication between processor and I/O devices.
	PO2	2	Students gain knowledge on microcontrollers.
	PO3	2	Student will draw design circuit to solve given and develop circuit
	PO4	2	Know fundamental concepts of devices which will help in solving problem
	PO5	3	Understand the concepts of theories and circuits and implemented over devices.
	PO6	3	Have a thorough understanding of the fundamental concepts and techniques used in digital electronics



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PSO1	2	Students will understand the basic structure of various systems.
PSO2	2	Understand the concepts of theories and circuits and implemented over devices.
PSO3	3	Know fundamental concepts of devices which will help in solving problem



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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	22PPHCT2005	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	22PPHCT2007	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	22PPHCP2002	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



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SEMESTER	II	BATCH	2022-2024
COURSENAME	QUANTUM MECHANICS - II	COURSE CODE	22PPHCT2005
COURSE UNITS	5	COURSE TYPE	CORE THEORY V
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

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 Statement	Cognitive Level
CO1	Explain the basic theories and extended to microscopic units.	K1-K2 (Understand and Apply)
CO2	Understand the concepts of perturbation and to evaluate the problems with certain approximation.	K1-K3 (Understand and Apply)
CO3	Give concise physical interpretation and arguments for validity	K1-K4 (Understand, Apply and Analyse)
CO4	Integrate several components of quantum system to assess problems.	K1-K5 (Understand, Apply, Analyze and Evaluate)
CO5	Establish application towards field equations.	K1-K6 (Understand, Apply, Evaluate, Create)



SYLLABUS

UNIT	TOPICS	HOURS
1	Unit I SCATTERING THEORY Scattering cross section –Transformation from center of mass to laboratory frame scattering amplitude-The born approximation –Partial wave analysis.	18 hrs
2	Unit II PERTURBATION THEORY Time dependent perturbation theory - constant and harmonic perturbations - Transition probabilities - Adiabatic approximation - Sudden approximation - Semi-classical treatment of an atom with electromagnetic radiation - Selection rules for dipole radiation.	18 hrs
3	Unit III RELATIVISTIC WAVE EQUATION KG equations- Interpretation of KG equation-Plane wave solution - Interpretation of negative energy states-magnetic moment of an electron due to spin – Energy values in a central potential – Limitation of KG equation (origin of dirac equation).	18 hrs
4	Unit IV DIRAC EQUATION Dirac equation for a free particle - covariant form of dirac equation – spin of dirac particle – relativistic invariance of dirac equation - probability density - magnetic moment of the electron - spin orbit interaction.	18 hrs
5	Unit V FIELD QUANTIZATION Quantization of the field – quantization of schrodinger equation – relativistic field – KG field – dirac field – EM field.	18 hrs



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. Quantum Mechanics Concepts and Applications, Nouredine Zettili, Wiley publication, 20092. Quantum Mechanics, G. Aruldhas, Prentice Hall of India, New Delhi, 2002.3. The Principles of Quantum Mechanics, P. A. M. Dirac, Oxford University Press, London, 2002.4. Quantum Mechanics, L. I. Schiff, 3rd Edition, International Student Edition, Mac Graw-Hill Kogakusha, Tokyo, 2013.5. A Textbook of Quantum Mechanics, P. M. Mathews and K. Venkatesan, Tata McGraw-Hill, New Delhi, 2017
Books For Reference	<ol style="list-style-type: none">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	<ol style="list-style-type: none">1. //www.edx.org//2. http://minty.caltech.edu/Ph125a/3. http://www.classcentral.com4. http://people.deas.harvard.edu/~jones/ap216/lectures/lectures.html5. http://www.ks.uiuc.edu/Services/Class/PHYS480/

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CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	2	2	2	3	3	2		2	3	2
CO2	2	3	2	2	2	2		2	2	2
CO3	2	2	2	2	3	3		2	2	2
CO4	2	2	2	2	2	2		2	2	2
CO5	2	2	2	2	2	2		2	2	2
Average (Use only filled in cells for calculation)	2	2.2	2	2.2	2.4	2.2		2	2.2	2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING



CO	PO/PSO	Level of correlation	Justification
CO1	PO1	2	The knowledge of basics principles will help the students to apply the same to implement and analyze their functionality at a moderate level
	PO2	2	Array concepts are very essential in solving problems.
	PO3	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning.
	PO4	3	Students will get a solid foundation in the principles and practices of basic concepts.
	PO5	3	The concept of Fundamentals of logic is applied for solving problems.
	PO6	2	Array concepts are very essential in solving problems.
	PSO1	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning
	PSO2	3	The knowledge of basics principles will help the students to apply the same to implement and analyze their functionality at a moderate level
	PSO3	2	Students will get a solid foundation in the principles and practices of basic concepts.
CO2	PO1	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning
	PO2	3	Students will get a solid foundation in the principles and practices of basic concepts.
	PO3	2	Array concepts are very essential in solving problems.
	PO4	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning
	PO5	2	The knowledge of basics principles will help the students to apply the same to implement and analyze their functionality at a moderate level
	PO6	2	Students will get a solid foundation in the principles and practices of basic concepts.



	PSO1	2	Array concepts are very essential in solving problems.
	PSO2	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning
	PSO3	2	The knowledge of basics principles will help the students to apply the same to implement and analyze their functionality at a moderate level
CO3	PO1	2	Students will get a solid foundation in the principles and practices of basic concepts.
	PO2	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning
	PO3	2	Students will be able to do projects using sequential logic in a multidisciplinary environment to a slighter extent and get scope for career development leading to lifelong learning.
	PO4	2	Array concepts are very essential in solving problems.
	PO5	3	Students will get a solid foundation in the principles and practices of basic concepts.
	PO6	3	Students will get a solid foundation in the principles and practices of basic concepts.
	PSO1	2	Array concepts are very essential in solving problems.
	PSO2	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning
	PSO3	2	The knowledge of basics principles will help the students to apply the same to implement and analyze their functionality at a moderate level
CO4	PO1	2	Students will get a solid foundation in the principles and practices of basic concepts.
	PO2	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning
	PO3	2	Array concepts are very essential in solving problems.
	PO4	2	The knowledge of basics principles will help the students to apply the same to implement and analyze their functionality at a moderate level



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SEMESTER		II	BATCH	2022-2024	
	PO5	2	Students will get a solid foundation in the principles and practices of basic concepts.		
	PO6	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning		
	PSO1	2	The knowledge of basics principles will help the students to apply the same to implement and analyze their functionality at a moderate level		
	PSO2	2	Students will get a solid foundation in the principles and practices of basic concepts.		
	PSO3	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning		
	CO5	PO1	2	Students will get a solid foundation in the principles and practices of basic concepts.	
		PO2	2	Array concepts are very essential in solving problems.	
		PO3	2	Students will be able to apply first principles of science to analyze the working of certain combinatorial environments to a slighter extent and get scope for career development leading to lifelong learning	
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		PSO3	2	Array concepts are very essential in solving problems.	



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OWNED AND MANAGED BY CORK INDUSTRIES CHARITIES TRUST
(Affiliated to the University of Madras and Accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

COURSENAME	ELECTRO MAGNETIC THEORY AND PLASMA PHYSICS	COURSE CODE	20PPHCT2006
COURSE UNITS	5	COURSE TYPE	CORE THEORY VI
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

COURSE OBJECTIVES	
1	Deal with the fundamental principles of Electro statics, Magneto statics and Electrodynamics.
2	Get familiarize with Maxwell's Equations and its application
3	To get an outline in plasma physics.

COURSE OUTCOMES: On completion of the course the students will be able to...		
	CO Statement	Cognitive Level
CO1	To revise the basis and fundamental theories of classical electrostatics	K1-K3 (Understand and Apply)
CO2	To analyze the concept of the Electrodynamical field.	K1- K4(Understand, Apply and Analyse)
CO3	Give concise physical interpretation with Maxwell's Equations and its applications.	K1-K4 (Understand, Apply and Analyse)
CO4	To analyze charged particle dynamics and radiation from localized time varying electromagnetic sources.	K1-K5 (Understand, Apply, Analyse and Evaluate)
CO5	Infer knowledge in plasma physics.	K1-K5 (Understand, Apply, Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	ELECTROSTATICS Laplace equation – Boundary conditions and uniqueness theorem – Laplace equation in three dimension – Solution in Cartesian and spherical polar coordinates-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.	18 hrs
2	MAGNETOSTATICS Biot-Savart Law - Ampere's law - Magnetic vector potential and magnetic field of a localized current distribution- Magnetostatic energy - Magnetic induction and magnetic field in macroscopic media - Boundary conditions - Uniformly magnetised sphere.	18 hrs
3	MAXWELL EQUATIONS 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.	18 hrs
4	WAVE PROPAGATION 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	18 hrs
5	ELEMENTARY PLASMA PHYSICS 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.	18 hrs



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">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	<ol style="list-style-type: none">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, 20025. Principles of Electrodynamics, Melvin Schwertz, Dover Publication, 2003.
E-Learning Resources	<ol style="list-style-type: none">1. http://www.plasma.uu.se/CED/Book/index.html2. http://www.thphys.nuim.ie/Notes/electromag/frame-notes.html3. http://www.thphys.nuim.ie/Notes/em-topics/em-topics.html4. http://dmoz.org/Science/Physics/Electromagnetism/Courses_and_Tutorials/5. http://www.edx.org/

PEDAGOGY (TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources



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CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2		2	3	3
CO2	2	3	2	3	2	1		2	2	2
CO3	2	2	3	1	2	3		2	3	2
CO4	3	3	2	2	2	2		3	3	2
CO5	2	2	3	3	2	2		2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2		2.2	2.8	2.2



JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly mapped as the students will be able to apply the concepts wherever required.
	PO2	2	Moderate level of correlations as the students will be able to apply their theoretical knowledge.
	PO3	1	Low level of mapping as students will acquire the basic skill for problem solving.
	PO4	2	Moderately mapped as the students learnt to facilitate the mathematical methods of Electromagnetism.
	PO5	3	Strongly mapped as the students will be able to find the feasible tool to make them expertise in technical skills.
	PO6	2	Moderately mapped as the students able to understand towards the theorems
	PSO1	2	Moderately mapped as the students will be able to implement the theorems towards problem solving.
	PSO2	3	Strongly mapped as the students will be able to describe the fundamentals.
	PSO3	3	Strongly mapped as the students will be able to apply knowledge of mathematics in real time Classical Mechanics problems.
CO2	PO1	2	Moderately mapped as the students will be able to infer the knowledge to formulate a problem.
	PO2	3	Highly mapped as the students will be able to articulate the ideas.
	PO3	2	Moderate level of correlation to strengthen professional ethics.
	PO4	3	Highly mapped to establish as empowered individuals.
	PO5	2	Moderate correlation to establish as managerial expertise.
	PO6	1	Low level of correlations as the students gain the theoretical knowledge.
	PSO1	2	Moderately mapped for the acquittance towards Research motivation.
	PSO2	2	Moderately correlated to gain knowledge in real time problems
	PSO3	2	Highly correlated to gain the skill and pursue higher education.
CO3	PO1	2	Moderate correlation to understand the concepts of Physics and apply it to their work.
	PO2	2	Moderate mapping to integrate several components of theories with applications to problems.
	PO3	3	Conceptual knowledge can be further expanded to understand and solve complex problems.
	PO4	1	Low level of mapping to establish as an empowered individual.
	PO5	2	Moderate correlation to equip with technical and managerial expertise.



	PO6	3	High level Mapping as the students able to create new avenues with the domain knowledge to meet global demands.
	PSO1	2	Moderately mapped as the students will be able to analyze the problem to be implemented.
	PSO2	3	Highly mapped to apply and enhance the life style.
	PSO3	2	Moderately mapped to write and execute scientific reports.
CO4	PO1	3	Strongly mapped to identify the complex problems with domain knowledge.
	PO2	3	High level of Correlation as the students will be able to analyze the problems with domain specific knowledge.
	PO3	2	Moderately mapped to plan the career with systematic building.
	PO4	2	Moderately mapped to evaluate the students' thinking process.
	PO5	2	Moderately mapped for the innovations
	PO6	2	Moderate correlation as the students understand the theory and not able to meet the global trends.
	PSO1	3	High level of acquaintances in Research motivation.
	PSO2	3	Life time enhancement can be highly applied to attain the skill within the domain specific.
	PSO3	2	Moderate mapping for effective communication.
CO5	PO1	2	Moderately mapped to analyze the complex problems.
	PO2	2	Moderately mapped acquire knowledge of real time problems.
	PO3	3	Strongly mapped to strengthen professional ethics and career planning.
	PO4	3	High level of mapping with self-reliant and empowered individuals.
	PO5	2	Moderate level of correlation with technical and managerial expertise.
	PO6	2	Moderate mapping to the global trends and demands.
	PSO1	2	Moderately mapped with technical expertise.
	PSO2	3	Strongly mapped as the students will be able to create new avenues to meet global trends and demands.
	PSO3	2	Moderately mapped for effective commutations in domain specific.

Correlation Level: 1-Low 2-Moderate 3-Strong



COURSE DATA SHEET

SEMESTER	II	BATCH	2022-2024
COURSENAME	COMPUTATIONAL METHODS AND C PROGRAMMING	COURSE CODE	22PPHCT2007
COURSE UNITS	5	COURSE TYPE	CORE THEORY-1
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

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 Statement	Cognitive Level
CO1	Study the concepts of nonlinear algebraic equations and extend it to three dimensions.	K1-K3 (Understand and Apply)
CO2	Analyze the theoretical concepts and formulate the results in interpolation and curve fitting.	K1-K3 (Understand and Apply)
CO3	Apply advanced knowledge of mathematics in numerical techniques.	K1-K4 (Understand, Apply and Analyse)
CO4	Attain a comprehensive introduction to the C-programming language and structured design.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	Extent the numerical techniques with programming language.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	UNIT 1: INTERPOLATION Interpolation with equally spaced and unevenly spaced points -Newton forward and backward interpolations, Lagrange interpolation. C program on Lagrange Interpolation.	18
2	UNIT 2: LINEAR SYSTEMS Solution of simultaneous linear equations – Gaussian elimination method- Gauss- Jordan elimination – Matrix inversion method – Eigen values and eigenvectors of matrices – Power and Jacobi Methods.	18
3	UNIT 3: SOLUTION OF EQUATION BY NUMERICAL METHODS The solutions of numerical algebraic equations and transcendental equations – Bisection method -Newton-Raphson method –Geometrical interpretation of Newton Raphson method- Rate and order of convergence of solutions- C program on Bisection method – C program on Newton Raphson method.	18
4	UNIT4: NUMERICAL INTEGRATION AND DIFFERENTIATION Numerical differentiation – Numerical integration – Trapezoidal rule – Simpson's rule – Simpson's 1/3 & 3/8 rules- Truncation error of trapezoidal and Simpson rule– Numerical solution of ordinary differential equations – Euler Method- Modified Euler method- Runge-Kutta methods- second and fourth order Runge-kutta method. C program on Euler's method – C Program on Runge-kutta method- C program on Trapezoidal and Simpson's Rules.	18
5	UNIT 5: COMPUTATIONAL PHYSICS Born- Oppenheimer approximation- Introduction to density functional theory (DFT)- Hohenberg-Kohn theorems, Kohn-Sham approach, Theories on exchange correlation functional: LDA and GGA.	18
		90



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. Computer Oriented Numerical Methods, V.Rajaraman, 4th Edition, PHI New Delhi, 2018 .2. Numerical Methods in Science and Engineering, M.K. Venkatraman, National Publishing Company, 2016.3. Introductory Methods of Numerical Analysis, S.S. Sastry, Pretence Hall India Pvt Ltd, 20054. Numerical Methods, E. Balagurusamy, McGraw Hill Education, 2017.5. Programming in ANSI C, E.Balagurusamy, McGraw Hill Education, 2017
Books For Reference	<ol style="list-style-type: none">1. Elementary Numerical Analysis- An Algorithmic Approach, S.D. Conte and C. de Boor, SIAM Society for Industrial and Applied Mathematics, 20172. 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	<ol style="list-style-type: none">1. http://www.sst.ph.ic.ac.uk/angus/Lecturs/compphys/comphys.html2. 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

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- Web Resources



CO-PO AND CO-PSO MAPPING:									
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	3	2	3	3
CO2	3	2	2	2	2	3	2	3	3
CO3	2	2	2	2	2	3	2	3	3
CO4	2	2	2	2	2	3	2	3	3
CO5	2	2	2	2	2	3	2	3	3
Average (Use only filled in cells for calculation)	2.2	2	2	2	2	3	2	3	3

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	2	Moderately mapped as students able to Identify and analyze the complex problems reaching substantiated conclusions using domain knowledge.
	PO2	2	Moderately mapped as students will be able to apply investigative research, specialize in problem identification, formulate research design, utilize analytical tools.
	PO3	2	Moderately mapped as students will be able to strengthen professional ethics and career planning
	PO4	2	Moderately mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	2	Moderately mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	3	Strongly mapped as the students will be able develop new innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics



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	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
CO2	PO1	3	Strongly mapped as students will be able to understand theoretical concepts and formulate the results..
	PO2	2	Moderately mapped as students will gain knowledge in apply research design
	PO3	2	Moderately mapped as students will be able to strengthen professional ethics and career planning
	PO4	2	Moderately mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	2	Moderately mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	3	Strongly mapped as the students will be able develop new innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
CO3	PO1	2	Moderately mapped as students will be able to understand numerical techniques
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	2	Moderately mapped as students will be able to strengthen professional ethics and career planning
	PO4	2	Moderately mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	2	Moderately mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	3	Strongly mapped as the students will be able develop new innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be



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			implemented.
CO4	PO1	2	Moderately mapped as students will be able to understand programming language
	PO2	2	Moderately mapped as students will be apply research design
	PO3	2	Moderately mapped as students will be able to strengthen professional ethics and career planning
	PO4	2	Moderately mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	2	Moderately mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	3	Strongly mapped as the students will be able develop new innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
CO5	PO1	2	Moderately mapped as students will be able to develop a program
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	2	Moderately mapped as students will be able to strengthen professional ethics and career planning
	PO4	2	Moderately mapped as students will be able to establish oneself as a self-reliant, empowered individual towards life and society.
	PO5	2	Moderately mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	3	Strongly mapped as the students will be able develop new innovations
	PSO1	2	Moderately mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics
	PSO2	3	Strongly mapped as the students will be able to analyze the problem to be implemented.
	PSO3	3	Strongly mapped as the students will be able to analyze the problem to be implemented.



COURSE DATA SHEET

SEMESTER	II	BATCH	2022-2024
COURSENAME	SPECTROSCOPY	COURSE CODE	22PPHET2001
COURSE UNITS	5	COURSE TYPE	ELECTIVE THEORY-1
CONTACT HOURS (L-T-P)	60-30	CREDITS	3

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 Statement	Cognitive Level
CO1	To impart basic knowledge of electromagnetic region and elaborate it to rotational level.	K1-K3 (Understand and Apply)
CO2	To understand vibrational spectroscopy applied in infrared region.	K1-K3 (Understand and Apply)
CO3	To study the vibrational and rotational level and to elucidate the structure of molecules.	K1-K4 (Understand, Apply and Analyse)
CO4	To learn the physics behind the concept of resonance in spectroscopy and study the environment of any molecule.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	To understand the concepts of NQR its instrumentation with applications.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	UNIT 1: MICROWAVE SPECTROSCOPY Salient Features of Rotational Spectra - Classifications of Rotors - Rotational spectra of diatomic molecules - Rotational spectra of Polyatomic molecules - Quadrupole moment and Hyperfine structure of linear molecules - Isotope effect in Rotational spectra - Stark effect - Microwave Spectrometer - Applications of Microwave Spectroscopy .	18
2	INFRARED SPECTROSCOPY Theory of Infrared Spectroscopy - Origin of Infrared spectra - Vibration motion of diatomic and simple polyatomic molecules - Anharmonicity – Fermi Resonance – Hydrogen Bonding – Normal Modes of Molecular Vibrations – Solid State Effects – Group frequencies - Overtones and Combinational frequencies – FTIR spectrometer - Applications of Infrared Spectroscopy	18
3	RAMAN SCATTERING Raman Effect - Classical theory of Raman effect - Quantum theory of Raman effect - Vibrational Raman spectra and Rotational Raman spectra – Mutual Exclusion principle – Raman spectrometer – Differences between IR and Raman spectroscopy – FT RAMAN Spectrometer - Applications of Raman Spectroscopy.	18
4	NMR AND ESR SPECTROSCOPY Principles of NMR Spectroscopy - Modes of Nuclear spin - Quantum theory of NMR - Bloch equations -Steady state solutions - - Chemical Shift - Interpretation of proton NMR spectrum of 1-nitro propane - Design of CW NMR Spectrometer - Applications of NMR Spectroscopy. Quantum Theory of ESR - Hyperfine interaction (Electron nucleus coupling) – Types of interactions - Zero field splitting - Design of ESR Spectrometer - Applications of ESR Spectroscopy.	18
5	NQR AND MOSSBAUER SPECTROSCOPY Quadrupole Nucleus-Theory of NQR-Splitting of NQR Spectra - NQR Spectrometer-Applications of NQR Spectroscopy. Principle of Massbauer Spectroscopy - Parameter for Massbauer spectra (Isomer Shift, Quadrupole interaction, Magnetic interaction) - Massbauer Spectrometer - Applications of Massbauer Spectroscopy.	18
		90



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">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	<ol style="list-style-type: none">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	<p>http://www.edu.rsc.org http://www.acs.org http://www.ncbionetwork.org http://www.cdl.edb.hkeycity.net http://www.educationonline.ku.edu</p>

PEDAGOGY(TEACHING METHODOLOGY):

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CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2		2	3	3
CO2	2	3	2	3	2	1		2	2	2
CO3	2	2	3	1	2	3		2	3	2
CO4	3	3	2	2	2	2		3	3	2
CO5	2	2	3	3	2	2		2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2		2.2	2.8	2.2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly Mapped to understanding the Concepts
	PO2	2	Moderately Mapped to Enhances the Spectroscopic Techniques to solve problems
	PO3	1	Low level of Correlation to apply Concepts to solve the complex problems
	PO4	2	Moderately Mapped that Students will be able to apply relations and validating various results to give concise physical interpretations,
	PO5	3	Strongly Mapped, Students can able to identify, formulate, review, and analyze real world problems to define the spectroscopy.
	PO6	2	Moderately Mapped to integrate several components of theories with applications to Physics.
	PSO1	2	Moderately Mapped to acquire Scientific temper leading to critical thinking and research motivation in Physics



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			area
	PSO2	3	Strongly Mapped to Study of Serializability of Transactions will build logical & analytical skills in student.
	PSO3	3	Strongly Mapped ,Students will be able to analyze an application using the concepts
CO2	PO1	2	Moderatly Mapped, Students will be able to comprehend basic concepts
	PO2	3	StronglyMapped to Understand the concepts of Physics and apply it to their work
	PO3	2	Moderatly Mapped to integrate several components of theories with applications to problems.
	PO4	3	StronglyMapped , Students will be able to classify different techniques
	PO5	2	Moderatly Mapped, Students can use modern tools to simulate combinational multidisciplinary environment to a slighter extent.
	PO6	1	Low level of Correlation ,Students will gain knowledge in classifying different types
	PSO1	2	Moderatly Mapped ,Students will be able to apply the fundamental knowledge
	PSO2	2	Moderatly Mapped, Students in a group develop small project to implement concept
	PSO3	2	Moderatly Mapped, Students can manage to do projects in multidisciplinary environment to a slighter extent and get scope for career development leading to lifelong learning.
CO3	PO1	2	Moderatly Mapped,Students will be able to comprehend basic concepts
	PO2	2	Moderatly Mapped, Students will be able to classify different concurrency
	PO3	3	StronglyMapped, integrating several components of theories with applications
	PO4	1	Low level of correlation,Students can apply Concepts to solve the complex questions
	PO5	2	Moderatly Mapped, learning will be applied to any solution given by student lifelong.
	PO6	3	StronglyMapped,Students can be aware of applications concerned with cultural, societal and environmental



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			considerations
	PSO1	2	Moderatly Mapped ,to attain the required skills to the Physics behind the phenomena occurring in nature
	PSO2	3	StronglyMapped, Team work plays vital role while carrying out projects using heterogeneous data structures
	PSO3	2	Moderatly Mapped , Students gain knowledge of identifying best methods among various methods will help students to identify research gap
CO4	PO1	3	StronglyMapped to understanding the Concepts
	PO2	3	StronglyMapped, Students will be able to analyze an application using the concepts
	PO3	2	Moderatly Mapped, To integrate several components of theories with applications to problems.
	PO4	2	Moderatly Mapped,To Understand the concepts of Physics and apply it to their work.
	PO5	2	Moderatly Mapped,Students can establish oneself as a self-reliant, empowered individual to have an inclusive, healthy and compassionate understanding towards life and society
	PO6	2	Moderatly Mapped that innovators and pioneers to create new avenues of employment catering to the global trends as well as demands
	PSO1	3	StronglyMapped, Applications concerned with cultural, societal and environmental considerations
	PSO2	3	StronglyMapped,To strengthen student's capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.
	PSO3	2	Moderatly Mapped,Students attain knowledge of identifying best methods among various methods will help students to identify research gap
CO5	PO1	2	Moderatly Mapped To solve present tools and test ideas on problems involving many body systems.
	PO2	2	Moderatly Mapped, Students can able to identify, formulate, review, and analyze real world problems
	PO3	3	StronglyMapped,Students can able to understand the formulation and working
	PO4	3	StronglyMapped,Students can classify different Questions



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	PO5	2	Moderatly Mapped, To apply proper normalization for research
	PO6	2	Moderatly Mapped, Students can analyze the transactions to achieve feasibility, viability and sustainability.
	PSO1	2	Moderatly Mapped, Apply the concepts to analyse the performance of research.
	PSO2	3	Strongly Mapped, Student can attain the required skills to the Physics behind the phenomena occurring in nature
	PSO3	2	Moderatly Mapped, Students can and execute an experiment through careful observation



COURSE DATA SHEET

SEMESTER	I and II	BATCH	2022-2024
COURSENAME	PRACTICAL (GENERAL)	I	COURSE CODE 20PPHCP2001
COURSE UNITS	10 Experiments	COURSE TYPE	CORE PRACTICAL
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

COURSE OBJECTIVES	
1	Emphasizes the significance of acquiring practical skills through hands-on experience in measuring physical quantities and employing practical methods to comprehend theoretical concepts.
2	Students will possess the capability to operate effectively and securely within a laboratory setting, whether working independently or collaboratively in teams.
3	Strengthening skills to meet contemporary demands in industrial and research settings.



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COURSE OUTCOMES: On completion of the course the students will be able to...		
	CO Statement	Cognitive Level
CO1	Understand the basics of experimental physics	K1-K2 (Understand and Apply)
CO2	Explore the concepts involved in the thermodynamics, heat and modern optics	K1-K3 (Understand and Apply)
CO3	Acquire strong laboratory skills	K1-K4 (Understand, Apply and Analyse)
CO4	Enhance the skill to meet the present day requirements in industries, research fields	K1-K5 (Understand, Apply, Analyze and Evaluate)
CO5	Create the knowledge of theories involved in physics using practical experiments	K1-K6 (Understand, Apply, Evaluate, Create)

SYLLABUS



LIST OF EXPERIMENTS	HOURS
<p><u>Any TEN Experiments:</u></p> <ol style="list-style-type: none">1. Cornu's method – Young's modulus by Elliptic fringes.2. Young's modulus – Hyperbolic fringes3. Stefan's constant.4. Band gap energy - Thermistor / Semiconductor5. 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 Parameters10. 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.	90 hrs

TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. Ouseph, C.C.; Rao, U.J., Vijayendran V, Practical Physics and Electronics (2009), Viswanathan, S., Printers & Publishers Pvt Ltd,2. Singh, S. P. (1999). Advanced Practical Physics (23rd ed.). Pragati Prakashan.3. Nelkon, M., & Ogborn, J. M. (1978). Advanced level Practical Physics (4th ed.). Pearson Education.4. Chattopadhyay, D., & Rakshit, P. C. (2017). An Advanced course in Practical Physics (10th ed.). New Central Book Agency.5. Squires, G. L. (2001). Practical Physics (4th ed.). Cambridge University Press.
E-Learning Resources	<ol style="list-style-type: none">1. https://vlab.amrita.edu/index.php?brch=194&cnt=1&sim=548&sub=12. https://vlab.amrita.edu/?sub=1&brch=282&sim=1005&cnt=13. https://www.scribd.com/document/328053182/3-e-by-m-by-Thomson-Method4. http://www.phys.utk.edu/labs/modphys/BalmerSeries.pdf



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CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2		2	3	3
CO2	2	3	2	3	2	1		2	2	3
CO3	2	2	3	1	2	3		2	3	2
CO4	3	3	2	2	2	2		3	3	2
CO5	2	2	3	3	2	2		2	3	3
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2		2.2	2.8	2.6

Correlation Level: 1-Low 2-Moderate 3-Strong



JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Highly mapped to understand and explore the experimental aspects.
	PO2	2	Moderately mapped to explore various fields in domain specific.
	PO3	1	Low level mapping to professional strengthening.
	PO4	2	Moderately mapped to be an empowered individual.
	PO5	3	Highly mapped to foster the technical expertise.
	PO6	2	Moderately mapped to emerge as a pioneer.
	PSO1	2	Moderately mapped to critical thinking with domain specific knowledge.
	PSO2	3	Highly mapped to attain the required skills to enhance the life style.
	PSO3	3	Highly mapped for precise measurements and interpretation.
CO2	PO1	2	Moderately mapped to reach the substantial conclusions.
	PO2	3	Highly mapped to formulate the design with valid conclusion.
	PO3	2	Moderately mapped for career planning within the domain specific.
	PO4	3	Strongly correlated as students have gained proficiency in domain specific.
	PO5	2	Students will develop a foundational skill set in problem-solving, providing them with the capacity to address challenges effectively to a moderate.
	PO6	1	Weak correlation, as students may identify some tools to enhance their technical skills, but their expertise level might remain low.
	PSO1	2	Acquaintance to acquire scientific temper can be mapped moderately.
	PSO2	2	Students can able to apply and enhance the life style moderately.
	PSO3	3	Highly mapped for the analyses and interpretation.
CO3	PO1	2	Moderately correlated as students can reasonably attain substantial conclusions.
	PO2	2	Moderately correlated as students can reasonably formulate a research design.
	PO3	3	Highly correlated for career planning with structured skill development.
	PO4	1	Low correlation for developing as an empowered individual may result from limited mapping.
	PO5	2	Moderate correlation in acquiring managerial expertise within a specific domain.



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	PO6	3	Highly correlated as students are equipped to meet global demands effectively.
	PSO1	2	Moderate correlation as the properties can be reasonably analyzed to fulfill research motivations.
	PSO2	3	Highly correlated with significant potential to enhance lifestyle.
	PSO3	2	Moderate correlation as effective communication skills can reasonably be developed while exploring domain-specific knowledge.
CO4	PO1	3	Highly mapped as the students would exhibit knowledge retention.
	PO2	3	Highly mapped to develop a structured plan to address the research question and Hypotheses.
	PO3	2	Adequately aligned to strengthen the professional ethics.
	PO4	2	Adequately calibrated to cultivate self-sufficiency and empower individuals.
	PO5	2	Moderately mapped for managerial skills in domain specific.
	PO6	2	Moderately positioned to adapt to the global trends.
	PSO1	3	Extensively charted within the research domain, particularly in a specialized field.
	PSO2	3	Highly mapped to acquire skills and elevate lifestyle.
	PSO3	2	Moderately for precise measurements and interpretation.
CO5	PO1	2	Moderately mapped as the students adapt the Laboratory concepts.
	PO2	2	Moderately mapped to formulate a research design.
	PO3	3	Highly mapped as the students construct career plans fortified by robust practical skills.
	PO4	3	Highly mapped to become a Well-rounded and empowered individual.
	PO5	2	Moderately mapped to achieve the innovations.
	PO6	2	Moderately mapped to create a new idea based on the theoretical concepts.
	PSO1	2	Moderately aligned for the research motivation in domain specific.
	PSO2	3	Highly mapped to Acquire the necessary skills can significantly enhance one's lifestyle.
	PSO3	3	Highly mapped to execute the interpretations.



COURSE DATA SHEET

SEMESTER	I and II	BATCH	2022-2024
COURSENAME	PRACTICAL II (ELECTRONICS)	COURSE CODE	22PPHCP2002
COURSE UNITS	10 Experiments	COURSE TYPE	CORE PRACTICAL
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

COURSE OBJECTIVES

1	Understand the experimental ideas related with circuits and transistors. Analyze observations and make meaningful conclusions.
2	Students will possess the capability to operate effectively and securely within a laboratory setting, whether working independently or collaboratively in teams.
3	Strengthening skills to meet contemporary demands in industrial and research settings.

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

	CO Statement	Cognitive Level
CO1	This course highlights the importance of having hands-on experience to measure physical quantities and use practical methods to understand theoretical concepts.	K1-K2 (Understand and Apply)
CO2	It helps students to acquire experimental abilities, which are essential for physics course.	K1-K3 (Understand and Apply)
CO3	Students will be able to use various components and equipment.	K1-K4 (Understand, Apply and Analyse)
CO4	Students will also be able to work efficiently and safely in a laboratory both individually and in groups	K1-K5 (Understand, Apply, Analyze and Evaluate)
CO5	Create the knowledge of theories involved in physics using practical experiments	K1-K6 (Understand, Apply, Evaluate, Create)



SYLLABUS

LIST OF EXPERIMENTS	HOURS
<p><u>Any TEN Experiments:</u></p> <p>ELECTRONICS:</p> <ol style="list-style-type: none">1. Schmitt trigger using IC 741 and IC 5552. IC 555 timer – astable and monostable multivibrator3. IC 7473 – Shift register, Ring counter and Johnson counter4. Op amp- Astable and monostable multivibrator5. Op-amp -Solving simultaneous equation.6. Op-amp R/2R ladder network7. Op-amp –Binary weighted resistor8. Op-amp – low pass , band pass and high pass filter9. Op-amp – Differentiator and Integrator10. UJT characteristics and Relaxation oscillator.11. FET characteristics and amplifier.12. Characteristics study of SCR and TRIAC13. Wein bridge and oscillator using Op-amp.14. Phase shift oscillator using IC7483.15. Arithmetic operations using IC7483.16. IC7490 as scalar and seven segment display using IC 744717. Microprocessor 8085 – LED interface18. Microprocessor 8085 – HEX keyboard19. Microprocessor 8085 – stepper motor interface	90 hrs



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TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. Singh, S. P. (1999). Advanced Practical Physics (23rd ed.). Pragati Prakashan.2. Nelkon, M., & Ogborn, J. M. (1978). Advanced level Practical Physics (4th ed.). Pearson Education.3. Chattopadhyay, D., & Rakshit, P. C. (2017). An Advanced course in Practical Physics (10th ed.). New Central Book Agency.4. Squires, G. L. (2001). Practical Physics (4th ed.). Cambridge University Press.5. <u>Ouseph, C.C.; Rao, U.J., Vijayendran V, Practical Physics and Electronics (2009), Viswanathan, S., Printers & Publishers Pvt Ltd,</u>
E-Learning Resources	<ol style="list-style-type: none">1. https://vlab.amrita.edu/index.php?brch=194&cnt=1&sim=548&sub=12. https://vlab.amrita.edu/?sub=1&brch=282&sim=1005&cnt=13. https://www.scribd.com/document/328053182/3-e-by-m-by-Thomson-Method4. http://www.phys.utk.edu/labs/modphys/BalmerSeries.pdf



CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2		2	3	3
CO2	2	3	2	3	2	1		2	2	3
CO3	2	2	3	1	2	3		2	3	2
CO4	3	3	2	2	2	2		3	3	2
CO5	2	2	3	3	2	2		2	3	3
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2		2.2	2.8	2.6

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Basic knowledge of the underlying components and circuits will be gained by students
	PO2	2	Students will be able to design circuits
	PO3	1	Students will be able to apply knowledge of circuits & Programming for understanding of concepts
	PO4	2	Achieving parallelism at process and thread level to improve performance of program.
	PO5	3	Students will be able to apply the fundamental knowledge of memory management to map the data and processor



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	PO6	2	Students will be able to investigate the scope of improving existing Memory and programming.
	PSO1	2	Students will gain knowledge about various electronic circuits and operational amplifiers.
	PSO2	3	Apply design and development principles to develop applications of varying complexity in emerging areas.
	PSO3	3	Achieving parallelism at process and thread level to improve performance of program.
CO2	PO1	2	Apply the knowledge of routing techniques
	PO2	3	Apply the concepts to analyse the performance of the circuits
	PO3	2	Achieving parallelism at process and thread level to improve performance of program.
	PO4	3	Learning this approach will help student to effectively manage the real time project with complex problem
	PO5	2	Apply the concepts to analyse the performance of the circuits
	PO6	1	Achieving parallelism at process and thread level to improve performance of program.
	PSO1	2	Learning this approach will help student to effectively manage the real time project with complex problem
	PSO2	2	Apply the knowledge of routing techniques
	PSO3	3	Basic knowledge about concepts of Object Oriented Programming will be gained by students
CO3	PO1	2	Achieving parallelism at process and thread level to improve performance of program.
	PO2	2	Apply the concepts to analyse the performance of the circuits
	PO3	3	Achieving parallelism at process and thread level to improve performance of program.



	PO4	1	Apply the concepts to analyse the performance of the circuits
	PO5	2	Apply the knowledge of routing techniques
	PO6	3	Achieving parallelism at process and thread level to improve performance of program.
	PSO1	2	Learning this approach will help student to effectively manage the real time project with complex problem
	PSO2	3	Basic knowledge about concepts of Object Oriented Programming will be gained by students
	PSO3	2	Apply the knowledge of routing techniques
CO4	PO1	3	Achieving parallelism at process and thread level to improve performance of program.
	PO2	3	Apply the concepts to analyse the performance of the circuits
	PO3	2	Basic knowledge about concepts of Object Oriented Programming will be gained by students
	PO4	2	Learning this approach will help student to effectively manage the real time project with complex problem
	PO5	2	Achieving parallelism at process and thread level to improve performance of program.
	PO6	2	Apply the knowledge of routing techniques
	PSO1	3	Concepts learned in this subject will be useful to design reliable solution
	PSO2	3	Students will be able to differentiate various transformations and they can analyze the need of particular technique in a specified situation
	PSO3	2	Basic knowledge about concepts of Object Oriented Programming will be gained by students
CO5	PO1	2	Achieving parallelism at process and thread level to improve performance of program.



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PO2	2	Apply the concepts to analyse the performance of the circuits
PO3	3	Learning this approach will help student to effectively manage the real time project with complex problem
PO4	3	Apply the concepts to analyse the performance of the circuits
PO5	2	Achieving parallelism at process and thread level to improve performance of program.
PO6	2	Apply the knowledge of routing techniques
PSO1	2	Learning this approach will help student to effectively manage the real time project with complex problem
PSO2	3	Apply the concepts to analyse the performance of the circuits
PSO3	3	Apply the knowledge of routing techniques



DEPARTMENT OF PG PHYSICS
SDNB VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
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(PG PHYSICS)

COURSE FRAME WORK
SEMESTER III

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
III	22PPHCT3008	CORE THEORY	STATISTICAL MECHANICS	6	4	40	60	100
III	20PPHCT3009	CORE THEORY	NUCLEAR AND PARTICLE PHYSICS	6	4	40	60	100
III	22PPHCE3002	CORE ELECTIVE	NANOSCIENCE AND TECHNOLOGY	5	3	40	60	100
III	22PPHCE3003	CORE ELECTIVE	CRYSTAL PHYSICS	5	3	40	60	100
III	22PPHCP4003	CORE PRACTICAL	PRACTICAL III (General)	6	4	-	-	-
III	22PPHCP4004	CORE PRACTICAL	PRACTICAL IV(Electronics)	6	4	-	-	-
III	18PSSRS3003	SOFT SKILL	RESEARCH SKILLS		3	50		50



COURSE DATA SHEET

SEMESTER	III	BATCH	2022-2024
COURSENAME	STATISTICAL MECHANICS	COURSE CODE	22PPHCT3008
COURSE UNITS	5	COURSE TYPE	CORE THEORY-8
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

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 Statement	Cognitive Level
CO1	To Learn relationship between equilibrium distributions and kinetic processes leading to equilibrium.	K1-K3 (Understand and Apply)
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.	K1-K3 (Understand and Apply)
CO3	To Apply in and various approaches macroscopic and microscopic systems.	K1-K4 (Understand, Apply and Analyse)
CO4	To develop statistical description of system to real statistical problems using classical and quantum distributions.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
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.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	UNIT 1: STATISTICAL MECHANICS AND THERMODYNAMICS Review of Thermodynamics - General conditions of Equilibrium (Thermal equilibrium, mechanical equilibrium, particle equilibrium) - Quasistatic processes - Nernst heat theorem - Connection between statistics and thermodynamics - Entropy- Entropy of mixing - Gibb's paradox.	18
2	UNIT 2: PHASE TRANSITIONS AND CRITICAL PHENOMENA Phase transitions - First order phase transition - Second order phase transition - Conditions for Phase equilibrium - Critical indices - Gibb's phase rule - Order parameters Landau theory of phase transition	18
3	UNIT 3: ENSEMBLES Microstate and Macrostates - Phase space -Ensemble - Ensemble Average- Microcanonical ensemble - Canonical and grand canonical ensembles(Qualitative treatment only) - Trajectories - Density of states - Liouville's theorem - Partition function - Molecular Partition functions - Calculation of statistical quantities (Entropy, Enthalpy, Gibb's Potential).	18
4	UNIT 4: CLASSICAL AND QUANTUM STATISTICS Density matrix - Statistics of ensembles - Statistics of indistinguishable particles - Maxwell-Boltzman statistics - Application of Maxwell Boltzmann Statics (Molecular energies in an ideal gas) - Fermi-Dirac statistics – Application of Fermi Dirac Statistics (Ideal Fermi gas) - Bose-Einstein statistics - Application of Bose Einstein statistics (Planck radiation formula) - Comparison of three statistics - Ideal Bose gas - Bose-Einstein condensation.	18
5	UNIT 5: REAL GAS, ISING MODEL AND FLUCTUATIONS 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 - Energy and density fluctuations – Brownian motion - Langevin theory.	18



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">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 Delhi3. 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	<ol style="list-style-type: none">1. Statistical Mechanics, K. Huang, 2002, Taylor and Francis, London2. 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	<p>http://www.nyu.edu/classes/tuckerman/stat.mech/lectures.html http://www.abo.fi/~mhotokka/mhotokka/lecturenotes/sm.html http://www-fl.ijs.si/~vilfan/SM/cont.html http://web.mit.edu/8.334/www/lectures/ http://cs.physics.sunysb.edu/verbaarschot/html/lectures/phy306-05/notes.html</p>

PEDAGOGY (TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources



CO-PO AND CO-PSO MAPPING:									
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	2	3	3
CO2	2	3	2	3	2	1	2	2	2
CO3	2	2	3	1	2	3	2	3	2
CO4	3	3	2	2	2	2	3	3	2
CO5	2	2	3	3	2	2	2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2	2.2	2.8	2.2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly Mapped to understanding the Concepts
	PO2	2	Moderately Mapped to Enhances the Statistical Methods to solve problems
	PO3	1	Low level of Correlation to apply Concepts to solve the complex problems
	PO4	2	Moderately Mapped that Students will be able to apply relations and validating various results to give concise physical interpretations,
	PO5	3	Strongly Mapped, Students can able to identify, formulate, review, and analyze real world problems to define the Physics
	PO6	2	Moderately Mapped to integrate several components of theories with applications to Physics.
	PSO1	2	Moderately Mapped to acquire Scientific temper leading to critical thinking and research motivation in Physics area
	PSO2	3	Strongly Mapped to Study of Serializability of Transactions will build logical & analytical skills in student.
	PSO3	3	Strongly Mapped, Students will be able to analyze an application using the concepts
CO2	PO1	2	Moderately Mapped, Students will be able to comprehend basic



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			concepts
	PO2	3	StronglyMapped to Understand the concepts of Physics and apply it to their work
	PO3	2	Moderatly Mapped to integrate several components of theories with applications to problems.
	PO4	3	StronglyMapped , Students will be able to classify different techniques
	PO5	2	Moderatly Mapped, Students can use modern tools to simulate combinational multidisciplinary environment to a slighter extent.
	PO6	1	Low level of Correlation ,Students will gain knowledge in classifying different types
	PSO1	2	Moderatly Mapped ,Students will be able to apply the fundamental knowledge
	PSO2	2	Moderatly Mapped, Students in a group develop small project to implement concept
	PSO3	2	Moderatly Mapped, Students can manage to do projects in multidisciplinary environment to a slighter extent and get scope for career development leading to lifelong learning.
CO3	PO1	2	Moderatly Mapped,Students will be able to comprehend basic concepts
	PO2	2	Moderatly Mapped, Students will be able to classify different concurrency
	PO3	3	StronglyMapped, integrating several components of theories with applications
	PO4	1	Low level of correlation,Students can apply Concepts to solve the complex questions
	PO5	2	Moderatly Mapped, learning will be applied to any solution given by student lifelong.
	PO6	3	StronglyMapped,Students can be aware of applications concerned with cultural, societal and environmental considerations
	PSO1	2	Moderatly Mapped ,to attain the required skills to the Physics behind the phenomena occurring in nature
	PSO2	3	StronglyMapped, Team work plays vital role while carrying out projects using heterogeneous data structures
	PSO3	2	Moderatly Mapped , Students gain knowledge of identifying best methods among various methods will help students to identify research gap
CO4	PO1	3	StronglyMapped to understanding the Concepts



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	PO2	3	StronglyMapped, Students will be able to analyze an application using the concepts
	PO3	2	Moderatly Mapped, To integrate several components of theories with applications to problems.
	PO4	2	Moderatly Mapped,To Understand the concepts of Physics and apply it to their work.
	PO5	2	Moderatly Mapped,Students can establish oneself as a self-reliant, empowered individual to have an inclusive, healthy and compassionate understanding towards life and society
	PO6	2	Moderatly Mapped that innovators and pioneers to create new avenues of employment catering to the global trends as well as demands
	PSO1	3	StronglyMapped, Applications concerned with cultural, societal and environmental considerations
	PSO2	3	StronglyMapped,To strengthen student's capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.
	PSO3	2	Moderatly Mapped,Students attain knowledge of identifying best methods among various methods will help students to identify research gap
CO5	PO1	2	Moderatly Mapped To solve present tools and test ideas on problems involving many body systems.
	PO2	2	Moderatly Mapped, Students can able to identify, formulate, review, and analyze real world problems
	PO3	3	StronglyMapped,Students can able to understand the formulation and working
	PO4	3	StronglyMapped,Students can classify different Questions
	PO5	2	Moderatly Mapped, To apply proper normalization for research
	PO6	2	Moderatly Mapped,Students can analyze the transactions to achieve feasibility, viability and sustainability.
	PSO1	2	Moderatly Mapped,Apply the concepts to analyse the performance of research.
	PSO2	3	StronglyMapped, Student can attain the required skills to the Physics behind the phenomena occurring in nature
	PSO3	2	Moderatly Mapped, Students can and execute an experiment through careful observation



COURSE DATA SHEET

SEMESTER	III	BATCH	2022-2024
COURSENAME	NUCLEAR AND PARTICLE PHYSICS	COURSE CODE	20PPHCT3009
COURSE UNITS	5	COURSE TYPE	CORE THEORY IX
CONTACT HOURS (L-T-P)	60-30	CREDITS	4

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 Statement	Cognitive Level
CO1	To Understand the concepts of nucleus and its properties to apply quantum theory of a particle and measure the properties of quantum system.	K1-K3 (Understand and Apply)
CO2	To Expand and evaluate the concepts of nuclear structures in nuclear reactions.	K1-K5(Understand, Apply, Analyze and Evaluate)
CO3	To Analyze the properties of stable nucleus and explore different types of nuclear models.	K1-K4 (Understand, Apply and Analyze)
CO4	Applying the decay concepts to study decay rates and extending to neutrino physics of parity conservation violation.	K1-K4(Understand, Apply, Analyze)
CO5	To Learn the concepts of elementary particles and symmetries.	K1-K4(Understand, Apply, Analyze)



SYLLABUS

UNIT	TOPICS	HOURS
1	NUCLEAR INTERACTIONS 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	18 hrs
2	NUCLEAR REACTIONS 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.	18 hrs
3	NUCLEAR MODELS 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.	18 hrs
4	NUCLEAR DECAY 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	18 hrs
5	ELEMENTARY PARTICLE PHYSICS 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.	18 hrs



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<p>BOOKS FOR STUDY:</p> <p>Introducing Nuclear Physics, K.S. Krane, Wiley, 2008, India.</p> <p>Nuclear Physics: Theory & Experiments, R.R. Roy and B.P. Nigam, New Age International, 2005.</p> <p>Introduction to Elementary Particles, D. Griffiths, 2nd Ed., Academic Press, 2008.</p> <p>Introductory Nuclear Physics, S.S.M. Wong, 2nd Ed., Wiley VCH, 2004.</p> <p>Nuclear Physics in a Nutshell, C.A. Bertulani, 1st Ed., Princeton University Press, 2007.</p>
Books For Reference	<p>Concept of Nuclear Physics, B.L. Cohen, McGraw-Hill, 2003.</p> <p>Nuclear & Particle Physics: An Introduction, B. Martin, Willey, 2006.</p> <p>Nuclear Physics: Experimental and Theoretical, H.S. Hans, 2nd Ed., New Academic Science Ltd., 2010.</p> <p>Basic Ideas and Concepts in Nuclear Physics, K. Heyde, 2nd Ed., Overseas Press, India, 2005.</p> <p>Nuclear Physics, I. Kaplan, Addison Wesley, (Indian Ed., from Narosa Publishing House, New Delhi), 2002.</p>
E-Learning Resources	<ul style="list-style-type: none">• http://ocw.mit.edu/OcwWeb/Physics/8-701Spring2004/Lecture notes• http://faraday.physics.utoronto.ca/General Interest/D.Bailey/SubAtomic/Lectures/Lect.html• http://www.edx.org/• http://minty.caltech.edu/Ph125a/• http://www.classcentral.com

PEDAGOGY (TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
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- Student Seminars/Webinars
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- Quizzes
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CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2		2	3	3
CO2	2	3	2	3	2	1		2	2	2
CO3	2	2	3	1	2	3		2	3	2
CO4	3	3	2	2	2	2		3	3	2
CO5	2	2	3	3	2	2		2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2		2.2	2.8	2.2

Correlation Level: 1-Low 2-Moderate 3-Strong



JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	The students will possess a robust understanding, enabling them to adeptly apply the concepts in any relevant context.
	PO2	2	Students will develop a foundational skill set in problem-solving, providing them with the capacity to address challenges effectively to a moderate.
	PO3	1	Weak correlation, as students may identify some tools to enhance their technical skills, but their expertise level might remain low.
	PO4	2	Moderately correlated as students will have the ability to become self-reliant and empowered individuals contributing positively to both their personal lives and society.
	PO5	3	Strongly correlated as students have gained proficiency in domain specific.
	PO6	2	Moderately correlated to create new avenues to meet global trends.
	PSO1	2	Moderate correlation for the acquittance in critical thinking.
	PSO2	3	Strongly mapped to apply the concepts and enhance the life style.
	PSO3	3	Strongly mapped for analyses and interpretation.
CO2	PO1	2	Moderate correlation as students will possess the capability to recognize and identify the concepts to a reasonable extent.
	PO2	3	High correlation as students will demonstrate a high level of proficiency in formulating research designs.
	PO3	2	Moderate correlation as students may only marginally improve their understanding and application of professional ethics.
	PO4	3	High correlation as students will exhibit a strong capability to become self-reliant and empowered individuals.



	PO5	2	Managerial expertise may not be strongly correlated at a high level.
	PO6	1	Low correlation as students may not significantly demonstrate innovative capabilities.
	PSO1	3	High correlation as students can develop a scientific temper, which fosters critical thinking skills to a significant degree.
	PSO2	3	High correlation as students can achieve the necessary skills within a specific domain to a significant extent.
	PSO3	3	Highly correlated as students can proficiently communicate scientific findings through reports.
CO3	PO1	2	Moderately correlated as students can reasonably attain substantial conclusions.
	PO2	2	Moderately correlated as students can reasonably formulate a research design.
	PO3	3	Highly correlated for career planning with structured skill development.
	PO4	1	Low correlation for developing as an empowered individual may result from limited mapping.
	PO5	2	Moderate correlation in acquiring managerial expertise within a specific domain.
	PO6	3	Highly correlated as students are equipped to meet global demands effectively.
	PSO1	2	Moderate correlation as the properties can be reasonably analyzed to fulfill research motivations.
	PSO2	3	Highly correlated with significant potential to enhance lifestyle.
	PSO3	2	Moderate correlation as effective communication skills can reasonably be developed while exploring domain-specific knowledge.
CO4	PO1	3	Highly mapped as the students would exhibit knowledge retention.



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	PO2	3	Highly mapped to develop a structured plan to address the research question and Hypotheses.
	PO3	2	Adequately aligned to strengthen the professional ethics.
	PO4	2	Adequately calibrated to cultivate self-sufficiency and empower individuals.
	PO5	2	Moderately mapped for managerial skills in domain specific.
	PO6	2	Moderately positioned to adapt to the global trends.
	PSO1	3	Extensively charted within the research domain, particularly in a specialized field.
	PSO2	3	Highly mapped to acquire skills and elevate lifestyle.
	PSO3	2	Moderately for precise measurements and interpretation.
CO5	PO1	2	Moderately mapped as the students grasp theoretical concepts.
	PO2	2	Moderately mapped to formulate a research design.
	PO3	3	Highly mapped as the students construct career plans fortified by robust theoretical understanding.
	PO4	3	Highly mapped to become a Well-rounded and empowered individual.
	PO5	2	Moderately mapped to achieve the innovations.
	PO6	2	Moderately mapped to create a new idea based on the theoretical concepts.
	PSO1	2	Moderately aligned for the research motivation in domain specific.
	PSO2	3	Highly mapped to Acquire the necessary skills can significantly enhance one's lifestyle.
	PSO3	2	Moderately mapped to execute the interpretations.



COURSE DATA SHEET

SEMESTER	III	BATCH	2022-2024
COURSENAME	NANO SCIENCE AND TECHNOLOGY	COURSE CODE	22PPHCET3002
COURSE UNITS	5	COURSE TYPE	CORE ELECTIVE
CONTACT HOURS (L-T-P)	60-30	CREDITS	3

COURSE OBJECTIVES

1	Knowledge on basic concepts of nanophysics and have an idea on general characterization techniques of nanomaterials.
2	Basic knowledge on crystal and its growth. 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 Statement	Cognitive Level
CO1	To understand the basic concepts in nanoscience.	K1-K3 (Understand and Apply)
CO2	To Comprehend the principles of nanotechnology.	K1-K3 (Understand and Apply)
CO3	To explore the field of nanomaterials.	K1-K4 (Understand, Apply and Analyse)
CO4	To Became aware of knowledge over tools of nanotechnology.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	To Frame to acquire knowledge towards the applications of nanoscience in medical field.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	INTRODUCTION TO NANOSCIENCE Background to Nanoscience and Nanotechnology – Scientific revolutions –Nanosized effects –Surface to volume ratio-atomic structure –molecules and phases –energy at the nano scale molecular and atomic size – quantum effects – types of nanotechnology and nano machines.	18
2	INTRODUCTION TO NANOMATERIALS Nanostructured materials-metal-semiconductor-ceramics and composites- size dependent properties - size dependent variation in mechanical, physical and chemical, magnetic, electronic transport, reactivity etc., - uniqueness in these properties compared to bulk and microscopic solids–nanomaterials and nanostructures in nature.	18
3	PREPARATIONS OF NANOMATERIALS Mechanical methods :Grinding – high energy ball milling – types of balls- ball ratio-medium for grinding. Physical Methods :Vapor deposition and different types of epitaxial growth techniques- pulsed laser deposition, Magnetron sputtering – Deposition progress and Micro lithography. Chemical method: Sol-gel technique – solvothermal methods-control of grain size – co-precipitation hydrolysis – sonochemical method combustion technique – colloidal precipitation template process –electro deposition – electrospinning technique.	18
4	CHARACTERIZATION TECHNIQUES X-ray powder diffraction –SEM,TEM,STM,AFM - X-Ray Photoelectron Spectroscopy, Auger Electron Spectroscopy-confocal microscopy – scanning near field optical microscopy .	18
5	APPLICATIONS OF NANOMATERIALS Applications of nano in IC chips, – CNT and Graphene based Electronic devices - Applications of Nanomaterials in Space -Application of Nanomaterials in storage devices - Types of storage devices -role of nanoelectronics for memory devices – GMR-AMR effect- Environmental Applications- sensors for DNA- Proteins, and Biological applications- self assembly systems- tissue culture- nanopharma.	18
		90



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<p>1. A Text book on Nanotechnology, Mark Ratner and Daniel Ratner, Pearson Education ,2001.</p> <p>2. A Handbook of Nanoelectronics, Branda paz, Dominant Publishers and Distributors, New Delhi, 2006.</p> <p>3. Nano:The essentials, T. Pradeep, Tata Mcgraw hill Publishing Co. Ltd., New Delhi.2010.</p> <p>4. Introduction to Nanotechnology, Charles Poole and Jr., Frank. J.Owens, Illustrated, John Wiley and Sons,2003.</p> <p>5. Introduction to Spintronics, P. Bandyopadhyay, M.Cahay, 2nd Ed., CRC Press, 2015</p>
Books For Reference	<p>1. Textbook of Nanoscience and Nanotechnology, B.S. Murty, P. Shankar, B. Raj, B.B. Rath, J.Murday, Springer-Verlag Berlin Heidelberg, 2013.</p> <p>2. Springer Handbook of Nanotechnology, B. Bhushan, Springer-Verlag Berlin Heidelberg, 2004.</p> <p>3. Introduction to Nanoscience and Nanotechnology, G. L. Hornyak, H.F. Tibbals, J. Dutta, J. J. Moore, CRC Press, 2008.</p> <p>4. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, G. Cao, Y. Wang, 2nd Ed., Imperial College Press, 2004</p> <p>5. Complex-shaped Metal Nanoparticles: Bottom-Up Syntheses and Applications, T.K. Sau, A.L. Rogach 1st Ed., Wiley-VCH, 2012.</p>
E-Learning Resources	<ol style="list-style-type: none">1. http://www.edx.org/2. http://minty.caltech.edu/Ph125a/3. http://www.classcentral.com4. http://nanotechnow.com/naotechnologybasics.com/nanotechnologylinks.com/nono net.rice.edu5. https://www.loc.gov/rr/scitech/selected-internet/nanotechnology.html

PEDAGOGY(TEACHING METHODOLOGY):

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- **LCD/SMART Boards**
- **Student Assignments**
- **Student Seminars/Webinars**
- **MCQ**
- **Quizzes**
- **NPTEL/Others - Add-on-courses**
- **Web Resources**



CO-PO AND CO-PSO MAPPING:									
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	2	3	2
CO2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	3	2	2
CO4	2	2	3	2	2	2	2	2	2
CO5	2	2	2	2	2	2	2	2	2
Average (Use only filled in cells for calculation)	2.2	2.2	2.2	2	2	2	2.2	2.2	2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	The knowledge of mathematical principles and basics of science will help the students to apply the same to moderately understand and analyse their performance. Also provide design solutions for the given specification for certain applications.
	PO2	3	Students can simulate combinational logic in a multidisciplinary environment to a slighter extent.
	PO3	2	Students will be able to apply first principles to moderately analyse and verify combinational problems.
	PO4	2	Compute the quantitative aspects of nanoscience and technology in systems. Identify appropriate seed ideas for realization.



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	PO5	2	Students are able to analyse the basic idea.
	PO6	2	Students will get a solid foundation in the principles and practices of nano science, and nanotechnology.
	PSO1	2	students will gain knowledge in classifying different types
	PSO2	3	students can able to understanding the various Concepts
	PSO3	2	Use knowledge of basic understanding and characterization technique in various problem and find its optimum solution.
CO2	PO1	2	identify physics behind current and relevant innovations in the respective branch by assignment.
	PO2	2	Effectively function individually and as a team in various class presentations.
	PO3	2	To strengthen student's capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.
	PO4	2	Moderately Mapped, Students attain knowledge of identifying best methods among various methods will help students to identify research gap
	PO5	2	Effectively function individually and as a team in various class presentations.
	PO6	2	Moderately Mapped, Students can able to identify, formulate, review, and analyze real world problems
	PSO1	2	identify physics behind current and relevant innovations in the respective branch by group discussion
	PSO2	2	Effectively function individually and as a team in various class presentations.
	PSO3	2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
CO3	PO1	2	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes.



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	PO2	2	Effectively function individually and as a team in various class presentations.
	PO3	2	identify physics behind current and relevant innovations in the respective branch by assignment
	PO4	2	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes
	PO5	2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
	PO6	2	identify physics behind current and relevant innovations in the respective branch by group discussion
	PSO1	3	Students can able to understand the formulation and working
	PSO2	2	Student can attain the required skills to the Physics behind the phenomena occurring in nature
	PSO3	2	Moderately Mapped, Students can and execute an experiment through careful observation
CO4	PO1	2	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes
	PO2	2	Students can able to understand the formulation and working
	PO3	3	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
	PO4	2	identify physics behind current and relevant innovations in the respective branch by assignment
	PO5	2	Effectively function individually and as a team in various class presentations.
	PO6	2	Students can able to understand the formulation and working
	PSO1	2	identify physics behind current and relevant innovations in the respective branch by group discussion



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	PSO2	2	Effectively function individually and as a team in various class presentations.
	PSO3	2	Apply the comprehended knowledge about nanoscience and nanotechnology in various application.
CO5	PO1	2	Effectively function individually and as a team in various class presentations.
	PO2	2	identify physics behind current and relevant innovations in the respective branch by assignment
	PO3	2	Effectively function individually and as a team in various class presentations.
	PO4	2	Review research literature to identify physics behind current and relevant innovations in the respective branch by assignment
	PO5	2	Apply the comprehended knowledge about nanoscience and nanotechnology in various application.
	PO6	2	Students can able to understand the formulation and working
	PSO1	2	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes
	PSO2	2	identify physics behind current and relevant innovations in the respective branch by seminar
	PSO3	2	Effectively function individually and as a team in various class presentations.



COURSE DATA SHEET

SEMESTER	III	BATCH	2022-2024
COURSENAME	CRYSTAL PHYSICS	COURSE CODE	22PPHCT3003
COURSE UNITS	5	COURSE TYPE	CORE ELECTIVE
CONTACT HOURS (L-T-P)	60-30	CREDITS	3

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 Statement	Cognitive Level
CO1	To understand the basics of nucleus and the concepts of nucleation.	K1-K3 (Understand and Apply)
CO2	To Analyze the experimental studies of crystal growth methods.	K1-K3 (Understand and Apply)
CO3	To Acquire the ideas on types of characterization of crystals and its applications.	K1-K4 (Understand, Apply and Analyse)
CO4	To recognize the crystal structure determination and reciprocal lattice.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	To study the concepts of crystallography.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	CRYSTAL GROWTH PHENOMENA Nucleation- Types of nucleation- Homogeneous and Heterogeneous nucleation- Classical theory of nucleation-Gibbs Thomson equation for Vapour- Energy of formation of a nucleus- Spherical nucleus- cylindrical nucleus- Cap shaped nucleus- Disc shaped nucleus.	18
2	CRYSTAL GROWTH TECHNIQUES Classification of methods of growth-Solution growth -Solution, solubility, and super solubility-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, double diffusion method Melt Growth-Growth from melt-The Bridgman-Czochralski method. Epitaxial growth- Liquid phase epitaxy-Tipping technique. Vapour phase epitaxy- Principles of method and apparatus. Molecular beam epitaxy.	18
3	BONDING IN SOLIDS 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-Metallic bond- Bond order-Bond length- Bond energy-electronegativity.	18
4	SINGLE CRYSTAL STRUCTURE DETERMINATION Braggs law in one dimension-Concept of reciprocal lattice-Construction of X ray diffractometer-Steps in crystal structure determination- Softwares for structure determination and visualization.	18
5	CHARACTERIZATION X-ray Diffraction- FTIR spectroscopy- Principle, instrumentation- UV-Visible spectroscopy-principle, instrumentation-Thermal characterization- thermal gravimetric analysis (TGA)- Differential Thermal Analysis (DTA)- Differential scanning calorimetry (DSC)- Mechanical studies- Micro-hardness- Vickers hardness test-estimation of hardness number-Etching- Wet etching- plasma etching.	18
		90



TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. A Text book on Crystal Physics , W A Wooster , Cambridge University , 2016.2. Elementary Crystallography, D. Velmurugan, MJP Publishers. 20113. Principles of instrumentation analysis, Koog Holler and Crouch, 6th edition, Thomson books/cole publications, 20124. 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	<ol style="list-style-type: none">1. Elementary Numerical Analysis- An Algorithmic Approach, S.D. Conte and C. de Boor, SIAM Society for Industrial and Applied Mathematics, 20172. Applied Numerical Analysis, B.F. Gerald and P.O. Whitley, , Pearson India, 2007.3. Numerical Analysis, F. Schield , Schaum Series, McGraw 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	<ol style="list-style-type: none">1. http://www.sst.ph.ic.ac.uk/angus/Lecturs/compphys/comphys.html2. 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

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- Web Resources



CO-PO AND CO-PSO MAPPING:										
	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-		3	2	2
CO2	3	2	1	-	1	-		3	2	2
CO3	2	2	1	-	1	-		3	2	2
CO4	2	2	1	-	1	-		3	2	2
CO5	2	2	1	-	1	-		3	2	2
Average (Use only filled in cells for calculation)	2.2	2	2	-	1	-		3	2	2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING			
CO	PO/PSO	Level of correlation	Justification
CO1	PO1	2	Moderately mapped as students able to understand the basics of nucleus and the concepts of nucleation.
	PO2	2	Moderately mapped as students will be able to apply investigative research, specialize in problem identification, formulate research design, utilize analytical tools.
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply



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			critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO2	PO1	3	Strongly mapped as students will be able to analyze the experimental studies of crystal growth methods..
	PO2	2	Moderately mapped as students will gain knowledge in apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO3	PO1	2	Moderately mapped as students will be able to Acquire the ideas on types of characterization of crystals and its applications.
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.



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	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO4	PO1	2	Moderately mapped as students will be able to identify crystal structure
	PO2	2	Moderately mapped as students will be apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO5	PO1	2	Moderately mapped as students will be able to understand concepts of crystallography
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.



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	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.



DEPARTMENT OF PG PHYSICS

SDNB VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)

COURSE FRAME WORK

SEMESTER IV

SEM	COURSE CODE	COURSE TITLE	TITLE OF THE PAPER	HRS	CREDITS	CA	SE	T
IV	20PPHCT4010	CORE THEORY	CONDENSED MATTER PHYSICS	6	4	40	60	100
IV	22PPHCE4004	CORE ELECTIVE	MICROPROCESSOR AND BASICS OF EMBEDDED SYSTEM	5	3	40	60	100
IV	22PPHCE4005	CORE ELECTIVE	MATERIAL SCIENCE	5	3	40	60	100
IV	22PPHCP4003	CORE PRACTICAL	PRACTICAL III (General)	6	4	40	60	100
IV	22PPHCP4004	CORE PRACTICAL	PRACTICAL IV (Electronics)	6	4	40	60	100
IV	20PPHPR4001		PROJECT		4	40	60	100
IV	23PSECR4004	SKILL ENHANCEMENT	COURSE ERA			50		50



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COURSE DATA SHEET

SEMESTER	IV	BATCH	2022-2024
COURSENAME	CONDENSED MATTER PHYSICS	COURSE CODE	20PPHCT4010
COURSE UNITS	5	COURSE TYPE	CORE THEORY- 10
CONTACT HOURS (L-T- P)	60-30	CREDITS	4

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 Statement	Cognitive Level
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.	K1-K3 (Understand and Apply)
CO2	To enhance students familiar with lattice vibrations.	K1-K3 (Understand and Apply)
CO3	To Expand and evaluate the energy band structure of metal and semiconductors.	K1-K4 (Understand, Apply and Analyse)
CO4	To gain basic knowledge about magnetism and ferromagnetic domains.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	To Acquire knowledge on functional materials like superconductors.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



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SYLLABUS

UNIT	TOPICS	HOURS
1	CRYSTAL STRUCTURE 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	18
2	LATTICE DYNAMICS 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 - Umklapp processes.	18
3	THEORY OF METALS AND SEMICONDUCTORS 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.	18
4	MAGNETISM 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 antiferromagnetism - Neel temperature.	18
5	SUPERCONDUCTIVITY 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.	18
		90



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TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">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	<ol style="list-style-type: none">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. Ashcroft and N. David Mermin , Hartcourt college Publishers,2014.
E-Learning Resources	<p>http://www.insights.emeritus.org http://www.libgudies.madison.edu https://www.britannica.com/science/condensed-matter-physics https://www.nature.com/subjects/condensed-matter-physics https://www.colorado.edu/physics/research/condensed-matter-physics</p>

PEDAGOGY(TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources



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CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	2	3	3
CO2	2	3	2	3	2	1	2	2	2
CO3	2	2	3	1	2	3	2	3	2
CO4	3	3	2	2	2	2	3	3	2
CO5	2	2	3	3	2	2	2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2	2.2	2.8	2.2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly Mapped to understanding the Concepts
	PO2	2	Moderately Mapped to Enhances the concepts and solve problems
	PO3	1	Low level of Correlation to apply Concepts to solve the complex problems
	PO4	2	Moderately Mapped that Students will be able to apply relations and validating various results to give concise physical interpretations,
	PO5	3	Strongly Mapped, Students can able to identify, formulate, review, and analyze real world problems to define the Physics
	PO6	2	Moderately Mapped to integrate several components of theories with applications to Physics.
	PSO1	2	Moderately Mapped to acquire Scientific temper leading to critical thinking and research motivation in Physics area
	PSO2	3	Strongly Mapped to Study of Serializability of Transactions will build logical & analytical skills in student.
	PSO3	3	Strongly Mapped, Students will be able to analyze an application using the concepts
CO2	PO1	2	Moderately Mapped, Students will be able to comprehend basic concepts
	PO2	3	Strongly Mapped to Understand the concepts of Physics and apply it to their work
	PO3	2	Moderately Mapped to integrate several components of theories with applications to problems.
	PO4	3	Strongly Mapped, Students will be able to classify different techniques



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	PO5	2	Moderatly Mapped, Students can use modern tools to simulate combinational multidisciplinary environment to a slighter extent.
	PO6	1	Low level of Correlation ,Students will gain knowledge in classifying different types
	PSO1	2	Moderatly Mapped ,Students will be able to apply the fundamental knowledge
	PSO2	2	Moderatly Mapped, Students in a group develop small project to implement concept
	PSO3	2	Moderatly Mapped, Students can manage to do projects in multidisciplinary environment to a slighter extent and get scope for career development leading to lifelong learning.
CO3	PO1	2	Moderatly Mapped,Students will be able to comprehend basic concepts
	PO2	2	Moderatly Mapped, Students will be able to classify different concurrency
	PO3	3	StronglyMapped, integrating several components of theories with applications
	PO4	1	Low level of correlation,Students can apply Concepts to solve the complex questions
	PO5	2	Moderatly Mapped, learning will be applied to any solution given by student lifelong.
	PO6	3	StronglyMapped,Students can be aware of applications concerned with cultural, societal and environmental considerations
	PSO1	2	Moderatly Mapped ,to attain the required skills to the Physics behind the phenomena occurring in nature
	PSO2	3	StronglyMapped, Team work plays vital role while carrying out projects using heterogenous data structures
	PSO3	2	Moderatly Mapped , Students gain knowledge of identifying best methods among various methods will help students to identify research gap
CO4	PO1	3	StronglyMapped to understanding the Concepts
	PO2	3	StronglyMapped, Students will be able to analyze an application using the concepts
	PO3	2	Moderatly Mapped, To integrate several components of theories with applications to problems.
	PO4	2	Moderatly Mapped,To Understand the concepts of Physics and apply it to their work.
	PO5	2	Moderatly Mapped,Students can establish oneself as a self-reliant, empowered individual to have an inclusive, healthy and compassionate understanding towards life and society
	PO6	2	Moderatly Mapped that innovators and pioneers to create new avenues of employment catering to the global trends as well as demands



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	PSO1	3	StronglyMapped, Applications concerned with cultural, societal and environmental considerations
	PSO2	3	StronglyMapped,To strengthen student's capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.
	PSO3	2	Moderatly Mapped,Students attain knowledge of identifying best methods among various methods will help students to identify research gap
CO5	PO1	2	Moderatly Mapped To solve present tools and test ideas on problems involving many body systems.
	PO2	2	Moderatly Mapped, Students can able to identify, formulate, review, and analyze real world problems
	PO3	3	StronglyMapped,Students can able to understand the formulation and working
	PO4	3	StronglyMapped,Students can classify different Questions
	PO5	2	Moderatly Mapped, To apply proper normalization for research
	PO6	2	Moderatly Mapped,Students can analyze the transactions to achieve feasibility, viability and sustainability.
	PSO1	2	Moderatly Mapped,Apply the concepts to analyse the performance of research.
	PSO2	3	StronglyMapped, Student can attain the required skills to the Physics behind the phenomena occurring in nature
	PSO3	2	Moderatly Mapped, Students can and execute an experiment through careful observation



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COURSE DATA SHEET

SEMESTER	IV	BATCH	2022-2024
COURSENAME	MICROPROCESSOR AND BASICS OF EMBEDDED SYSTEM.	COURSE CODE	22PPHET4004
COURSE UNITS	5	COURSE TYPE	CORE ELECTIVE IV
CONTACT HOURS (L-T-P)	60-30	CREDITS	3

COURSE OBJECTIVES

1	Realize the architecture of microprocessors and methodology of programming.
2	Explore the interfacing using the microcontroller.
3	Acquire knowledge in Embedded system and ATmega.

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

	CO Statement	Cognitive Level
CO1	To understand the architecture of 8086 microprocessor and Interrupts in 8086	K1-K3 (Understand and Apply)
CO2	Be familiar with the basic concepts of architecture and assembly language programming of 8086 microprocessor.	K1-K3 (Understand and Apply)
CO3	To gain knowledge about the microcontroller family and educate clear ideas in 8051 microcontrollers.	K1-K4 (Understand, Apply and Analyse)
CO4	To write an assembly program with 8051.	K1-K5 (Understand, Apply, Analyze and Evaluate)
CO5	To infer the knowledge about Embedded systems and Atmel.	K1-K5 (Understand, Apply, Evaluate)



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SYLLABUS

UNIT	TOPICS	HOURS
1	8086 ARCHITECTURE 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.	18 hrs
2	8086 PROGRAMMING 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.	18 hrs
3	MICROCONTROLLER 8051 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.	18 hrs
4	INTERFACING I/O AND MEMORY WITH 8051 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.	18 hrs
5	INTRODUCTION TO ATmega328 Embedded system concept-Role of microprocessor, microcontroller and embedded microcontroller- ATmega328 microcontroller - Pin configuration of Atmega328- ATmega328 architecture- AVR memory- Addressing modes-Interrupts.	18 hrs

TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<p>Microprocessors and Interfacing programming and Hardware, Douglas V. Hall (TataMc Graw Hill) 2012.</p> <p>The 8086 /8088 Microprocessors - Programming, Software, Hardware and application. W.A. Triebel and Avatar Singh, Prentice Hall of India, New Delhi, 2009.</p> <p>The 8051 Micro Controller Architecture, Programming and Applications. Kenneth J. Ayala, 3rd Edition, Penram International, 2014.</p> <p>Design with PIC Microcontrollers, John B. Peatman, 7th Indian reprint, Pearson Education 2004.</p> <p>The 8051 Microcontroller and Embedded Systems Using Assembly , C.Muhammad Ali Mazidi, Pearson Education, 2012.</p>
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Books For Reference	<p>Operational amplifiers with linear integrated circuits, W.D. Stanley, 4th Ed., Pearson Education India, 2002.</p> <p>Digital Principles and Design, D.D. Givone, Tata McGraw-Hill, 2002.</p> <p>Microprocessor Architecture, Programming & Applications with 8085, R.S. Gaonkar, Prentice Hall, 2002.</p> <p>Electronic devices, T.L. Floyd, 9th Ed., Pearson Education. Ltd., 2013.</p> <p>Microprocessor Architecture, Programming and Applications with 8085, Ramesh Gaonkar, Penram International, 2013.</p>
E-Learning Resources	<ol style="list-style-type: none"> 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://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf

PEDAGOGY (TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6		PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2		1	2	3
CO2	2	3	2	3	2	1		2	2	2
CO3	2	2	3	1	2	3		2	3	2
CO4	3	3	2	2	2	2		3	3	2



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CO5	2	2	3	3	2	2	2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2	2.0	2.6	2.2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly mapped as the students will be able to apply the concepts wherever required.
	PO2	2	moderate level of correlations as the students will be able to apply their theoretical knowledge.
	PO3	1	Low level of mapping as the students will acquire the basic skill for problem solving.
	PO4	2	Moderately mapped as the students learnt to facilitate the mathematical methods of classical mechanics.
	PO5	3	High level correlation as the students will be able to find the feasible tool to make them expertise in technical skills.
	PO6	2	Moderately mapped as the students able to understand towards the theorems
	PSO1	1	Slightly mapped as the students will be able to implement the theorems towards problem solving.
	PSO2	2	Moderately mapped as the students will be able to describe the fundamentals.
	PSO3	3	Strongly mapped as the students will be able to apply knowledge in real time problems.



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CO2	PO1	2	Moderately mapped as the students will be able to infer the knowledge to formulate a problem.
	PO2	3	Highly mapped as the students will be able to articulate the ideas.
	PO3	2	Moderate level of correlation to strengthen professional ethics.
	PO4	3	High correlation to establish as empowered individuals.
	PO5	2	Moderately correlated to establish as managerial expertise.
	PO6	1	Less correlation as the students will be able to acquire the concepts.
	PSO1	2	Moderate level of correlation to gain the basic domain knowledge.
	PSO2	2	Moderately correlated to gain knowledge in real time problems
	PSO3	2	Moderately correlated to gain the skill and pursue higher education.
CO3	PO1	2	Moderately correlated to understand the concepts of Physics and apply it to their work.
	PO2	2	Moderate mapping to integrate several components of theories with applications to problems.
	PO3	3	Conceptual knowledge can be further expanded to understand and solve complex problems.
	PO4	1	Low level of mapping to establish as an empowered individual.
	PO5	2	Moderate correlation to equip with technical and managerial expertise.
	PO6	3	Highly Mapped as the students able to gain the fundamental knowledge and explore in domain specific.
	PSO1	2	Moderately mapped as the students will be able to analyze the problem to be implemented.
	PSO2	3	Highly mapped to apply and enhance the life style.
	PSO3	2	Moderately mapped to write and execute scientific reports.
CO4	PO1	3	Strongly mapped to identify the complex problems with domain knowledge.
	PO2	3	High level of Correlation as the students will be able to gain knowledge.



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	PO3	2	Moderately mapped to plan the career with systematic building.
	PO4	2	Moderately mapped to evaluate the students' thinking process.
	PO5	2	Moderately mapped as the students will be able to apply the domain specific problems technically.
	PO6	2	Moderate level of correlations as the students understands the theory and not able to meet the global trends.
	PSO1	3	Moderate level of acquaintances in Research motivation.
	PSO2	3	Life time enhancement could be highly applied.
	PSO3	2	Moderately mapped as the students will be able to write the scientific reports and communicate effectively.
CO5	PO1	2	Moderately mapped to analyze the complex problems.
	PO2	2	Moderately mapped to acquire knowledge of real time problems.
	PO3	3	Highly mapped to strengthen professional ethics and career planning.
	PO4	3	High level of mapping with self-reliant and empowered individual.
	PO5	2	Moderate level of correlation with technical and managerial expertise.
	PO6	2	Moderate mapping to the global trends and demands.
	PSO1	2	Moderately mapped with technical expertise.
	PSO2	3	Strongly mapped as the students will be able to create new avenues to meet global trends and demands.
	PSO3	2	Moderate mapping for the new innovations.



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COURSE DATA SHEET

SEMESTER	IV	BATCH	2022-2024
COURSENAME	MATERIAL SCIENCE	COURSE CODE	22PPHET4005
COURSE UNITS	5	COURSE TYPE	CORE ELECTIVE
CONTACT HOURS (L-T-P)	60-30	CREDITS	3

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 Statement	Cognitive Level
CO1	To make students familiar with advanced materials	K1-K3 (Understand and Apply)
CO2	Become aware of knowledge towards polymers	K1-K3 (Understand and Apply)
CO3	To educate the concepts of Dielectric and extended towards its applications	K1-K4 (Understand, Apply and Analyse)
CO4	Understand the fundamental principles and concepts of crystal growth techniques	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	To gain basic knowledge about magnetic materials	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	CERAMICS AND COMPOSITES Types of ceramic materials-examples of ceramic materials-Structural features of ceramics- silicate structures-silicate tetrahedral-silicate doublehedral-chain-sheet structure-framework-vitreous structures-production of alumina- forming and post forming process - glass forming and annealing-mechanical properties of ceramics- electrical properties of ceramics-technical ceramic system: Silica-Alumina ceramic system- Zr and Si system - cement and concrete - composite materials - Types of composites-characteristics of composites- fibre reinforced composites-continuous and discontinuous fibre composites- polymer matrix composites-Glass fibre- carbon fibre-aramid composites- commercial composites.	18
2	POLYMERS Characteristics of polymers- applications of polymers- Classification of polymers - structural features - linear structure- network/framework structure- crosslinking chain-branched chain- conditions of polymerization- degree of polymerization-mechanism of polymerization-strengthening mechanism of polymers-thermoplastics- thermosetting plastics-rubber- natural rubbers- synthetic rubber/elastomers-mechanical properties-electrical-optical-chemical properties- cellular plastics - liquid crystal polymers-nature of liquid crystal polymers-properties of liquid crystal polymers.	18
3	DIELECTRIC MATERIALS 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.	18
4	ELECTRONIC MATERIALS Purification of electronic materials - single crystal growth - wafer manufacture - oxidation - photolithography - doping technique - epitaxial growth - metallization - circuits and process simulation and integration - junction formation - junction lasers.	18
5	MAGNETIC MATERIALS 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.	18
		90



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TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. Materials Science and Engineering, V. Raghavan, 2003, 4th Edition, Prentice-Hall India, New Delhi,2012.2. Material Science and Engineering, William Callister, Wiley 20063. 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 Reference	<ol style="list-style-type: none">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, 20093. 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-Learning Resources	<ol style="list-style-type: none">1. http://www.elearningindustry.com2. http://www.edx.org3. http://www.learnphy.com4. http://www.doitpom.ac.uk5. http://www.openculture.org

PEDAGOGY(TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources



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CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	3	2	2
CO2	3	2	1	-	1	-	3	2	2
CO3	2	2	1	-	1	-	3	2	2
CO4	2	2	1	-	1	-	3	2	2
CO5	2	2	1	-	1	-	3	2	2
Average (Use only filled in cells for calculation)	2.2	2	2	-	1	-	3	2	2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	2	Moderately mapped as students able to understand the familiar with advanced materials
	PO2	2	Moderately mapped as students will be able to apply investigative research, specialize in problem identification, formulate research design, utilize analytical tools.
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
CO2	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
	PO1	3	Strongly mapped as students will be able to analyze the types of polymers
	PO2	2	Moderately mapped as students will gain knowledge in apply research



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			design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO3	PO1	2	Moderately mapped as students will be able to understand concepts of Dielectric and extended towards its applications
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO4	PO1	2	Moderately mapped as students will be able to understand the fundamental principles and concepts of crystal growth techniques
	PO2	2	Moderately mapped as students will be apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and



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			society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO5	PO1	2	Moderately mapped as students will be able to understand concepts of magnetic materials
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.



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COURSE DATA SHEET

SEMESTER	III & IV	BATCH	2022-2024
COURSENAME	PRACTICAL III	COURSE CODE	22PPHCP4003
COURSE UNITS	10	COURSE TYPE	CORE PRACTICAL
CONTACT HOURS (L-T-P)	60-30	CREDITS	3

COURSE OBJECTIVES

1	Create deep ideas of measuring sophisticated instruments
2	Analyze the characteristics of sophisticated instruments
3	Determine the applications of sophisticated instruments

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

	CO Statement	Cognitive Level
CO1	Define the basic concepts related to GM counter	K1-K3 (Understand and Apply)
CO2	Determine the Michelson Interferometer – Wavelength, separation of wavelengths	K1-K3 (Understand and Apply)
CO3	Determine the thickness of enamel coating wire – Air wedge.	K1-K4 (Understand, Apply and Analyse)
CO4	Analyze the characteristics of B-H curve	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	Determine the Compressibility of a liquid by ultrasonic interferometer	K1 - K5 (Understand, Apply, Analyze and Evaluate)



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SYLLABUS

UNIT	TOPICS	HOURS
1	<ol style="list-style-type: none">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 using Ultrasound Diffraction Method12. Conductivity measurement using four probe method.13. Solar constant – Lee's Disc14. Solar Spectrum – Fraunhofer lines15. Thickness of enamel coating wire – Air wedge.16. Measurement of Curie temperature of a Ferromagnetic material.17. Fresnel biprism using spectrometer.18. Thickness of Edser and Butler fringes.19. Elastic constants of glass using Cornu's method20. Numerical aperture of an optical Fiber21. Impedance measurement –LCR bridge.	90

TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. V. Y. Rajopadhye and V. L. Purohit. Text book of experimental physics.2. H. Singh. B.Sc practical physics. S. Chand & Co.3. T. C. Hayes and P. Horowitz. Students manual for the art of electronics. Cambridge University Press.4. Sanish Kumar Gosh. A text book of practical physics. New Central Books.5. J. P. Holman. Experimental methods for engineers. Tata McGraw Hill.
Books For Reference	<ol style="list-style-type: none">1. L. K. Maheswari. Laboratory manual for introductory electronics experiments. New Age International.2. Srinivasan and Balakrishnan. A text book of practical physics. Vols. I, II. S. Viswanathan Publishers.3. D. Chatopadhyay and P. C. Ratshit. An advanced course in practical physics. New



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Central Books.
4. B. Ghosh. Advanced practical physics. Vols. I, II. Sreedhar Publishers.

E-Learning Resources

1. [Practical Physics](#)
2. [MsC Practical Physics](#)
3. [Practical Physics](#)
4. [World of Physics](#)
5. [Physics Experiments](#)

PEDAGOGY (TEACHING METHODOLOGY):

- Chalk & Talk
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- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	2	2	1	-	1	-	3	2	2
CO2	2	2	1	-	1	-	3	2	2
CO3	2	2	1	-	1	-	3	2	2
CO4	2	2	1	-	1	-	3	2	2
CO5	2	2	1	-	1	-	3	2	2
Average (Use only filled in cells for calculation)	2	2	2	-	1	-	3	2	2

Correlation Level: 1-Low 2-Moderate 3-Strong

JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	2	Moderately mapped as students able to understand the basic concepts related



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			to GM counter
	PO2	2	Moderately mapped as students will be able to apply investigative research, specialize in problem identification, formulate research design, utilize analytical tools.
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO2	PO1	2	Moderately mapped as students will be able to determine the Michelson Interferometer – Wavelength, separation of wavelength
	PO2	2	Moderately mapped as students will gain knowledge in apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO3	PO1	2	Moderately mapped as students will be able to Determine the thickness of enamel coating wire using Air wedge.
	PO2	2	Moderately mapped as students will be able to apply research design



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	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and are familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyze, apply critical study and demonstrate concept based problems solving approaches that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behavior of microscopic and macroscopic bodies.
CO4	PO1	2	Moderately mapped as students will be able to analyze the characteristics of B-H curve
	PO2	2	Moderately mapped as students will be apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.
	PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
	PO6	-	No direct contribution to innovation
	PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
	PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
	PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.
CO5	PO1	2	Moderately mapped as the students will be able to determine the Compressibility of a liquid by ultrasonic interferometer
	PO2	2	Moderately mapped as students will be able to apply research design
	PO3	1	Slightly mapped as students will be able to strengthen professional ethics and career planning
	PO4	-	No direct contribution to self-reliant, empowered individual towards life and society.



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PO5	1	Slightly mapped as students will be equipped with technical expertise to innovate and critically analyze various attributes which constitute pivotal issues in a multidisciplinary scenario.
PO6	-	No direct contribution to innovation
PSO1	3	Strongly mapped as the students will be able to Acquire advanced knowledge in some areas of interest in Physics and is familiar with contemporary research within various fields of Physics.
PSO2	2	Moderately mapped as the students will be able to analyse, apply critical study and demonstrate concept based problems solving approach that can be applied to different conditions.
PSO3	2	Moderately mapped as the students will be able to understand physical behaviour of microscopic and macroscopic bodies.



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COURSE DATA SHEET

SEMESTER	II & IV	BATCH	2022-2024
COURSENAME	PRACTICAL 4 (ELECTRONICS)	COURSE CODE	22PPHCP4004
COURSE UNITS	10	COURSE TYPE	CORE PRACTICAL- 4
CONTACT HOURS (L-T- P)	60-30	CREDITS	4

COURSE OBJECTIVES

1	To provide in depth knowledge of Microprocessor 8086 and Microcontroller 8051
2	Applying the C Language to solve Computational Methods.
3	Acquire knowledge on functional physics concepts

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

	CO Statement	Cognitive Level
CO1	To Understand the fundamental principles and concepts Microprocessor	K1-K3 (Understand and Apply)
CO2	To enhance students familiar Microcontroller	K1-K3 (Understand and Apply)
CO3	To Expand and evaluate the Computational Methods Using C Language	K1-K4 (Understand, Apply and Analyse)
CO4	To gain basic knowledge about Writing Programs.	K1 - K5 (Understand, Apply, Analyze and Evaluate)
CO5	To Acquire knowledge on functional Methodology.	K1 - K5 (Understand, Apply, Analyze and Evaluate)



SYLLABUS

UNIT	TOPICS	HOURS
1	<p>Microprocessor 8086 <u>Any TEN Experiments:</u> 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</p> <p>Microcontroller 8051 Experiments: 1.Addition & subtraction 2.Multiplication & division 3.Sorting in ascending & descending order 4.LED interface 5.Stepper motor interface 6.Choosing maxima and minima 7.Multibyte addition and subtraction</p> <p>C Programming: 1.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 $\delta n \delta 6$, with Algorithm, Flow-chart, C PROGRAM, and output. 2.Newton forward interpolation with Algorithm, Flow-chart, C PROGRAM, and output. 3.Newton backward interpolation with Algorithm, Flow-chart, C PROGRAM, and output. 4.Numerical integration by the trapezoidal rule, with Algorithm, Flow-chart, C PROGRAM, and output. 5.Numerical integration by Simpson's rule, with Algorithm, Flow-chart, C PROGRAM and output. 6.Numerical solution of ordinary first-order differential equations by the Euler method, with Algorithm, Flow-chart, C PROGRAM, and output. 7. Solving simultaneous equations.</p>	90
		90

TEXT/REFERENCE BOOKS/E - RESOURCES:

Text Books	1.Practical Electronics (Volume I): 8085 Microprocessor & 8051 Microcontroller Laboratory Manual. 2.Practical Electronics Microprocessor Handbook 3.A Practical Introduction to Microprocessors
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4.C Practical Programs Code Book A 1: Important Programs in C Language
5.Fall in Love With C Language : Practical Guide in 100 Pages

Books For Reference

- 1.Practical Interfacing Techniques for Microprocessor Systems (Prentice-Hall series in microprocessor technology)
- 2.Practical Embedded Controllers: Design and Troubleshooting
- 3.Textbook on Microprocessor-Based Laboratory Experiments and Project
- 4.Mastering Multi language programming
- 5.Let Us C: Authentic guide to C programming language

E-Learning Resources

- <http://eie.sliet.ac.in/files/2021/03/Lab-Manual-for-Microprocessor-and-Microcontroller-Lab.pdf>
https://www.researchgate.net/publication/339181765_Practical_Electronics_Volume_I_8085_Microprocessor_8051_Microcontroller_Laboratory_Manual
<https://www.britannica.com/science/>
<https://www.nature.com/>
<https://www.colorado.edu/physics/>

PEDAGOGY (TEACHING METHODOLOGY):

- Chalk & Talk
- LCD/SMART Boards
- Student Assignments
- Student Seminars/Webinars
- MCQ
- Quizzes
- NPTEL/Others - Add-on-courses
- Web Resources

CO-PO AND CO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	2	3	3
CO2	2	3	2	3	2	1	2	2	2
CO3	2	2	3	1	2	3	2	3	2
CO4	3	3	2	2	2	2	3	3	2
CO5	2	2	3	3	2	2	2	3	2
Average (Use only filled in cells for calculation)	2.4	2.4	2.2	2.2	2.2	2	2.2	2.8	2.2

Correlation Level: 1-Low 2-Moderate 3-Strong



JUSTIFICATION OF CO-PO/PSO MAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Strongly Mapped to understanding the Concepts
	PO2	2	Moderately Mapped to Enhances the concepts and solve problems
	PO3	1	Low level of Correlation to apply Concepts to solve the complex problems
	PO4	2	Moderately Mapped that Students will be able to apply relations and validating various results to give concise physical interpretations,
	PO5	3	Strongly Mapped, Students can able to identify, formulate, review, and analyze real world problems to define the Microprocessor
	PO6	2	Moderately Mapped to integrate several components of theories with applications to C Language
	PSO1	2	Moderately Mapped to acquire Scientific temper leading to critical thinking and research motivation in Physics area
	PSO2	3	Strongly Mapped to Study of Serializability of Transactions will build logical & analytical skills in student.
	PSO3	3	Strongly Mapped, Students will be able to analyze an application using the concepts
CO2	PO1	2	Moderately Mapped, Students will be able to comprehend basic concepts
	PO2	3	Strongly Mapped to Understand the concepts of Physics and apply it to their work
	PO3	2	Moderately Mapped to integrate several components of theories with applications to problems.
	PO4	3	Strongly Mapped, Students will be able to classify different techniques
	PO5	2	Moderately Mapped, Students can use modern tools to simulate combinational multidisciplinary environment to a slighter extent.
	PO6	1	Low level of Correlation, Students will gain knowledge in classifying different types
	PSO1	2	Moderately Mapped, Students will be able to apply the fundamental knowledge
	PSO2	2	Moderately Mapped, Students in a group develop small project to implement concept
	PSO3	2	Moderately Mapped, Students can manage to do projects in multidisciplinary environment to a slighter extent and get scope for career development leading to lifelong learning.
CO3	PO1	2	Moderately Mapped, Students will be able to comprehend basic concepts
	PO2	2	Moderately Mapped, Students will be able to classify different concurrency
	PO3	3	Strongly Mapped, integrating several components of theories with applications



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	PO4	1	Low level of correlation, Students can apply Concepts to solve the complex questions
	PO5	2	Moderately Mapped, learning will be applied to any solution given by student lifelong.
	PO6	3	Strongly Mapped, Students can be aware of applications concerned with cultural, societal and environmental considerations
	PSO1	2	Moderately Mapped, to attain the required skills to the Physics behind the phenomena occurring in nature
	PSO2	3	Strongly Mapped, Team work plays vital role while carrying out projects using heterogeneous data structures
	PSO3	2	Moderately Mapped, Students gain knowledge of identifying best methods among various methods will help students to identify research gap
CO4	PO1	3	Strongly Mapped to understanding the Concepts
	PO2	3	Strongly Mapped, Students will be able to analyze an application using the concepts
	PO3	2	Moderately Mapped, To integrate several components of theories with applications to problems.
	PO4	2	Moderately Mapped, To Understand the concepts of Physics and apply it to their work.
	PO5	2	Moderately Mapped, Students can establish oneself as a self-reliant, empowered individual to have an inclusive, healthy and compassionate understanding towards life and society
	PO6	2	Moderately Mapped that innovators and pioneers to create new avenues of employment catering to the global trends as well as demands
	PSO1	3	Strongly Mapped, Applications concerned with cultural, societal and environmental considerations
	PSO2	3	Strongly Mapped, To strengthen student's capability in organizing and presenting the acquired knowledge coherently both in oral and written discourse.
	PSO3	2	Moderately Mapped, Students attain knowledge of identifying best methods among various methods will help students to identify research gap
CO5	PO1	2	Moderately Mapped To solve present tools and test ideas on problems involving many body systems.
	PO2	2	Moderately Mapped, Students can able to identify, formulate, review, and analyze real world problems
	PO3	3	Strongly Mapped, Students can able to understand the formulation and working
	PO4	3	Strongly Mapped, Students can classify different Questions
	PO5	2	Moderately Mapped, To apply proper normalization for research
	PO6	2	Moderately Mapped, Students can analyze the transactions to achieve



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			feasibility, viability and sustainability.
PSO1	2		Moderatly Mapped,Apply the concepts to analyse the performance of research.
PSO2	3		StronglyMapped, Student can attain the required skills to the Physics behind the phenomena occurring in nature
PSO3	2		Moderatly Mapped, Students can and execute an experiment through careful observation





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COURSE DATA SHEET

SEMESTER	IV	BATCH	2021-2023
COURSE NAME	PROJECT	COURSE CODE	20PPHPR4001
COURSE UNITS	5	COURSE TYPE	PROJECT
CONTACT HOURS (L-T-P)	4-0-0	CREDITS	4

COURSE OBJECTIVES

1. Apply theoretical and practical techniques to solve real-life problems in Technology and Science, etc.
2. To conduct Comprehensive data analysis projects and improve skills related to designing and performing scientific experiments.
3. To develop proficiency in Physics in modern life.

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

	CO Statement	Cognitive Level
CO1	Conduct and manage independent research on advanced topics in Physics	K1-K3 (Understand and Apply)
CO2	An outline of recent facts, allowing researchers to identify relevant theories, methods, and laws in the existing research.	K1-K3 (Understand and Apply)
CO3	Develop survey questionnaire, plan and execute data collection.	K1 - K5 (Understand, Apply and Analyze)
CO4	Design and carry out research and analyze basic science	K1 - K5 (Understand, Apply, Analyze and evaluate)
CO5	Enhance Science facts and entrepreneurial skills.	K5 - K6 (Understand, Apply, Analyze, evaluate, and execute)



SYLLABUS

UNIT	TOPICS	
1	<p>Project Initiation and Topic Selection during the Semester III</p> <ul style="list-style-type: none"> Assignment of Project: Assigned by lot method. The project work is chosen / allotted individually on different topics. Independent Project Work: Conducted under supervision, with potential co-guides from other institutions. The students shall be encouraged to do their project work in the College and outside the college . If found essential, they may be permitted to carry out their major project outside the College. 	
2	<p>Literature Review and Proposal Development</p> <ul style="list-style-type: none"> Literature Review: Comprehensive analysis of existing research. Proposal Development: Detailed research proposal including objectives and methodology 	
3	<p>Research Design and Data Collection</p> <ul style="list-style-type: none"> Research Design: Finalize experimental setup and obtain ethical approvals. Experimental work : Systematic data collection and detailed work book maintenance. 	
4	<p>1. Experimental result Analysis and Preliminary Findings</p> <ul style="list-style-type: none"> Apply proper experimental techniques and Summarize and discuss initial results. <p>2. Final Submission and Evaluation (End of Semester IV)</p> <ul style="list-style-type: none"> Final Submission: Submit two copies and a soft copy of the dissertation. Evaluation: By internal and external examiners; includes a viva-voce. 	
5	<p>PROJECT EVALUATION GUIDELINES:</p> <p>The project is evaluated on the basis of following heads:</p> <p>For Viva-Voce maximum is 60 marks which will be conducted by both the internal and external examiners during end semester university practical examinations.</p> <p>Internal: 40 marks</p> <p>I Review – Selection of the field of study, topic and literature collection - 15 marks</p> <p>II Review – Research design and Experimental results - 10 marks</p> <p>III Review – Analysis and conclusion, preparation of rough draft - 15 marks</p> <p>External: 60 marks</p> <p>Thesis/ Dissertation - 30 marks</p>	



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	Presentation - 15 marks	
	Viva-voce - 15 marks	

TEXT/REFERENCEBOOKS/E - RESOURCES:

Text Books	<ol style="list-style-type: none">1. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman 4th edition, (Publisher: Addison-Wesley).2. Physics Laboratory Experiments by Jerry D. Wilson and Cecilia A. Hernández-Hall 4th edition (Publisher: Cengage Learning)3. Conceptual Physics by Paul G. Hewitt (Publisher: Pearson)4. Experimental Physics: Principles and Practice" by Leonard M. Appel and David P. Shoemaker (Publisher: Cambridge University Press)5. Physics Experiments Using PCs: A Guide for Instructors and Students" by R.J. Barlow and A.R. Steadman (Publisher: Taylor & Francis)
Books For Reference	<ol style="list-style-type: none">1. Physics Projects for Young Scientists" by John Cochrane (Publisher: Dover Publications)2. Hands-On Physics Activities with Real-Life Applications: Easy-to-Use Labs and Demonstrations by James Cunningham, Norman Herr, and Dennis G. Tasa (Publisher: Jossey-Bass)
E-Learning Resources	<ol style="list-style-type: none">1. https://www.physics.com/2. https://www.project.com/3. https://www.science.com/4. https://sciencehub.com/5. https://basics.com/

PEDAGOGY (TEACHING METHODOLOGY):

- Formal face-to-face lectures
- Experiential Learning
- Small-group cooperative learning (as one of the ways for teachers to incorporate active learning).
- Student: Seminars/Webinars
- Web Resources



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CO-POANDCO-PSOMAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	3	3	3	3
CO2	2	3	2	1	2	2	3	3	2
CO3	2	3	2	2	2	2	2	3	2
CO4	3	3	2	2	3	3	3	3	3
CO5	1	2	3	2	3	3	2	2	2
Average (Use only filled in cells for calculation)	2.2	2.8	2.2	1.8	2.6	2.6	2.6	2.8	2.4

Correlation Level: 1-Low 2- Moderate 3-Strong



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JUSTIFICATION OF CO-PO/PSOMAPPING

CO	PO/PSO	Level of correlation	Justification
CO1	PO1	3	Good Domain Knowledge in Choosing a research topic in advanced statistical fields.
	PO2	3	Good life skills through problem identification, research design, and analytical tools.
	PO3	2	Moderate understanding in managing research projects develops professional ethics and planning skills.
	PO4	2	Moderate understanding in research promotes self-reliance and an inclusive understanding of statistical applications..
	PO5	3	Strong correlation in technical , innovate and critical analyse issues in a multidisciplinary
	PO6	3	Strong contribution to imbibing ethical and moral values
	PSO1	3	Good Domain Knowledge in Choosing a research topic in advanced statistical fields.
	PSO2	3	Good Domain skills through enhancement in statistical software for planning & conducting socio economic survey and other health related projects.
	PSO3	3	Mandatory for gaining employment/pursue higher education and jobs.
CO2	PO1	2	Moderate understanding in recent facts aids in complex problem analysis.
	PO2	3	Strong correlation in identifying gaps and relevant theories is crucial for investigative research.
	PO3	2	Moderate knowledge of recent developments supports ethical decision-making and career planning.
	PO4	1	Low correlation as it indirectly influences personal development.
	PO5	2	Moderate correlation in technical, innovate skill issues in a multidisciplinary field.
	PO6	2	Moderate correlation in understanding trends and gaps can inspire innovative solutions
	PSO1	3	Strong correlation in identifying relevant theories and methods is essential for solving real-world problems.
	PSO2	3	Strong correlation in current facts in planning and conducting surveys.
	PSO3	2	Moderate correlation in professional skills in various fields.
CO3	PO1	2	Moderate Domain skills in analyzing complex problems
	PO2	3	Effective survey design and data collection are key components of investigative research.
	PO3	2	Moderate correlation in surveys enhances professional ethics and planning
	PO4	2	Moderate correlation to promote self-reliance and societal understanding.
	PO5	2	Moderate correlation in the technical and managerial aspects involved in survey execution.



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	PO6	2	Moderate correlation in executed surveys can lead to innovative insights
	PSO1	2	Moderate correlation in solving problems in various fields.
	PSO2	3	Good Domain skills through enhancement in statistical software for planning & conducting socio economic survey and other health related projects
	PSO3	2	Moderate correlation in professional skills in various fields..
CO4	PO1	3	Moderate Domain Knowledge in analyzing complex problems
	PO2	3	Good life skills through problem identification, research design, and analytical tools
	PO3	2	Moderate correlation in career planning and ethical decision-making.

	PO4	2	Moderate correlation in research and data analysis promote self-reliance
	PO5	3	Strong correlation in the technical and managerial aspects involved in survey execution.
	PO6	3	strong correlation in executed surveys can lead to innovative insights
	PSO1	3	Strong correlation in advanced statistical techniques for real-world problem-solving.
	PSO2	3	Good Domain skills through enhancement in statistical software for planning & conducting socio economic survey and other health related projects
	PSO3	3	Strong correlation in career planning and ethical decision-making.
CO5	PO1	1	Less focuses on soft skills rather than technical problem analysis.
	PO2	2	Moderate correlation in communication and entrepreneurial skills support investigative research dissemination.
	PO3	3	Strong skill in professional ethics and career planning.
	PO4	2	Directly enhances self-reliance and societal understanding.
	PO5	3	Strong correlation in the technical and managerial tools.
	PO6	3	Strong correlation in communication and entrepreneurship are crucial for innovation and employment creation.
	PSO1	2	Moderate correlation in problem solving.
	PSO2	2	Moderate correlation in enhances skills in planning and conducting projects
	PSO3	2	Moderate correlation in career opportunities.



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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