MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE

(An Autonomous College)

Affiliated to Periyar University, Salem | Accredited by **NAAC** with '**A**' Grade

Recognized by **UGC** under Section 2(f) & 12 (B)

MUTHAYAMMAL
COLLEGE OF ARTS
AND SCIENCE
(Autonomous)
A UNIT OF VANETRA GROUP
Learn.
Lead

ESTD-1994

DEGREE OF MASTER OF SCIENCE

Learning Outcomes – Based Curriculum Framework
– Choice Based Credit System

Syllabus for M.Sc., Physics

(Semester Pattern)

(For Candidates admitted from the academic year 2023-2024 and onwards)

Regulation and Syllabus for

M. Sc Physics

(With effect from the Academic Year 2023-24)

Vision:

To redefine the scope of higher education by infusing into each of our pursuits, initiatives that will encourage intellectual, emotional, social and spiritual growth, thereby nurturing a generation of committed, Knowledgeable and socially responsible citizens.

Mission:

*To Ensure State of the world learning experience

*To Espouse value based Education

*To Empower rural education

*To Instill the sprite of entrepreneurship and enterprise

*To create a resource pool of socially responsible world citizens

QUALITY POLICY

To Seek – To Strive – To Achieve greater heights in Arts and Science, Engineering, Technological and Management Education without compromising on the Quality of Education.

DEPARTMENT OF PHYSICS

Vision:

- To provide a transformative learning and research ambiance with the inclusion of all the weaker sections of society to create leaders and innovators tied with holistic values to generate new knowledge and to serve the globe.

Mission:

- Periodical course revision to assimilate with the current state of fields in physics learning and research with modern gadgets.
- Individuals apparatus to enhance experimental skills with well-equipped special laboratories and workshop assistance are provided for the different programmes.
- Platform to inculcate and nurture creativity through eminent scholarly lectures, sharing of resources at interdepartmental level, numerous activities of various clubs, MoU for interaction with leading research institutions, inbuilt incubation centre etc.
- For integral formation, assistance and guidance to individual students, faculty members are assigned as mentors for the programme of stay.

PREAMBLE

The curriculum for the P.G. Physics for universities and colleges is revised as per Learning Outcomes- based Curriculum Framework (LOCF). The learner centric courses are designed to enable the students to progressively develop a good understanding of the concepts of various domains in physics. Significant modification is the inclusion of the courses to equip students to face challenges in industries and make them employable.

PROGRAMME LEARNING OUTCOME NATURE AND EXTENT OF THE PROGRAMME

M.Sc. Physics is a two year regular programme. There four semesters in this programme. Each semester is of sixteen weeks duration. Teaching and learning process of M.Sc. Physics involves theory and practical classes along with seminar presentation and research project work. The curriculum will be taught through formal lectures with the aid of power-point presentations, audio and video tools and other teaching aids can be used as and when required. Emphasis will be given to laboratorywork and visit to National laboratories to give hands on experience to students. Students will be encourage to do semester long project in their own institutes as well as in reputed institutes of National level.

AIM OF THE PROGRAMME

Understand the underlying Physics in respective specializations, and, be able to teach and guide successfully. Introduce advanced ideas and techniques that are applicable in respective fields. Provide the students with a broad spectrum of Physics Courses .Emphasize the role of Physics in other disciplines such as (Chemical Sciences, Mathematical Sciences, Life Sciences and their applied areas) .Develop the ability of the students to observe, perform, analyze and report an experiment. Develop the ability of the students to deal with physical models and formulas mathematically. Equip the students with different practical, intellectual and transferable skills. Strengthen the student knowledge of Physics and its applications in real world. Provide the student with mathematical and computational tools and models to be used in solving professional problems. Improve the student's inter disciplinary skills.

GRADUATE ATTRIBUTES

GA 1 Disciplinary Knowledge
GA 2 Self-directed Learning
GA 3 Multi-cultural Competency
GA 4 Research-related Skill
GA 5 Analytical Reasoning
GA 6 Moral and Ethical Reasoning
GA 7 Communication Skill

In an M.Sc. in Physics program, disciplinary knowledge refers to the comprehensive understanding and expertise that students acquire in the field of physics. Here are some key attributes and aspects of disciplinary knowledge that graduates typically develop:

1. **Core Principles**: Graduates should have a solid grasp of the fundamental principles of physics, including mechanics, electromagnetism, thermodynamics, quantum mechanics, and statistical mechanics.

2. **Advanced Topics**: Knowledge in advanced areas such as particle physics, condensed matter physics, astrophysics, nuclear physics, and theoretical physics, depending on the specialization chosen.

3. **Mathematical Proficiency**: Proficiency in the mathematical techniques used in physics, including calculus, differential equations, linear algebra, complex analysis, and numerical methods.

4. **Experimental Skills:** Understanding of experimental techniques, data analysis, and interpretation of results, particularly in laboratory-based courses and projects.

5. **Theoretical Understanding**: Ability to apply theoretical frameworks to solve complex physical problems, including both classical and modern theoretical approaches.

6. **Computational Physics**: Familiarity with computational methods and software used in physics research and analysis, such as programming languages (like Python or MATLAB) and simulation tools.

7. **Interdisciplinary Applications**: Awareness of how physics concepts and methods intersect with other disciplines such as engineering, chemistry, biology, and environmental sciences.

8. **Critical Thinking**: Development of critical thinking skills to evaluate and analyze scientific literature, formulate hypotheses, and critique experimental design and results.

9. **Communication Skills**: Ability to communicate effectively about physics concepts, both orally and in writing, to peers, academics, and the broader community.

10. **Ethical Awareness**: Understanding of the ethical considerations and responsibilities involved in conducting research and applying physics knowledge in various contexts.

These attributes collectively represent the disciplinary knowledge that M.Sc. graduates in physics should possess, enabling them to pursue careers in research, academia, industry, or other fields where physics expertise is valued.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1 : Post Graduates will be able to promote learning environment to meet the Industry expectation

PEO2 : Post Graduates will be incorporated the critical thinking with good Communication and Leadership skills to become a self-employed

PEO3 : Post Graduates will be upholding the human values and environmental sustenance for the betterment of the society

PROGRAMME OUTCOMES (POs)

PO1 : Post graduates will attain profound proficiency and expertise

PO2 : Post graduates will be ensured with corporative self – directed learning

PO3 : Post graduates will acquire acumen to handle diverse contexts and function in domains of multiplicity

PO4 : Post graduates will exercise intelligence in research Investigations and Introducing innovations

PO5 : Post graduates will learn ethical values and commit to Professional ethics.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1 : Gained the ability to identify and analyze complex Physics problems using the principles of Physics with suitable mathematical tools.

PSO2 : Developed skills to communicate effectively with peers, professionals and society at large and demonstrate professional ethics

PSO3 : Molded to adopt, absorb and develop innovative ideas.

PSO4 : Inculcate scientific temper and motivate student to take up further research

PSO5 : Exhibited effective individual talent, and engaged themselves in lifelong learning and dissemination.

REGULATIONS (2023-2024)

1. DURATION OF THE PROGRAME

1.1 Two years (Four semesters)

1.2 Each academic year shall be divided into two semesters. The odd semesters Shall consist of the period from June to November of each year and the even Semesters from December to May of each year.

1.3 There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

2.1 A candidate who (1) has passed the B. Sc Physics as the Main subject of study or (2) an examination of Universities accepted by the Syndicate of the Periyar University as equivalent there to, shall be permitted to appear and qualify for the M. Sc Physics Degree examination in this Branch at Muthayammal college of arts and science (Autonomous), Rasipuram.

3. CREDIT REQUIRMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

3.1. A Candidate shall be eligible for the award of the Degree only if he/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 and passed the examinations of all the four Semesters prescribed earning a minimum of 91 credits as per the distribution given in Regulation fulfilled such other conditions as have been prescribed thereof.

4. COURSE OF STUDY, CREDITS AND SCHEME OF EXAMINATION

4.1 The Course Components and Credit Distribution shall consist of the following: (Minimum Number of Credits to be obtained)

S.No	Study Components	Credit Distribution
01	Core, Elective, EDC, and Project Courses	84
02	Internship	02
03	Human Rights	02
04	Professional Competency Skills	02
	Extension Activity	01
Total Credits		91

4.1.1 Extension Activity:

Students shall be awarded a maximum of 1 Credit for Compulsory Extension Service. All the Students shall have to enroll for clubs / NSO (Sports & Games) Retract / Youth Red Cross or any other Service Organizations in the College and shall have to put in compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the College before 31st March in a year. If a student lacks 40 hours attendance in the first year, he or she shall have to compensate the same during the subsequent years.

Those students who complete minimum attendance of 40 hours in one year will get 'half-a- credit and those who complete the attendance of 80 or more hours in Two Years will get 'one credit'. Literacy and Population Education and Field Work shall be compulsory components in the above extension service activities.

4.2 Inclusion of the Massive Open Online Courses (MOOCs) available on SWAYAM and NPTEL

4.2.1 Students can choose the MOOC Course Available on SWAYAM and NPTEL under Core, Elective or Soft skill category. He/ she will be awarded degree only after producing valid certificate of the MOOC course for credit Mobility

5. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

5.1 Eligibility: Students shall be eligible to go to subsequent semester only if they earn sufficient attendance as prescribed by the Periyar University.

5.2. Attendance: All Students must earn 75% and above of attendance for appearing for the End Semester Examination.(Theory/Practical)

5.3. Condonation of shortage of attendance: If a Student fails to earn 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%) after collecting the prescribed fee for Theory/Practical examination separately, towards the condonation of shortage of attendance. Such fees collected and should be remitted to the University.

5.4. Non-eligibility for condonation of shortage of attendance: Students who have secured less than 65% but more than 50% of attendance are NOT ELIGIBLE for condonation of shortage of attendance and such Students will not be permitted to appear for the regular examination, but will be allowed to proceed to the next year/next semester of the program and they may be permitted to take next University examination by paying the prescribed condonation fee

5.5. Detained students for want of attendance: Students who have earned less than 50% of attendance shall not be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of final semester of the course, by paying the fee for the break of study as prescribed by the College from time to time.

5.6. Condonation of shortage of attendance for married women students: In respect of married women students undergoing PG programs, 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 (D.G.O) from the Government Hospital and the prescribed fee along with attendance details shall be forwarded to the college to consider the condonation of attendance mentioning the category

5.7. Zero Percent (0%) Attendance: The Students, who have earned 0% of attendance, have to repeat the program (by rejoining) without proceeding to succeeding semester and they have to obtain prior permission from the College/University immediately to rejoin the program.

5.8. Transfer of Students and Credits: The strength of the credits system is that it permits inter Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another in accordance with their aptitude and abilities by obtaining necessary permission from the university.

5.8.1. Transfer of Students is permitted from one Institution to another Institution for the same program with same nomenclature.

Provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested.

Provided the Student should have passed all the courses in the Institution from where the transfer is requested.

5.8.2 The marks obtained in the courses will be converted and grades will be assigned as per the College norms.

5.8.3 The transfer students are eligible for classification.

5.8.4 The transfer students are not eligible for Ranking, Prizes and Medals.

5.8.5 Students who want to go to foreign Universities up to two semesters or Project Work with the prior approval of the Departmental/College Committee are allowed to get transfer of credits and marks which will be converted in to Grades as per the University norms and are eligible to get CGPA and Classification; they are not eligible for Ranking, Prizes and Medals.

5.9. Students are exempted from attendance requirements for online courses of the College and MOOC's.

6. EXAMINATION AND EVALUATION

6.1. Register for all subjects: Students shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current (subsequent) Semester Subjects.

6.2. Marks for Internal and End Semester Examinations

Category	Theory	Practical
Internal Assessment	25	40
End semester Examination	75	60

6.3 Procedure for Awarding Internal Marks Internal Examination Marks - Theory

Components	Marks
CIA I&II	10
Attendance	5
Assignment/Quiz	5
Seminar	5
Total	25

6.4. Awarding Marks for Attendance (out of 5)

Percentage of Attendance	Marks
Below 60%	0 marks
60% to 75%	3 marks
75% to 90%	4 marks
Above 90%	5 marks

6.5. Components for Practical CIA.

Components	Marks
CIA -I	15
CIA - II	15
Observation Note	05
Attendance	5
Total	40

6.6. Components for Practical ESE.

Components	Marks
Completion of Experiments	50
Record	05
Viva voce	05
Total	60

6.7. Internship/ Industrial Training, Mini Project and Major Project Work

Internship/Industrial Training		Project Work		
	Marks	Components		Marks
CIA*[1]		CIA		
Work Diary	25	a) Attendance	20 Marks	50
Report	50	b) Review / Work Diary*[1]	30 Marks	
Viva-voce	25			
Examination				
Total	100	ESE*[2]		150
		a) Final Report	120 Marks	
		b)Viva-voce	30 Marks	
		Total		200

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

6.8. Guidelines for Professional Competency Skill- Online Mode - Online Exam 3 hours

Components	Marks
100 Objective Type Questions 100*1=100 Marks	100

Objective type Questions from Question Bank.

- The passing minimum for this paper is 50%
- In case, the candidate fails to secure 50% passing minimum, he/ she may have to reappear for the same in the subsequent semesters.

6.9 Components for Human Rights Course (CIA Only)

The Course Human Rights is to be treated as 100% C I A course which is offered in II Semester for I year PG students.

Total Marks for the Course =100

Components	Marks
Two Tests	75
Assignments	25
Total	**100**

- In case the candidate fails to secure 50 marks, which is the passing minimum, he/she may have to reappear for the same in the subsequent semesters

QUESTION PAPER PATTERN FOR CIA I, II AND ESE	
(3 HOURS)	MAXIMUM:75Marks
SECTION-A (Objective Type) Answer ALL Questions **ALL Questions Carry EQUAL Marks**	**(10 x1=10 marks)**
SECTION-B (Analytical Type) Answer any THREE Questions out of FIVE Questions **ALL Questions Carry EQUAL Marks**	**(3 x 5 = 15 marks)**
SECTION-C (Either or Type) Answer ALL Questions **ALL Questions Carry EQUAL Marks**	**(5 x 10 = 50 marks)**

(Syllabus for CIA-I 2.5 Unit ,Syllabus for CIA-II All 5 Unit)

6.10 PASSING MINIMUM

6.10.1 There shall be no passing minimum for Internal.

6.10.2 For external examination, passing minimum shall be 50% [Fifty Percentage] of the maximum marks prescribed for the course for each Course/Practical/Project and Viva-Voce.

6.10.3 In the aggregate [External/Internal] the passing minimum shall be of 50%.

6.10.4 He / She shall be declared to have passed the whole examination, if he/she passes in all the Courses and Practical wherever prescribed as per the scheme of the examinations by earning 90 CREDITS. He/she shall also fulfill the extension activities prescribed earning a minimum of 1 credit to qualify for the Degree.

6.11 SUPPLIMENTARY EXAMINATION:

Supplementary Examinations is conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

6.11.1 Eligibility: A Student who is having arrear of only one theory course in any of the semester or two theory course in the Final semester of the PG degree programme alone is eligible for Supplementary Examinations.

6.11.2 Non-eligibility for those completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

6.12. RETOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

6.12.1 Re-totaling: All UG Students who appeared for their Semester Examinations are eligible for applying for re-totaling of their answer scripts.

6.12.2 Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

6.12.3 Photo copy of the answer scripts: Students who have applied for revaluation can apply for the Photocopy of answer scripts by paying prescribed fee.

7. CLASSIFICATION OF SUCCESSFUL STUDENTS

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
00-49	0.0	U	Re-appear
ABSENT	0.0	AAA	ABSENT

7.1. Computation of Grade Point Average (GPA) in a Semester, Cumulative Grade Point Average(CGPA) and Classification

GPA for a Semester: = ∑iCiGi ,∑iCi

That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

CGPA for the entire programme: = ∑n∑iCniGni ,∑n∑iCni That is, CGPA is the sum of the multiplication of grade points by the credits of the entire programme divided by the sum of the credits of the courses of the entire programme

Where,

Ci= Credits earned for course I in any semester,

Gi=GradePointsobtainedforcourseiinanysemestern=Semesterinwhichsuchcourseswere credited.

7.2 Letter Grade and Classification

CGPA	GRAD E	CLASSIFICATION OF FINAL RESULT
9.5-10.0	O+	First Class -Exemplary*
9.0 and above but below9.5	O	
8.5 and above but below 9.0	D++	
8.0 and above but below 8.5	D+	First Class with Distinction*
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	
6.5 and above but below 7.0	A+	First Class
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 Students who have passed in the first appearance and within the prescribed semester of the PG Program are eligible.

8. RANKING

Students who pass all the examinations prescribed for the Program in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking I, II and III.

9. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAM TO QUALIFY FOR A DEGREE

9.1. A Student who for whatever reasons is not able to complete the program within the normal period (N) or the Minimum duration prescribed for the programme, may be allowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span =N+2years for the completion of programme.)

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S. No.	Study Components	Sem I		Sem II		Sem III		Sem IV		No. of Paper	Total Credit
		No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit	No. of Paper	Credit		
1	DISCIPLINE SPECIFIC CORESES(DSC)-THEORY	3	12	2	8	3	10	3	9	11	39
2	DSC-PRACTICAL	1	3	1	3	1	3	1	3	4	12
3	DISCIPLINE SPECIFIC ELECTIVE COURSES(DSE)	1	3	2	6	1	3			4	12
4	PROJECT WORK							1	3	1	3
5	INTERNSHIP					1	2			1	2
6	GENERIC ELECTIVE COURSES(GEC)-EDC					1	3			1	3
7	HUMAN RIGHTS			1	2					1	2
8	ONLINE - COMPETITIVE EXAMINATION							1	2	1	2
9	SOFT SKILL	1	2	1	2			1	2	3	6
10	PROFESSIONAL COMPETENCY COURSE	1	2							1	2
11	SKILL ENHANCEMENT COURSE -I			1	2	1	2	1	2	3	6
12	EXTENSION ACTIVITY							1	1	1	1
	Cumulative Credits	**7**	**22**	**8**	**23**	**8**	**23**	**8**	**22**	**32**	**91**

Total No. of Subjects	**32**
Marks	**3100**
TOTAL CREDITS	**91**
Extra credit	4
TOTAL CREDITS	**95**

MUTHAYAMMAL COLLEGE OF ARTS AND SCIENCE (Autonomous) - Rasipuram - 637 408
Scheme of Examinations - CBCS Pattern
(For the Students Admitted Academic Year: 2023-2024 Onwards)
M. Sc. Physics

S.No.	COURSE COMPONENTS	COURSE_CODE	TITLE OF THE COURSE	Hrs./W		CREDIT POINTS	MAX.MARKS		
				Lect.	Lab.		CIA	ESE	TOTAL
SEMESTER - I									
1	DSC THEORY - I	23M1PPHC01	MATHEMATICAL PHYSICS	5		4	25	75	100
2	DSC THEORY - II	23M1PPHC02	CLASSICAL MECHANICS AND RELATIVITY	5		4	25	75	100
3	DSC THEORY - III	23M1PPHC03	LINEAR AND DIGITAL ICs AND APPLICATIONS	5		4	25	75	100
4	DSC PRACTICAL - I	23M1PPHP01	PRACTICAL: GENERAL PHYSICS EXPERIMENTS		6	3	40	60	100
5	DSE THEORY - I	23M1PPHE01	MATERIALS SCIENCE	5		3	25	75	100
6	PCC	23M1PPHPC1	SEMICONDUCTOR DEVICES	2		2	25	75	100
7	AECC- SOFT SKILL-I	23M1PPHS01	ATMOSPHERIC PHYSICS	2		2	25	75	100
			TOTAL	**24**	**6**	**22**	**190**	**510**	**700**
SEMESTER - II									
1	DSC THEORY - IV	23M2PPHC04	STATISTICAL MECHANICS	5		4	25	75	100
2	DSC THEORY - V	23M2PPHC05	QUANTUM MECHANICS-I	5		4	25	75	100
3	DSC PRACTICAL - II	23M2PPHP02	PRACTICAL:ANALOG AND DIGITAL EXPERIMENTS		6	3	40	60	100
4	DSE THEORY - II	23M2PPHE10	ADVANCED OPTICS	4		3	25	75	100
5	DSE THEORY - III	23M2PPHE12	MICROPROCESSOR 8085 AND MICROCONTROLLER 8051	4		3	25	75	100
6	SEC THEORY-I	23M2PPHSE1	ELECTRONICS IN DAILY LIFE	2		2	25	75	100
7	AECC- SOFT SKILL-II	23M2PPHS02	LASER PHYSICS AND APPLICATIONS	2		2	25	75	100
8	HUMAN RIGHTS	23M2PHUR01	HUMAN RIGHTS	2	-	2	100	-	100
			TOTAL	**24**	**6**	**23**	**290**	**510**	**800**

SEMESTER - III									
1	CORE COURSE -VI	23M3PPHC06	QUANTUM MECHANICS - II	5		4	25	75	100
2	DSC THEORY - VII	23M3PPHC07	CONDENSED MATTER PHYSICS	5		3	25	75	100
3	DSC THEORY - VIII	23M3PPHC08	ELECTROMAGNETIC THEORY	4		3	25	75	100
4	DSC PRACTICAL - III	23M3PPHP03	PRACTICAL:MICROPROCESSOR 8085 AND MICROCONTROLLER 8051		6	3	40	60	100
5	DSE THEORY - IV	23M3PPHE04	ENERGY PHYSICS	4		3	25	75	100
6	SEC THEORY-II	23M3PPHSE2	COMMUNICATION ELECTRONICS	2		2	25	75	100
7	EDC-I	23M3PCSED1	FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS	4		3	25	75	100
8	INTERNSHIP	23M3PPHIS1	INTERNSHIP	-	-	2	-	-	-
			TOTAL	**24**	**6**	**23**	**190**	**510**	**700**
SEMESTER - IV									
1	DSC THEORY - IX	23M4PPHC09	NUCLEAR AND PARTICLE PHYSICS	4		3	25	75	100
2	DSC THEORY - X	23M4PPHC10	SPECTROSCOPY	4		3	25	75	100
3	DSC THEORY - XI	23M4PPHC11	NUMERICAL METHODS AND COMPUTER PROGRAMMING	4		3	25	75	100
4	DSC PRACTICAL - IV	23M4PPHP04	PRACTICAL:NUMERICAL METHODS AND COMPUTER PROGRAMMING (FORTRAN/C)		6	3	40	60	100
5	PROJECT WORK	23M4PPHPR1	PROJECT WORK	8		4	50	150	200
6	SEC THEORY-III	23M4PPHSE3	CHARACTERISATION OF MATERIALS	2		2	25	75	100
7	AECC- SOFT SKILL-III	23M4PPHS03	SOLAR PHYSICS	2		2	25	75	100
8	ONLINE COMPETITIVE EXAM	23M4PPHOE1	PHYSICS FOR COMPETITIVE EXAMINATIONS	-	-	2	100	-	100
	EXTRA CREDIT		EXTENSION ACTIVITY	-	-	1	-	-	-
			TOTAL	**24**	**6**	**23**	**315**	**585**	**900**
			OVERALL TOTAL	**96**	**24**	**91**	**985**	**2115**	**3100**
	EXTRA CREDIT	23M4PPHEC1	MOOC Courses offered in SWAYAM / NPTEL	-	-	2	-	-	-
	EXTRA CREDIT		VALUE ADDED COURSE			2			

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PPHC01	**MATHEMATICAL PHYSICS**	**DSC THEORY - I**	**I**	**5**	**3**	**2**	**-**	**4**

Objective	Students are understanding the solid mathematical foundation in vector calculus, matrices and differential equations. To provide an in-depth knowledge onorthogonal polynomials.

Unit	Course Content	Knowledge Levels	Sessions
I	**LINEAR VECTOR SPACE** Basic concepts - Definitions- examples of vector space - Linear independence - Scalar product- Orthogonality - Gram-Schmidt orthogonalization procedure - linear operators - Dual space - ket and bra notation - orthogonal basis - change of basis - Isomorphism of vector space - projection operator - Eigen values and Eigen functions - Direct sum and invariant subspace - orthogonal transformations and rotation.	K3	12
II	**COMPLEX ANALYSIS** Review of Complex Numbers - de Moivre's theorem - Functions of a Complex Variable - Differentiability - Analytic functions- Harmonic Functions - Complex Integration - Contour Integration, Cauchy - Riemann conditions - Singular points - Cauchy's Integral Theorem and integral Formula - Taylor's Series - Laurent's Expansion - Zeros and poles - Residue theorem and its Application: Potential theory - (1) Electrostatic fields and complex potentials - Parallel plates, coaxial cylinders and an annular region (2) Heat problems - Parallel plates and coaxial cylinders.	K4	12
III	**MATRICES** Types of Matrices and their properties, Rank of a Matrix - Conjugate of a matrix - Adjoint of a matrix - Inverse of a matrix - Hermitian and Unitary Matrices - Trace of a matrix - Transformation of matrices - Characteristic equation - Eigen values and Eigen vectors - Cayley - Hamilton theorem - Diagonalization.	K3	12
	FOURIER TRANSFORMS & LAPLACE TRANSFORMS Definitions - Fourier transform and its inverse - Transform of Gaussian function and Dirac delta function - Fourier		

IV	transform of derivatives – Cosine and sine transforms - Convolution theorem. Application: Diffusion equation: Flow of heat in an infinite and in a semi - infinite medium - Wave equation: Vibration of an infinite string and of a semi - infinite string. Laplace transform and its inverse – Transforms of derivatives and integrals – Differentiation and integration of transforms – Dirac delta functions – Application – Laplace equation: Potential problem in a semi - infinite strip.	K4	12
V	**DIFFERENTIAL EQUATIONS** Second order differential equation – Sturm – Liouville's theory – Series solution with simple examples – Hermite polynomials – Generating function – Orthogonality properties – Recurrence relations – Legendre polynomials - Generating function – Rodrigue formula – Orthogonality properties – Dirac delta function – One dimensional Green's function and Reciprocity theorem – Sturm - Liouville's type equation in one dimension & their Green's function.	K5	12
Course Outcome	**CO1:** Applying the mathematical knowledge for the description of physical phenomena.	K3	
	CO2: Analyze the basic and advanced mathematical tools required for Physics Problems.	K4	
	CO3: Apply the matrices in the study of electrical circuits, Quantum mechanics and Optics.	K3	
	CO4: Analyze various problems from physics and apply the concepts learnt in the class to effectively solve them.	K4	

	CO5: Evaluate the separation of variable technique to solve Laplace equation in different coordinate systems.	K5	

Learning Resources	
Text Books	1. George Arfken and Hans J Weber, 2012, Mathematical Methods for Physicists – A Comprehensive Guide (7th edition), Academic press. 2. P.K. Chattopadhyay, 2013, Mathematical Physics (2nd edition), New Age, New Delhi. A. W. Joshi, 2017, Matrices and Tensors in Physics, 4th Edition (Paperback), New Age International Pvt. Ltd., India. 3. B.D.Gupta, 2009, Mathematical Physics(4thedition), Vikas Publishing House, New Delhi. 4. H. K. Dass and Dr. Rama Verma, 2014, Mathematical Physics, Seventh Revised Edition, S. Chand & Company Pvt. Ltd., New Delhi.
Reference Books	1. E. Kreyszig, 1983, Advanced Engineering Mathematics, Wiley Eastern, New Delhi. 2. D. G. Zill and M. R. Cullen, 2006, Advanced Engineering Mathematics, 3rd Ed. Narosa, New Delhi. 3. S. Lipschutz, 1987, Linear Algebra, Schaum's Series, McGraw - Hill, New York. P. R. Halmos, 1965, Finite Dimensional Vector Spaces, 2nd Edition, Affiliated East West, New Delhi. 3. C. R. Wylie and L. C. Barrett, 1995, Advanced Engineering Mathematics, 6th Edition,International Edition, McGraw-Hill, New York.
Website Link	1. www.khanacademy.org 2. https://youtu.be/LZnRlOA1_2I 3. http://hyperphysics.phy-astr.gsu.edu/hbase/hmat.html#hmath 4.https://www.youtube.com/watch?v=_2jymuM7OUU&list=PLhkiT_RYTEU27vS_SlED56gNjVJGO2qaZ 5. https://archive.nptel.ac.in/courses/115/106/115106086

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024Onwards									
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**	
23M1PPHC01	**MATHEMATICAL PHYSICS**	**DSC THEORY - I**	**I**	**5**	**3**	**2**	**-**	**4**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S	M	S	S	M	M
CO2	S	M	S	S	M	S	M	M	S	S
CO3	M	S	M	S	S	M	M	M	S	M
CO4	S	M	S	M	S	M	S	S	M	S
CO5	M	M	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Open Book Problem Solving
Teaching and Learning Methods	Chalk and talk method, Group Discussions, Interactions
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	**Verified By**	**Approved By Member Secretary**
Ms. M. SARANYA	Dr .M.REVATHI	Dr. S. SHAHITHA

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1PPHC02	**CLASSICAL MECHANICS AND RELATIVITY**	**DSC THEORY- II**	**I**	**5**	**4**	**1**	**-**	**4**

Objective	To enable the students to understand the aspects of principles of classical mechanics, Lagrangian formulation, Hamilton formulation, Small oscillation and Relativity		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**PRINCIPLES OF CLASSICAL MECHANICS:** Mechanics of a single particle – mechanics of a system of particles – conservation laws for a system of particles – constraints – holonomic & non-holonomic constraints – generalized coordinates – configuration space – transformation equations – principle of virtual work.	K2	12
II	**LAGRANGIAN FORMULATION:** D'Alembert's principle – Lagrangian equations of motionfor conservative systems – applications: (i) simple pendulum (ii) Atwood's machine (iii)projectile motion	K4	12
III	**HAMILTONIAN FORMULATION:** Phase space – cyclic coordinates – conjugate momentum – Hamiltonian function – Hamilton's canonical equations of motion – applications: (i) simple pendulum (ii) one dimensional simple harmonic oscillator (iii) motion of particle in a central force field.	K4	12
IV	**SMALL OSCILLATIONS:** Formulation of the problem – transformation to normal coordinates – frequencies of normal modes – linear triatomic molecule.	k5	12
V	**RELATIVITY:** Inertial and non-inertial frames – Lorentz transformation equations – length contraction and time dilation – relativistic addition of velocities – Einstein's mass-energy relation – Minkowski's space – four vectors – position, velocity, momentum, acceleration and force in for vector notation and their transformations.	k5	12
Course Outcome	**CO1:** Understanding the basic concept of Classical mechanics.	K2	
	CO2: Analyze Lagrangian formulation.	K4	
	CO3: Analyze the Hamilton formulation.	K4	

	CO4: Estimate the Small oscillation.	K5	
	CO5: Determine the Relativity.	K5	

Learning Resources	
Text Books	1. H. Goldstein, Classical Mechanics, 3rd Edition, Pearson Edu., 2002. 2. J. C. Upadhyaya, Classical Mechanics, Himalaya Publshing. Co. New Delhi, 2016. 3. R. Resnick, Introduction to Special Theory of Relativity, Wiley Eastern, New Delhi, 1968. 4. R. G. Takwala and P.S. Puranik, Introduction to Classical Mechanics – Tata – McGraw Hill,New Delhi, 1980. 5. N. C. Rana and P.S. Joag, Classical Mechanics - Tata McGraw Hill, 2001.
Reference Books	1. K. R. Symon, Mechanics, Addison Wesley, London, 1971. 2. S. N. Biswas, Classical Mechanics, Books & Allied, Kolkata,1999. 3. Gupta, Kumar and Sharma, Classical Mechanics, Pragathi Prakashan, 2017. 4. T.W.B. Kibble, Classical Mechanics, McGraw-Hill, New York, 2004. 5. Greenwood, Classical Dynamics, Dover Publication, New York, 1985.
Website Link	https://en.wikipedia.org/wiki/Classical_mechanics https://link.springer.com/book/10.1007/978-3-319-68780-3 https://link.springer.com/book/10.1007/978-1-4614-3978-3

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards							
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M1PPHC02	CLASSICAL MECHANICS AND RELATIVITY	DSC THEORY- II	I	5	4	1	-	4

CO - PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	M	S	M	M
CO2	S	S	S	M	S	S	L	S	M	S
CO3	M	M	S	M	S	S	M	S	S	S
CO4	S	S	S	S	S	S	M	S	S	S
CO5	S	M	S	S	S	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG			

Tutorial Schedule	Problem solving session
Teaching and Learning Methods	Chalk and talk method, Power point presentation.
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Ms. L. MOHANA	Dr. M. REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hrs**	**L**	**T**	**P**	**C**
23M1PPHC03	**LINEAR AND DIGITAL ICs AND APPLICATIONS**	**DSC THEORY - III**	**I**	**5**	**3**	**2**	**-**	**4**
Objective	To understand the basic concepts of operational amplifier and its various applications. To understand the basics of PLL and its practical applications. To know about analog multipliers.							

Unit	Course Content	Knowledge Levels	Sessions
I	**INTEGRATED CIRCUITS AND OPERATIONAL AMPLIFIER :** Introduction, Classification of IC's, basic information of Op-Amp 741 and its features, the ideal Operational amplifier, Op-Amp internal circuit and Op-Amp Characteristics.	K2	10
II	**APPLICATIONS OF OP-AMP :** LINEAR APPLICATIONS OF OP-AMP: Solution to simultaneous equations and differential equations, Instrumentation amplifiers, V to I and I to V converters. NON-LINEAR APPLICATIONS OF OP-AMP: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multivibrators, Triangular and Square waveform generators.	K3	13
III	**ACTIVE FILTERS & TIMER AND PHASE LOCKED LOOPS :** **ACTIVE FILTERS:** Introduction, Butterworth filters – 1st order, 2nd order low pass and high pass filters, band pass, band reject and all pass filters. TIMER AND PHASE LOCKED LOOPS: Introduction to IC 555 timer, description of functional diagram, monostable and astable operations and applications, Schmitt trigger, PLL - introduction, basic principle, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.	K4	13
IV	**VOLTAGE REGULATOR & D to A AND A to D CONVERTERS :** **VOLTAGE REGULATOR:** Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator. D to A AND A to D CONVERTERS: Introduction, basic DAC	K3	12

	techniques -weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters -parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.		
V	**CMOS LOGIC, COMBINATIONAL CIRCUITS USING TTL 74XX ICs & SEQUENTIAL CIRCUITS USING TTL 74XX ICs :** CMOS LOGIC: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic. COMBINATIONAL CIRCUITS USING TTL 74XX ICs: Study of logic gates using 74XX ICs, Four-bit parallel adder (IC 7483), Comparator (IC 7485), Decoder (IC 74138, IC74154), BCD to 7-segment decoder (IC7447), Encoder (IC74147), Multiplexer (IC74151), Demultiplexer (IC 74154). SEQUENTIAL CIRCUITS USING TTL 74XX ICs: Flip Flops (IC 7474, IC 7473), Shift Registers, Universal Shift Register (IC 74194), 4- bit asynchronous binary counter (IC 7493).	K4	12
Course Outcome	**CO1:** Understanding the basic concepts of operational amplifier and its various applications.	K2	
	CO2: Identify the basics of PLL and its practical applications.	K3	
	CO3: Analyze Active filter and timer and phase locked loops	K4	
	CO4: select various techniques to develop A/D and D/A convertors.	K3	
	CO5: Develop skills to develop simple filter circuits and various amplifiers and can solve problems related to it	K4	

Learning Resources				
Text Books	1. D. Roy Choudhury, Shail B. Jain (2012), Linear Integrated Circuit, 4th edition, New Age International Pvt. Ltd., New Delhi, India. 2. Ramakant A. Gayakwad, (2012), OP-AMP and Linear Integrated Circuits, 4th edition, Prentice Hall / Pearson Education, New Delhi. 3. B.L. Theraja and A.K. Theraja,(2004), A Textbook of Electrical technology, S. Chand & Co. 4. V.K. Mehta and Rohit Mehta, (2008), Principles of Electronics, S. Chand & Co, 12th Edition. 5. V. Vijayendran, (2008), Introduction to Integrated electronics (Digital & Analog), S. Viswanathan Printers & Publishers Private Ltd, Reprint. V.			
Reference Books	1. Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi. 2. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi. 3. Malvino and Leach (2005), Digital Principles and Applications 5th Edition, Tata McGraw Hill, New Delhi. 4. Floyd, Jain (2009), Digital Fundamentals, 8th edition, Pearson Education, New Delhi. 5. Millman & Halkias (2000), Integrated Electronics, Tata McGraw Hill, 17th Reprint.			
Website Link	1. https://nptel.ac.in/course.html/digital circuits/ 2. https://nptel.ac.in/course.html/electronics/operational amplifier/ 3. https://www.allaboutcircuits.com/textbook/semiconductors/chpt-7/field-effect-controlled-thyristors/ 4. https://www.electrical4u.com/applications-of-op-amp/ 5. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M1PPHC03	**LINEAR AND DIGITAL ICs AND APPLICATIONS**	**DSC THEORY - III**	**I**	**5**	**3**	**2**	**-**	**4**	

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	S	M	S	M	S
CO2	M	S	M	S	S	M	M	S	M	M
CO3	S	S	S	M	M	S	S	M	S	M
CO4	M	M	M	S	M	S	S	S	S	S
CO5	S	S	M	S	M	M	S	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Assignments, Group discussions
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	**Verified By**	**Approved By Member Secretary**
Dr. M.REVATHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHC04	STATISTICAL MECHANICS	DSC THEORY - IV	II	5	3	2	-	4

Objective	This course develops concepts in laws of thermodynamics and postulates of statistical mechanics, statistical interpretation of thermodynamics, microcanonical, canonical and grant canonical ensembles; the methods of statistical mechanics are used to develop the statistics for Bose-Einstein, selected topics from Fluctuations and transport phenomena are discussed.

Unit	Course Content	Knowledge Levels	Sessions
I	**PHASE TRANSITIONS:** Thermodynamic potentials - Phase Equilibrium - Gibb's phase rule - Phase transitions and Ehrenfest's classifications –Third law of Thermodynamics. Order parameters – Landau's theory of phase transition - Critical indices - Scale transformations and dimensional analysis	K3	10
II	**STATISTICAL MECHANICS AND THERMODYNAMICS:** Foundations of statistical mechanics - Specification of states of a system - Micro canonical ensemble - Phase space - Entropy - Connection between statistics and thermodynamics – Entropy of an ideal gas using the micro canonical ensemble - Entropy of mixing and Gibb's paradox.	K5	10
III	**CANONICAL AND GRAND CANONICAL ENSEMBLES:** Trajectories and density of states - Liouville's theorem - Canonical and grand canonical ensembles - Partition function - Calculation of statistical quantities - Energy and density fluctuations.	K4	9
IV	**CLASSICAL AND QUANTUM STATISTICS :** Density matrix - Statistics of ensembles - Statistics of indistinguishable particles - MaxwellBoltzmann statistics - Fermi-Dirac statistics – Ideal Fermi gas – Degeneracy - Bose-Einstein statistics - Plank radiation formula - Ideal Bose gas - Bose-Einstein condensation.	K5	9

V	**REAL GAS,ISING MODEL AND FLUCTUATIONS:** Cluster expansion for a classical gas - Virial equation of state - Calculation of the first Virial coefficient in the cluster expansion - Ising model - Mean-field theories of the Ising model in three, two and one dimensions – Exact solutions in one dimension. Correlation of space-time dependent fluctuations - Fluctuations and transport phenomena - Brownian motion - Langevin's theory - Fluctuation-dissipation theorem - The Fokker-Planck equation.	K5	10
Course Outcome	**CO1**: Apply to critical phenomena and Survey of third law of thermodynamic.	K3	
	CO2: Explain statistical physics and thermodynamics as logical Consequences of the postulates of statistical mechanics.	K5	
	CO3: Calculate the statistical quantities and verification of Liouville's theorem.	K5	
	CO4: Evaluate and explain the differences between classical and quantum mechanics.	K5	
	CO5: Evaluate the order parameter, response functions and correlation of space-time dependent fluctuations.	K5	

Learning Resources

Text Books	1. S. K. Sinha, 1990, Statistical Mechanics, Tata McGraw Hill, New Delhi. 2. B. K. Agarwal and M. Eisner, 1998, Statistical Mechanics, Second Edition New Age International, New Delhi. 3. J. K. Bhattacharjee, 1996, Statistical Mechanics: An Introductory Text, Allied Publication, New Delhi.
ReferenceBooks	1. R. K. Pathria, 1996, Statistical Mechanics, 2 nd edition, Butter Worth Heinemann, New Delhi. 2. L. D. Landau and E. M. Lifshitz, 1969, Statistical Physics, Pergamon Press, Oxford. 3. K. Huang, 2002, Statistical Mechanics, Taylor and Francis, London.
Website Link	1. https://byjus.com/chemistry/third-law-of-thermodynamics/ 2. https://web.stanford.edu/~peastman/statmech/thermodynamics.html 3. https://en.wikipedia.org/wiki/Grand_canonical_ensemble 4. https://en.wikipedia.org/wiki/Ising_model

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**	**Course Type**		**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M2PPHC04	**STATISTICAL MECHANICS**	**DSC THEORY - IV**		**II**	**5**	**3**	**2**	**-**	**4**	
CO-PO Mapping										
CO Number	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	M	M	L	M	M	M	M	S	L	M
CO2	M	M	S	L	M	M	S	S	M	M
CO3	L	M	M	S	M	L	S	S	M	S
CO4	S	M	M	S	S	S	S	M	M	M
CO5	S	S	M	S	M	M	M	S	S	M
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG			
Tutorial Schedule	Assignments, Group discussions									
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation									
Assessment Methods	Seminar, CIA – I, CIA – II, ESE									
Designed By	**Verified By**					**Approved By Member secretary**				
Mr. A.MOHANDASS GANDHI	Dr .M.REVATHI					Dr. S. SHAHITHA				

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHC05	**QUANTUM MECHANICS - I**	**DSC THEORY - V**	**II**	**5**	**3**	**2**	**-**	**4**

Objective	The main objective of this course is to make students aware about the basic formulations in quantum mechanics. The course takes up the responsibility to give information about hermitian operators, their eigen values and eigenvectors.

Unit	Course Content	Knowledge Levels	Sessions
I	**BASIC FORMALISM:** Interpretation of the wave function – Time dependent Schrodinger equation –Time independent Schrodinger equation – Stationary states – Ehrenfest's theorem – Linear vector space – Linear operator – Eigen functions and Eigen Values – Hermitian Operator – Postulates of Quantum Mechanics – Simultaneous measurability of observables – General Uncertainty relation	K1	10
II	**ONE DIMENSIONAL AND THREE-DIMENSIONAL ENERGY EIGEN VALUE PROBLEMS:** Square – well potential with rigid walls – Square well potential with finite walls – Square potential barrier – Alpha emission – Bloch waves in a periodic potential – Kronig-penny square – well periodic potential – Linear harmonic oscillator: Operator method – Particle moving in a spherically symmetric potential – System of two interacting particles – Hydrogen atom – Rigid rotator	K2	10
III	**GENERAL FORMALISM1:** Dirac notation – Equations of motions – Schrodinger representation – Dirac notation – Equations of motions – Schrodinger representation – Heisenberg representation – Interaction representation – Coordinate representation – Momentum representation – Symmetries and conservation laws – Unitary transformation – Parity and time reversal	K3	9
IV	**APPROXIMATION METHODS:** Time independent perturbation theory for non-degenerate energy levels – Degenerate energy levels – Stark effect in Hydrogen atom – Ground and excited state – Variation method – Helium atom – WKB approximation – Connection	K4	10

	formulae (no derivation) – WKB quantization – Application to simple harmonic oscillator.		
V	**ANGULAR MOMENTUM:** Eigenvalue spectrum of general angular momentum - Ladder operators and their algebra – Matrix representation - Spin angular momentum – Addition of angular momenta - CG Coefficients – Symmetry and anti – symmetry of wave functions – Construction of wave-functions and Pauli's exclusion principle.	K5	9
Course Outcome	**CO1**: students will be able to appreciate the beauty of quantum mechanics. They will be knowing all types of representations of operators and ways to apply them in different problems.	K1	
	CO2: The most important thing students learned form this course was how to solve the hydrogen atom problem by using quantum mechanics.	K2	
	CO3: Apply principles of Quantum Mechanics to calculate observables for given wave functions	K3	
	CO4: Students learned about time independent degenerate and non degenerate perturbations and to apply them in harmonic oscillator.	K4	

	CO5: Students got an idea of Pauli spin matrices which are very important in nuclear and particle physics as well as atomic and molecular physics.	K5	
Learning Resources			
Text Books	1.P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, 2nd edition(37th Reprint),Tata McGraw-Hill, New Delhi, 2010. 2. G. Aruldhas, Quantum Mechanics, 2nd edition, Prentice Hall of India, New Delhi, 2009. 3. David J Griffiths, Introduction to Quantum Mechanics. 4th edition, Pearson, 2011. 4. SL Gupta and ID Gupta, Advanced Quantum Theory and Fields, 1st Edition, S.Chand& Co., New Delhi, 1982. 5. A. Ghatak and S. Lokanathan, Quantum Mechanics: Theory and Applications, 4thEdition, Macmillan, India, 1984.		
Reference Books	1. E. Merzbacher, Quantum Mechanics, 2nd Edition, John Wiley and Sons, New York, 1970. 2. V. K. Thankappan, Quantum Mechanics, 2nd Edition, Wiley Eastern Ltd, New Delhi, 1985. 3. L. D. Landau and E. M. Lifshitz, Quantum Mechanics, 1st edition, Pergomon Press, Oxford, 1976. 4. S. N. Biswas, Quantum Mechanics, Books and Allied Ltd., Kolkata, 1999. 5. V. Devanathan, Quantum Mechanics, 2nd edition, Alpha Science International Ltd, Oxford, 2011.		
Website Link	1. http://research.chem.psu.edu/lxjgroup/download_files/chem565-c7.pdf 2. http://www.feynmanlectures.caltech.edu/III_20.html 3. http://web.mit.edu/8.05/handouts/jaffe1.pdf 4. https://hepwww.pp.rl.ac.uk/users/haywood/Group_Theory_Lectures/Lecture_1.pdf 5. https://theory.physics.manchester.ac.uk/~xian/qm/chapter3.pdf		
	L-Lecture	T-Tutorial	P-Practical C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2PPHC05	QUANTUM MECHANICS - I	DSC THEORY - V	II	5	3	2	-	4

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	M	M	M	M	S	L	M
CO2	M	M	S	L	M	M	S	S	M	M
CO3	L	M	M	S	M	L	S	S	M	S
CO4	S	M	M	S	S	S	S	M	M	M
CO5	S	S	M	S	M	M	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Assignments, Group discussions
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Mr. A.MOHANDASS GANDHI	Dr .M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHC06	**QUANTUM MECHANICS - II**	**DSE THEORY -VI**	**III**	**5**	**3**	**2**	**-**	**4**
Objective	To enable the students to extract the structure of matter from the scattering of particles and to study about the relativistic quantum mechanics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**SCATTERING THEORY:** Scattering amplitude – Cross sections – Born approximation and its validity – Scattering by a screened coulomb potential – Yukawa potential – Partial wave analysis – Scattering length and Effective range theory for s wave – Optical theorem – Transformation from centre of mass to laboratory frame.	K5	12
II	**PERTURBATION THEORY :** Time dependent perturbation theory – Constant and harmonicperturbations – Fermi Golden rule – Transition probabilityEinstein's A and B Coefficients – Adiabatic approximation – Sudden approximation – Semi – classical treatment of an atom with electromagnetic radiation – Selection rules for dipole radiation.	K5	12
III	**RELATVISTIC QUANTUM MECHANICS :** Klein – Gordon Equation – Charge and Current Densities – Dirac Matrices – Dirac Equation – Plane Wave Solutions – Interpretation of Negative Energy States – Antiparticles – Spin of Electron – Magnetic Moment of An Electron Due To Spin.	K5	12
IV	**DIRAC EQUATION :** Covariant form of Dirac Equation – Properties of the gamma matrices – Traces – Relativistic invariance of Dirac equation – Probability Density – Current four vector – Bilinear covariant – Feynman's theory of positron (Elementary ideas only without propagation formalism).	K5	12

V	**CLASSICAL FIELDS AND SECOND QUANTIZATION :** Classical fields – Euler Lagrange equation – Hamiltonian formulation – Noether's theorem – Quantization of real and complex scalar fields – Creation, Annihilation and Number operators – Fock states – Second Quantization of K-G field – Density Functional Theory (DFT). ***Current Trends** –Quantum information and quantum computing	K5	12
	***Self Study**		
Course Outcome	**CO1:** Explain the basic information about the scattering problems and to solve various problems.	K5	
	CO2: Evaluate the problems using perturbation theory.	K5	
	CO3: Compare the concept of relativistic quantum mechanics and to develop the appropriate Schrödinger's equation to solve quantum mechanics problems.	K5	
	CO4: Interpret the Dirac equation.	K5	
	CO5: Examine the field quantization and used to solve various field theory problems.	K4	

Learning Resources

Text Books	1. P. M. Mathews and K. Venkatesan, A Text book of Quantum Mechanics, , Tata McGraw-Hill, New Delhi, 2nd Edition (2010). 2. G. Aruldhas, Quantum Mechanics, Prentice-Hall of India, New Delhi, 2nd Edition (2009). 3. Nouredine Zettili, Quantum mechanics concepts and applications, 2nd Edition, Wiley,(2017).
Reference Books	1. B. K. Agarwal and Hari Prakash, Quantum Mechanics, , PHI Learning Pvt. Ltd. NewDelhi, 7th reprint (2009). 2. Deep Chandra Joshi, Quantum Electrodynamics and Particle Physics, I.K.International Publishing house Pvt. Ltd., 1st edition, (2006). 3. Ghatak and S.Lokanathan, Quantum Mechanics: Theory and Applications, Macmillan India, New Delhi, 4th Edition,(2004)
Website link	1. https://ocw.mit.edu/courses/physics/8-05-quantum-physics-ii-fall-2013/lecture notes/MIT8_05F13_Chap_09.pdf

	2. http://hep.itp.tuwien.ac.at/~kreuzer/qt08.pdf 3. https://www.cmi.ac.in/~govind/teaching/rel-qm-rc13/rel-qm-notes-gk.pdf 4. https://web.mit.edu/dikaiser/www/FdsAmSci.pdf
Self Study Materials	https://nlist.inflibnet.ac.in/search/Record/EBC1069829

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PPHC06	QUANTUM MECHANICS - II	DSE THEORY -VI	III	5	3	2	-	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	M	S	S
CO2	M	M	M	S	M	M	S	M	S	M
CO3	S	M	S	M	S	S	M	S	S	S
CO4	S	S	S	S	S	S	M	M	M	M
CO5	S	M	M	S	M	S	M	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussions, Quiz
Teaching and Learning Methods	Chalk and Talk , Power Point Presentation
Assessment Methods	Seminar, CIA I, CIA-II, ESE

Designed By	Verified By	Approved By Member Secretary
Dr. M.MEENACHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHC07	**CONDENSED MATTER PHYSICS**	**DSC THEORY - VII**	**III**	**5**	**3**	**2**	**-**	**3**
Objective	This Course Exposes the Students To Have a Discussion On Different Crystal Structures and apply the systematic approach to problem solving in crystal vibrations.							

Unit	Course Content	Knowledge Levels	Sessions
I	**CRYSTAL PHYSICS :** 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, and FCC). Structure and properties of liquid crystals. Diffraction Conditions - Laue equations - Brillouin zone - Structure factor - Atomic form factor - Inert gas crystals - Cohesive energy of ionic crystals - Madelung constant - *Quasi crystals* .	K5	12
II	**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 – Einstein's theory of specific heat capacity Debye's theory of lattice heat capacity - Thermal Conductivity - Umkalapp processes.	K4	12

III	**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 - Fermi surfaces and construction - Experimental methods in Fermi surface studies - de Hass-van Alphen effect.	K4	12
IV	**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.	K5	12
V	**SUPERCONDUCTIVITY** Experimental facts: Occurrence - Effect of magnetic fields - Meissner effect – Critical field – Critical current - Entropy and heat capacity - Energy gap - Microwave and infrared properties - Type I and II Superconductors. Theoretical Explanation: Thermodynamics of super conducting transition - London equation - Coherence length – Isotope effect - Cooper pairs – Bardeen Cooper Schrieffer (BCS) Theory . Single particle tunneling - Josephson tunneling - DC and AC Josephson effects - High temperature Superconductors – SQUIDS. ***Current Trends -** Photonic Crystals Physics and Practical Modeling	K5	12
	***Self study**		

Course Outcome	**CO1:** Compare the different types of crystal structures.	K5	
	CO2: Explain about specific heat capacity and thermal conductivity of metal.	K4	
	CO3: Classify the materials based on band theory.	K4	
	CO4: Criticize about magnetism and explain the magnetic materials with necessary theories.	K5	
	CO5: Interpret the concepts, theories and elaborate about the superconductivity.	K5	

Learning Resources	
Text Books	1. C. Kittel, Introduction to Solid State Physics, 8 th Edition, Wiley, New York, (2005). 2. Rita John, Solid State Physics, Tata Mc-Graw Hill Publication(2017). 3. A. J. Dekker, Solid State Physics, Macmillan students Edition , New Delhi (2008).
Reference Books	1. J. P. Srivastava, , Elements of Solid State Physics, Prentice-Hall of India, New Delhi(2006). 2. S.O.Pillai, solid state physics, seventh Edition, New Age International, New Delhi (2014). 3. Wahab.M.A, Solid State Physics, Second Edition , Narosa, (2010)
Website Link	1. http://www.cmmp.ucl.ac.uk/%7Eaph/Teaching/3C25/index.html 2. https britannica.com/science://www. /crystal 3.https://www.nationalgeographic.org/encyclopedia/magnetism/ 4. https://www.brainkart.com/article/Super-Conductors_6824
Self study material	1. https://nlist.inflibnet.ac.in/search/Record/978-3-642-02646-1

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PPHC07	CONDENSED MATTER PHYSICS	DSC THEORY - VII	III	5	3	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	M	S	S
CO2	M	M	M	S	M	M	S	M	M	M
CO3	S	M	S	M	S	M	M	S	S	S
CO4	S	S	S	S	M	S	M	M	M	M
CO5	S	M	M	S	M	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	group discussions, Online-Quiz
Teaching and Learning Methods	Chalk and Talk , Power Point Presentation
Assessment Methods	Seminar, CIA I, CIA-II, ESE

Designed By	Verified By	Approved By Member Secretary
Dr. M.MEENACHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHC08	**ELECTROMAGNETIC THEORY**	**DSC THEORY - VIII**	**III**	**4**	**2**	**2**	**-**	**3**
Objective	Students are acquiring knowledge about boundary conditions between two media and the technique of method of separation of variables and use various mathematical tools to solve Maxwell equations.							

Unit	Course Content	Knowledge Levels	Sessions
I	**ELECTROSTATICS :** Boundary value problems and Laplace equation – Boundary conditions and uniqueness theorem – Laplace equation in three dimension – Solution in Cartesian and spherical polar coordinates – Examples of solutions for boundary value problems. 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.	K3	10
II	**MAGNETOSTATICS :** Biot-Savart's Law - Ampere's law - Magnetic vector potential and magnetic field of a localized current distribution - Magnetic moment, force and torque on a current distribution in an external field - Magneto static energy - Magnetic induction and magnetic field in macroscopic media - Boundary conditions - Uniformly magnetized sphere.	K4	10
III	**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	K4	10

	and Lorentz gauges - Energy and momentum of the field - Poynting's theorem - Lorentz force - Conservation laws for a system of charges and electromagnetic fields.		
IV	**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. Inhomogeneous wave equation and retarded potentials - Radiation from a localized source - Oscillating electric dipole.	K5	9
V	**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 magneto sonic waves. ***Current Trends: Stochastic electrodynamics, Self - Confinement of a plasma.**	K6	9
	*** Self Study.**		
Course Outcome	**CO1:** Apply vector calculus operations and develop knowledge of vector fields and scalar fields.	K3	
	CO2: Examine the fundamental nature of static fields, including steady current, static electric and magnetic fields	K4	
	CO3: Simplify the Maxwell's equations to describe how electromagnetic field behaves in different media.	K4	
	CO4: Analyze the concept of propagation of EM waves through wave guides in optical fiber communications and also in radar installations, calculate the transmission and reflection coefficients of electromagnetic waves.	K5	
	CO5: Estimate the interaction of ionized gases with self-consistent electric and magnetic fields.	K6	
Learning Resources			

Text Books	1. D. J. Griffiths , Introduction to Electrodynamics, Cambridge University Press, 5th Edition (2023). 2. J. D. Jackson, Classical Electrodynamics, Wiley Eastern Ltd. New Delhi, 4th edition (2020). 3. J. A. Bittencourt, Fundamentals of Plasma Physics, Pergamon Press, Oxford, 5th Edition (2004). 4. Gupta, Kumar and Singh, Electrodynamics, S. Chand & Co., New Delhi 24th edition (2023).			
Reference Books	1. J. D. Kraus and D. A. Fleisch, Electromagnetics with Applications, WCB McGraw-Hill, New York, 5th Edition (2017). 2. B. Chakraborty, Principles of Electrodynamics, Books and Allied, Kolkata,(2010). 3. Andrew Zangwill,Modern Electrodynamics, Cambridge University Press, USA ,(2013).			
Website Link	1. https://byjus.com/physics/maxwells-equations/ 2.https://testbook.com/physics/biot-savart-law 3. https://byjus.com/physics/circular-polarisation/ 4. https://www.geeksforgeeks.org/amperes-law/			
Self Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/detail.action?docID=1679723			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHC08	**ELECTROMAGNETIC THEORY**	**DSC THEORY - VIII**	**III**	**4**	**2**	**2**	**-**	**3**

CO - PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	M	S	M	S
CO2	S	S	S	M	M	S	S	S	S	M
CO3	M	S	S	S	S	M	S	M	M	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	M	S	M	S	S	S	S	M	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Open book problem solving
Teaching and Learning Methods	Chalk and talk method, Power point presentations, Group discussions, Interactions
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	**Verified By**	**Approved By Member Secretary**
Ms. M.SARANYA	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc.-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PPHC09	**NUCLEAR AND PARTICLE PHYSICS**	**DSC THEORY - IX**	**IV**	**4**	**2**	**2**	**-**	**3**
Objective	Students benefit from having a better understanding of the basic nuclear forces at work in nature, their symmetries.							

Unit	Course Content	Knowledge Levels	Sessions
I	**NUCLEAR MODELS** Liquid drop model – Weizacker mass formula – Isobaric mass parabola –Mirror Pair - Bohr Wheeler theory of fission – shell model – spin-orbit coupling – magic numbers – angular momenta and parity of ground states – magnetic moment – Schmidt model – electric Quadrapole moment - Bohr and Mottelson collective model – rotational and vibrational bands	K4	12
II	**NUCLEAR FORCES** Nucleon – nucleon interaction – Tensor forces – properties of nuclear forces – ground state of deuteron – Exchange Forces - Meson theory of nuclear forces – Yukawa potential – nucleon nucleon scattering – effective range theory – spin dependence of nuclear forces - charge independence and charge symmetry – isospin formalism	K5	12
III	**NUCLEAR REACTIONS** Kinds of nuclear reactions – Reaction kinematics – Q-value – Partial wave analysis of scattering and reaction cross section – scattering length – Compound nuclear reactions – Reciprocity theorem – Resonances – Breit Wigner one level formula – Direct reactions - Nuclear Chain reaction – four factor formula.	K5	12
	NUCLEAR DECAY	k5	12

IV	Alpha Decay - Beta decay – Continuous Beta spectrum – Fermi theory of beta decay - Comparative Half-life – Fermi Kurie Plot – mass of neutrino – allowed and forbidden decay -- neutrino physics – Helicity - Parity violation - Gamma decay – multipole radiations – Angular Correlation - internal conversion – nuclear isomerism – angular momentum and parity selection rules.		
V	**ELEMENTARY PARTICLES** Classification of Elementary Particles – Types of Interaction and conservation laws – Families of elementary particles – Isospin – Quantum Numbers – Strangeness – Hypercharge and Quarks –SU (2) and SU (3) groups-Gell Mann matrices-Gell Mann Okuba Mass formula-Quark Model. Standard model of particle physics – Higgs boson. ***Current Trends:** Ghost particles	K5	12
	*** Self Study.**		
Course Outcome	**CO1:** Classify the nuclear models.	K4	
	CO2: Explain nuclear interaction and forces	K5	
	CO3: Classify the nuclear reactions.	K5	
	CO4: Analyze data from nuclear scattering experiments to Identify different properties of the nuclear force.	K5	
	CO5: Evaluate some idea about the Symmetry classification of elementary particles and quarks.	K5	

Learning Resources	
Text Books	1. D. C. Tayal – Nuclear Physics – Himalaya Publishing House (2020). 2. S. N. Ghoshal, Nuclear Physics (S. Chand, New Delhi, 2018). 3. M. L. Pandya and R. P. S. Yadav, Elements of Nuclear Physics (KedarNath Ram Nath, Meerut, 2020).
Reference Books	1. Bernard L Cohen – Concepts of Nuclear Physics – McGraw Hill Education (India) Private Limited; edition (2001). 2. Radiation Biology (Wiley, New Jersey, 2021).

	3. C. P. De Los Heros, Probing Particle Physics with Neutrino Telescopes (World Scientific, Singapore, 2020).			
Website Link	1. http://bubl.ac.uk/link/n/nuclearphysics.html 2.http://www.phys.unsw.edu.au/PHYS3050/pdf/Nuclear_Models.pdfhttp://www.scholarpedia .org/article/Nuclear_Forces 3. https://www.nuclear-power.net/nuclear-power/nuclear-reactions/			
Self Study Material	https://doi.org/10.1007/s00348-019-2875-2			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M4PPHC09	NUCLEAR AND PARTICLE PHYSICS	DSC THEORY - IX	IV	4	2	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	M	S	M	S	M	S	S	M
CO2	M	S	M	M	S	S	M	M	S	S
CO3	L	M	S	M	M	S	M	S	M	M
CO4	M	S	S	M	S	M	M	S	M	S
CO5	S	S	M	S	M	S	M	M	S	S

Level of Correlation Between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	group discussions
Teaching and Learning Methods	chalk and talk , power point presentation
Assessment Methods	Seminar, CIA-I, CIA-II, ESE

Designed By	Verified By	Approved By Member Secretary
V.SATHEESHKUMAR	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PPHC10	**SPECTROSCOPY**	**DSC THEORY - X**	**IV**	**4**	**2**	**2**	**-**	**3**
Objective	The students will be able to gain knowledge about the basic principles of UV, IR, Raman, Mass, NMR and their instrumentation techniques along with their applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**MICROWAVE SPECTROSCOPY:** Rotational spectra of diatomic molecules - Rigid Rotor (Diatomic Molecules)-reduced mass – rotational constant - Effect of isotopic substitution - Non rigid rotator – centrifugal distortion constant- Intensity of Spectral Lines- Polyatomic molecules – linear – symmetric asymmetric top molecules - Hyperfine structure and Quadra pole moment of linear molecules - Instrumentation techniques – block diagram -Information Derived from Rotational Spectra- Stark effect Problems.	K3	10
II	**INFRA-RED SPECTROSCOPY**: Vibrations of simple harmonic oscillator – zero-point energy- An harmonic oscillator – fundamentals, overtones and combinations- Diatomic Vibrating Rotator- PR branch – PQR branch- Fundamental modes of vibration of H_2O and CO_2 -Introduction to application of vibrational spectra- IR Spectrophotometer Instrumentation (Double Beam Spectrometer) – Fourier Transform Infrared Spectroscopy - Interpretation of vibrational spectra- remote analysis of atmospheric gases like N_2O using FTIR by National Remote Sensing Centre (NRSC), India.	K5	10

III	**RAMAN SPECTROSCOPY**: Theory of Raman Scattering - Classical theory – molecular polarizability – polarizability ellipsoid - Quantum theory of Raman effect - rotational Raman spectra of linear molecule - symmetric top molecule – Stokes and anti-stokes line- SR branch -Raman activity of H_2O and CO_2 -Mutual exclusion principle.	K5	9
IV	**RESONANCE SPECTROSCOPY**: Nuclear and Electron spin-Interaction with magnetic field - Population of Energy levels - Larmor precession- Relaxation times - Double resonance- Chemical shift and its measurement - NMR of Hydrogen nuclei - Indirect Spin -Spin Interaction - Instrumentation techniques of NMR spectroscopy – NMR in Chemical industries .Electron Spin Resonance: Basic principle –Total Hamiltonian (Direct Dipole-Dipole interaction and Fermi Contact Interaction) – Hyperfine Structure (Hydrogen atom) – ESR Spectra of Free radicals –g-factors - Instrumentation - Medical applications of ESR – Nuclear Quadrupole Resonance Spectroscopy(NQR) **.**	K4	10
V	**UV SPECTROSCOPY:** Origin of UV spectra - Laws of absorption – Lambert Bouguer law – Lambert Beer law - molar absorptivity – transmittance and absorbance - Color in organic compounds- Absorption by organic Molecule -Chromophores -Effect of conjugation on chromophores - Choice of Solvent and Solvent effect - Absorption by inorganic systems - Instrumentation - double beam UV-Spectrophotometer - Simple applications ***Current Trends:** Terahertz	K6	9
	*** Self Study.**		
Course Outcome	**CO1:** Understand the fundamental principles of microwave spectroscopy.	K3	
	CO2: Determine the vibrations for a Diatomic molecule and Analyze whether they are infrared-active.	K5	

	CO3: Justify the difference in intensity of Stokes and anti-Stokes lines.	K5	
	CO4: Analyze various resonance spectroscopy techniques, such as NMR,ESR understanding their underlying principles and experimental setups.	K4	
	CO5: Study and solve problems of Ultraviolet and Visible spectroscopy of organic molecules.	K6	

Learning Resources

Text Books	1. Fundamentals of Molecular Spectroscopy by Colin N. Banwell and Elaine M.McCash, Tata McGraw-Hill Publishing Company Limited, New Delhi,2017. 2. D.N. Satyanarayana, Vibrational Spectroscopy and Applications, New AgeInternational Publication. 2004. 3. B.K. Sharma,Spectroscopy, Goel Publishing House Meerut,2015. 4. P.S.Kalsi, Spectroscopy of Organic Compounds (7th Edition), New AgeInternational Publishers,2016. 5. Spectroscopy by H. Kaur, Pragati Prakashan, Meerut,2023.
Reference Books	1. J. L. McHale, Molecular Spectroscopy, Pearson Education India, New Delhi. 2008 2. J. M. Hollas,Basic Atomic and Molecular Spectroscopy, Royal Society of Chemistry, RSC,Cambridge,2002. 3. Modern Spectroscopy, Hollas, Michael J, Wiley, 4 th Ed-2003. 4. W.Demtroder, Laser Spectroscopy: Basic concepts and Instrumentation, Springer.2008
Website Link	1. https://www.coursera.org/lecture/spectroscopy/introduction-3N5D5 2. https://www.coursera.org/lecture/spectroscopy/infrared-spectroscopy-8jEee 3. https://onlinecourses.nptel.ac.in/noc20_cy08/preview
Self Study Material	Ashutosh Kumar Shukla, Advanced Spectroscopic Techniques for Food Quality.

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	Course Title		Course Type		Sem	Hours	L	T	P	C
23M4PPHC10	SPECTROSCOPY		DSC THEORY - X		IV	4	2	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	S	S	M	S
CO2	S	S	M	S	S	S	S	S	M	S
CO3	S	S	M	S	S	S	S	S	M	S
CO4	S	S	M	S	S	S	S	M	M	S
CO5	S	s	M	S	s	S	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Online-QUIZ
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I, CIA - II ,ESE

Designed By	Verified By	Approved By Member Secretary
MOHANDASS GANDHI A	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PPHC11	**NUMERICAL METHODS AND COMPUTER PROGRAMMING**	**DSC THEORY - XI**	**IV**	**4**	**2**	**2**	**-**	**3**
Objective	To equip students with the essential knowledge and skills required to solve complex mathematical problems using numerical methods and computer programming techniques.							

Unit	Course Content	Knowledge Levels	Sessions
I	**SOLUTIONS OF EQUATIONS:** Zeros or Roots of an equation - Non-linear algebraic equation and transcendental equations - Zeros of polynomials –Roots of polynomials, nonlinear algebraic equations and transcendental equations using Bisection and Newton-Raphson methods - Convergence of solutions in Bisection and Newton-Raphson methods – Limitations of Bisection and Newton-Raphson methods.	K3	10
II	**LINEAR SYSTEM OF EQUATIONS :** Simultaneous linear equations and their matrix representation- Inverse of a Matrix – Solution of simultaneous equations by Matrix inversion method and its limitations - Gaussian elimination method – Gauss Jordan method – Inverse of a matrix by Gauss elimination method - Eigen values and eigenvectors of matrices – Direct method - Power method and Jacobi Method to find the Eigen values and Eigen vectors.	K4	10
III	**INTERPOLATION AND CURVE FITTING:** Interpolation with equally spaced points - Newton forward and backward interpolation - Interpolation with unevenly spaced points - Lagrange interpolation – Curve fitting – Method of least squares – Fitting a polynomial.	K4	8

IV	**DIFFERENTIATION, INTEGRATION AND SOLUTION OF DIFFERENTIAL EQUATIONS:** Numerical differentiation – Numerical integration – Trapezoidal rule – Simpson's rule – Error estimates – Gauss-Legendre, Gauss-Laguerre, Gauss-Hermite and Gauss-Chebyshev quadrature – solution of ordinary differential equations – Euler and Runga Kutta methods.	K5	10
V	**PROGRAMMING WITH C:** Flow-charts – Integer and floating point arithmetic expressions – Built-in functions – Executable and non-executable statements – Subroutines and functions – Programs for the following computational methods: (a) Zeros of polynomials by the bisection method, (b) Zeros of polynomials/non-linear equations by the Newton-Raphson method, (c) Newton's forward and backward interpolation, Lagrange Interpolation, (d) Trapezoidal and Simpson's Rules, (e) Solution of first order differential equations by Euler's method. ***Current Trends:** Program for converting numerical values to roman-Validating ISBNs.	K6	10
	***Self Study.**		
Course Outcome	**CO1:** Apply numerical methods to obtain approximate solutions to mathematical problems.	K3	
	CO2: Explain and evaluate the accuracy of common numerical methods.	K4	
	CO3: Analyze and interpret the fundamental concepts of Interpolation and Curve fitting.	K4	
	CO4: Derive numerical methods for various mathematical operations and tasks.	K5	
	CO5: Implementation of numerical methods in computer programming using C or C++ language.	K6	
Learning Resources			

Text Books	1 Rajaraman, “Computer Oriented Numerical Methods," 6th Edition, PHI LearningPvt. ., New Delhi, 2019. 2.M. K. Jain, S. R. Iyengar, and R. K. Jain, , "Numerical Methods for Scientific and Engineering Computation," 6th Edition, New Age International (P) Ltd., Publishers, New Delhi, 2017. 3. F. Scheid, “Numerical Analysis," 3rd Edition, Schaum's Outline Series, McGraw-Hill Education, New York, 2009. 4. W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, “Numerical Recipes: The Art of Scientific Computing," 3rd Edition, Cambridge University Press. 2007.
Reference Books	1. S. D. Conte and C. de Boor, “Elementary Numerical Analysis: An Algorithmic Approach," 4th Edition, McGraw-Hill Education, New York, 2019. 2. B. F. Gerald and P. O. Wheatley, “Applied Numerical Analysis," 8th Edition, Pearson Education, Boston, 2017. 3. S. S. Kuo, “Numerical Methods and Computers," 7th Edition, Pearson Education, Boston,2005. 4. V. Rajaraman, "Programming in FORTRAN / Programming in C," 4th Edition, PHI Learning Pvt. Ltd., New Delhi, 2016.
Website Link	1.https://www.scribd.com/doc/202122350/Computer-Oriented-Numerical-Methods-by-V- RajaRaman 2.https://www.scirp.org/(S(lz5mqp453edsnp55rrgjct55))/reference/referencespapers.aspx?ref erenceid=1682874 3. https://nptel.ac.in/course/122106033/ 4. https://nptel.ac.in/course/103106074/ 5. https://onlinecourses.nptel.ac.in/noc20_ma33/preview
Self Study Material	1.https://ebookcentral.proquest.com/lib/inflibnet-ebooks/reader.action?docID=5400397&query=

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M4PPHC11	NUMERICAL METHODS AND COMPUTER PROGRAMMING	DSC THEORY - XI	IV	4	2	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	S	S	S	S	S	S	M	S
CO3	S	S	S	S	L	S	S	S	S	S
CO4	M	S	S	M	S	S	L	M	S	M
CO5	S	M	S	S	M	M	S	M	M	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving sessions
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I, CIA-II , ESE

Designed By	Verified By	Approved By Member Secretary
Dr. C.INDIRA PRIYADHARSINI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PPHP01	**PRACTICAL: GENERAL PHYSICS EXPERIMENTS**	**DSC PRACTICAL - I**	**I**	**6**	**-**	**-**	**6**	**3**
Objective	Students should carry enough knowledge and expertise in the general experiments sothat they can be fit for teaching job as well as to design the experiments in research purpose.							

S. No	List of Experiments (Any 8 Experiments)	Knowledge Levels	Sessions
1	Determination of Young's modulus and Poisson's ratio by Elliptical fringes - Cornu's Method.	K5	6
2	Determination of Young's modulus and Poisson's ratio by Hyperbolic fringes - Cornu's Method.	K6	6
3	Charge of an Electron by Spectrometer.	K5	6
4	Determination of Viscosity of the given liquid – Meyer's disc.	K5	6
5	Measurement of Coefficient of linear expansion- Air wedge Method.	K5	6
6	B-H loop using Anchor ring.	K6	6
7	Determination of Thickness of the enamel coating on a wire by diffraction.	K5	6
8	Determination of Rydberg's Constant - Hydrogen Spectrum.	K5	6
9	F. P. Etalon-Spectrometer- Determination of Thickness.	K5	6
10	Determination of Thickness of air film - Solar spectrum – Hartmann's formula- Edser and Butler fringes.	K6	6
11	Measurement of Band gap energy – Thermistor.	K5	6
12	Determination of Planck's Constant – LED Method.	K6	6
13	Determination of Specific charge of an electron – Thomson's method.	K5	6

14	etermination of Compressibility of a liquid using ltrasonics Interferometer.	K6	6
15	Determination of Wavelength, Separation of wavelengths – Michelson Interferometer.	K5	6
16	GM counter - Characteristics, inverse square law and absorption coefficient.	K6	6
17	Measurement of Resistivity of semiconductor - Four probe method.	K5	6
18	Arc spectrum - Iron/Copper.	K5	6
19	Molecular spectra - AlO band.	K5	6
20	Measurement of wavelength of Diode Laser / He – Ne Laser using Diffraction grating.	K5	6
21	Determination of Diffraction pattern of light with circular aperture using Diode/ He-Ne laser.	K5	6
22	Study the beam divergence, spot size and intensity profile of Diode/He-Ne laser.	K6	6
23	Measurements of Standing wave and standing wave co-efficient, Law of Inverse square,Receiver end transmitter behavior, Radiation Pattern - Microwave test bench.	K6	6
24	Susceptibility measurement by Quinke's method.	K5	6
25	Susceptibility determination of solid by Gouy's method	K5	6
26	Determination of Stefan's constant.	K5	6
27	Study the temperature characteristics and determine the band gap of given thermistor.	K5	6
28	Determination of band gap in a semiconductor.	K6	6
29	Study the spectrum of hydrogen atom.	K5	6
30	I-V Characteristics of Solar cell and determine its maximum efficiency.	K5	6
31	Determination of Hall Effect in a semiconductor and measurement of Hall Coefficient.	K5	6
32	Characterization of LVDT.	K6	6
33	e/m-Zeeman effect.	K5	6

34	Characteristics of laser and tunnel diode.	K5	6
35	Determination of Solar constant.	K5	6
Course Outcome	**CO1:** Appraise of elastic constants of a material by Cornu's interference method strengthens.	K5	
	CO2: Evaluate of refractive index of a liquid by shift assists the students to understand uses of laser, refractive index and grating.	K5	
	CO3: Estimate thermal conductivity of a rod using Forbe's method students realizes heat conduction.	K6	
	CO4: Develop get acquainted with nuclear detector and the working principles when they are assigned with study of beta efficiency by GM counter.	K6	
	CO5: Create the experiment with single slit, the pre-requisite knowledge is developed amongst students.	K6	

Learning Resources				
Text Books	1. Practical Physics, Gupta and Kumar, Pragati Prakasan, 2020. 2. An Advanced Course in Practical Physics, D.Chattopadhyay, P,C.Rakshit, New Central Book Agency(P) Ltd., 2007. 3. Kit Developed for doing experiments in Physics-Instruction manual, R. Srinivasan K.R Priolkar, Indian Academy of Sciences. 4. A Textbook of Advanced Practical Physics, S.K.Ghosh, New Central, Fourth Edition, 2000.			
Reference Books	1. Advanced Practical Physics, S.P Singh, PragatiPrakasan. 2. An advanced course in Practical Physics, D. Chattopadhayay, C.R Rakshit, New Central Book Agency Pvt. Ltd. 3. A course on experiment with He-Ne Laser, R.S. Sirohi, John Wiley & Sons (Asia) Pvt. Ltd.			
Website Link	1. https://www.youtube.com/watch?v=DLE-ieOVFjI 2. https://www.youtube.com/watch?v=acBEQ8qqVKU			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1PPHP01	PRACTICAL: GENERAL PHYSICS EXPERIMENTS	DSC PRACTICAL - I	I	6	-	-	6	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	S	S	S	M
CO2	S	S	S	M	S	S	S	S	L	S
CO3	S	M	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	M	S	S	M	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Dr. C. INDIRA PRIYADHARSINI	Dr. M. REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHP02	**PRACTICAL: ANALOG AND DIGITAL EXPERIMENTS**	**DSC PRACTICAL - II**	**II**	**6**	**-**	**-**	**6**	**3**
Objective	Learn the Arithmetic operations using IC, and Construction of different wave generators and oscillator circuits, study the electronic analog and digital experiments.							

S. No	List of Experiments (Any 8 Experiments)	Knowledge Levels	Sessions
1	Construction of relaxation oscillator using UJT.	K1	6
2	FET CS amplifier- Frequency response, input impedance, output Impedance.	K3	6
3	Study of important electrical characteristics of IC 741.	K1	6
4	V- I Characteristics of different colours of LED.	K1	6
5	Study of attenuation characteristics of Wien's bridge network and design of Wien's bridge oscillator using Op-Amp.	K5	6
6	Study of attenuation characteristics of Phase shift network and design of Phase shift oscillator using Op-Amp.	K5	6
7	Design of monostable multivibrator using IC 741 and 555 timer.	K4	6
8	Construction of Schmidt trigger circuit using IC 741.	K4	6
9	Construction of square wave and Triangular wave generator using IC 741.	K3	6
10	Construction of a quadrature wave using IC 324.	K3	6
11	Construction of pulse generator using the IC 741.	K3	6
12	Construction of half adder and full adder circuits using NAND gates.	K3	6
13	Construction of half subtractor and full subtractor circuits using NAND Gates.	K3	6
14	Construction of Op-Amp - 4 bit Digital to Analog converter (Binary Weighted and R/2R ladder type).	K3	6
15	Study of R-S, clocked R-S and D-Flip flop using NAND gates.	K3	6
16	Study of J-K, D and T flip flops using IC 7476/7473.	K3	6
17	Arithmetic operations using IC 7483- 4-bit binary addition and subtraction.	K4	6
18	Study of Arithmetic logic unit using IC 74181.	K4	6
19	Construction of Encoder and Decoder circuits using ICs.	K3	6

20	IC 7490 as scalar and seven segment display using IC7447.	K4	6
21	Solving simultaneous equations – IC 741 / IC LM324.	K4	6
22	Op-Amp –Active filters: Low pass, High pass and Band pass filters (Second Order) Batter worth filter.	K4	6
23	Construction of Current to Voltage and Voltage to Current Conversion using IC 741.	K3	6
24	Construction of second order butter worth multiple feedback narrow band pass filter.	K4	6
25	Realization of analog to digital converter (ADC) using 4-bit DAC and synchronous counter IC 74193.	K4	6
26	Construction of square wave generator using IC 555.	K3	6
27	Construction of Schmidt trigger circuit using IC555.	K3	6
28	Construction of pulse generator using the IC 555.	K3	6
29	BCD to Excess- 3 and Excess 3 to BCD code conversion.	K3	6
30	Study of binary up / down counters - IC 7476 / IC7473.	K3	6
31	Shift register and Ring counter and Johnson counter- IC 7476/IC 7474.	K3	6
32	Study of synchronous parallel 4-bit binary up/down counter using IC 74193.	K5	6
33	Study of asynchronous parallel 4-bit binary up/down counter using IC 7493.	K5	6
34	Study of Modulus Counter.	K3	6
35	Construction of Multiplexer and Demultiplexer using ICs.	K3	6
Course Outcome	**CO1**: Study of attenuation characteristics of Wien's bridgenetwork and Construction of UJT, Schmidt trigger circuit, quadrature wave, square wave and Triangular wave generator using Ic's.	K5	
	CO2: Study about R-S, clocked R-S and D-Flip flop, T-Flip flop Arithmetic logic units.	K4	
	CO3: Realization of analog to digital converter (ADC), Solving simultaneous equations using Ic's.	K4	
	CO4: Study of binary up / down counters and Shift register.	K3	
	CO5: Study of synchronous and asynchronous counters.	K5	

Learning Resources				
Text Books	1. Practical Physics, Gupta and Kumar, Pragati Prakasan. 2. Kit Developed for doing experiments in Physics- Instruction manual, R. Srinivasan, K.R Priolkar, Indian Academy of Sciences. 3. Op-Amp and linear integrated circuit, Ramakanth A Gaykwad, Eastern Economy Edition. 4. Electronic lab manual Vol I, K ANavas, Rajath Publishing. 5. Electronic lab manual Vol II, K ANavas, PHI eastern Economy Edition.			
Reference Books	1. An advanced course in Practical Physics, D. Chattopadhayay, C.R Rakshit, New Central Book Agency Pvt. Ltd. 2. Advanced Practical Physics, S.P Singh, PragatiPrakasan. 3. A course on experiment with He-Ne Laser, R. S. Sirohi, John Wiley & Sons (Asia) Pvt. Ltd. 4. Electronic lab manual Vol II, Kuriachan T.D, Syam Mohan, Ayodhya Publishing. 5. Electronic Laboratory Primer a design approach, S. Poornachandra, B. Sasikala, Wheeler Publishing, New Delhi.			
Website Link	https://www.google.com/search?q=ANALOG+AND+DIGITAL+EXPERIMENTS&rlz=1C1RLNS_enIN825IN825&oq=ANALOG+AND+DIGITAL+EXPERIMENTS&gs_lcrp=EgZjaHJvbWUqBggAEEUYOzIGCAAQRRg7MggIARAAGBYYHjIICAIQABgWGB7SAQc5NTBqMGo3qAIAsAIA&sourceid=chrome&ie=UTF-8			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2PPHP02	PRACTICAL: ANALOG AND DIGITAL EXPERIMENTS	DSC PRACTICAL - II	II	6	-	-	6	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	L	M	S	S	L	M	S	M
CO2	S	M	S	M	S	S	M	S	L	S
CO3	M	M	S	M	S	S	M	S	M	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	S	S	S	M	M	S	M	S	M	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Mr. A. MOHANDASS GANDHI	Dr. M. REVATHI	Dr. S. SHAHITHA

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHP03	**PRACTICAL: MICROPROCESSOR 8085 AND MICROCONTROLLER 8051**	**DSC PRACTICAL - III**	**III**	**6**	**-**	**-**	**6**	**3**
Objective	Students apply and develop the programme of clock-driven, register-based, digital integrated circuit that accepts binary data as input, processes it according to instructions stored in its memory, and provides results (also in binary form) as output.							

S. No.	List of Experiments (Any EIGHT Experiments)	Knowledge Levels	Sessions
1.	Addition, Subtraction, Multiplication and Division of 8-bit numbers.	K5	6
2.	16-bit addition and subtraction	K5	
3.	16-bit multiplication and division	K5	
4.	Code conversion (8-bit number): a) Binary to BCD b) BCD to binary.	K6	
5.	Ascending and descending order of numbers	K6	
6.	Largest and smallest number in a set of numbers	K6	
7.	Factorial of number	K6	
8.	Sum of a series of 8-bit numbers	K6	
9.	Addition of multi byte numbers	K6	
10.	Interfacing of LED – Binary up/down counter, BCD up/down counter and N/2N up/down counter	K5	
11.	Interfacing of DC stepper motor – Clockwise, Anti-clockwise	K5	
12.	Interfacing of Temperature Controller and Measurement	K5	
13.	Traffic Light Controller	K5	
14.	Key board Interface	K5	
15.	Study of 16 bit addition and subtraction using 8051	K6	
16.	Stepper Motor interface to 8051 Microcontroller	K6	

Course Outcome	**CO1:** Illustrate the Program for 8 bit/16 addition, subtraction and multiplication.	K1-K6	
	CO2: Relate the program for Sum of a set of N data (8-bit number)	K1-K5	
	CO3: Design programs for picking up the smallest and largest number in an array.	K1-K5	
	CO4: Sorting in ascending and descending order using 8085	K1-K5	
	CO5: Modify the program for the Temperature controller and Measurements	K1-K6	

Learning Resources				
Text Books	1. Douglas V. Hall, Microprocessors and Interfacing programming and Hardware, Tata McGraw Hill Publications (2008). 2. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. Mckinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education (2008). 3. The 8085 Microprocessor, Architecture, Programming and Interfacing – K. Udaya Kumar, S. Uma Shankar, Pearson.			
Reference Books	1. W. A. Tribel, Avtar Singh, The 8086/8088 Microprocessors: Programming, Interfacing, Software, Hardware and Applications, Prentice-Hall of India, New Delhi. 2. Microprocessor and Its Application - S. Malarvizhi, Anuradha Agencies Publications 3. Microprocessor Architecture, Program And Its Application With 8085 - R.S. Gaonkar, New Age International (P) Ltd.			
Website Link	1. https://youtu.be/aKMD5S-fI1g?si=BCgtWZBlg-YB7cOH 2. https://youtu.be/2bcWI9zCMj4?si=FDMtD5-yhEPXI5XS 3. https://www.youtube.com/watch?v=EOAXox9XzTI 4. https://youtu.be/UsRxe6OTitA?si=qhWsG3mA1M9RzodK			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PPHP03	PRACTICAL: MICROPROCESSOR 8085 AND MICROCONTROLLER 8051	DSC PRACTICAL - III	III	6	-	-	6	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	S	M	S	M
CO2	M	S	M	S	M	S	S	S	M	S
CO3	S	S	S	M	S	S	S	M	S	S
CO4	S	S	S	S	S	S	M	S	M	M
CO5	S	M	S	S	S	S	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Demonstration and practical sessions
Assessment Methods	CIA-I, CIA-II, ESE

Designed By	Verified By	Approved By Member Secretary
Dr. S. MANIKANDAN	Dr. M.REVATHI	Dr. S. SHAHITHA

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M4PPHP04	**PRACTICAL:NUMERICAL METHODS AND COMPUTER PROGRAMMING(FORTRAN/C)**	**DSC PRACTICAL - IV**	**IV**	**6**	**-**	**-**	**6**	**3**
Objective	A student applies the programme using Numerical Methods in Computer Programming, which are a set of strategies for addressing mathematical problems using computer programming.							

S. No.	List of Experiments (Any EIGHT Experiments)	Knowledge Levels	Sessions
1.	Program for matrix addition, subtraction and multiplication.	K5	6
2.	Program for transpose of a matrix.	K5	
3.	Lagrange interpolation with Algorithm, Flow chart and output. .	K6	
4.	Newton forward interpolation with Algorithm, Flow chart and output	K5	
5.	Newton backward interpolation with Algorithm, Flow chart and output	K6	
6.	Curve-fitting: Least squares fitting with Algorithm, Flow chart and output	K6	
7.	Numerical integration by the trapezoidal rule with Algorithm, Flow chart and output	K5	
8.	Numerical integration by Simpson‘s rule with Algorithm, Flow chart and output.	K5	
9.	Numerical solution of ordinary first-order differential equations by the Euler method with Algorithm, Flow chart and output	K5	
10.	Numerical solution of ordinary first-order differential equations by the Runge- Kutta method with Algorithm,	K6	

	Flow chart and output		
11.	Numerical solution of wave functions of simple harmonic oscillator	K5	
12.	Computer simulation of Kroning- Penny Model	K6	
13.	Finding Roots of a Polynomial - Bisection Method	K6	
14.	Finding Roots of a Polynomial - Newton Raphson Method.	K6	
15.	Solution of Simultaneous Linear Equation by Gauss elimination method.	K5	
16.	Solution of Ordinary Differential Equation by Euler.	K5	
17.	Runge Kutta Fourth Order Method for solving first order Ordinary Differential Equations.	K5	
18.	Write a program to solve heat equation- finite difference method.	K5	
19.	Newton‘s cotes formula	K6	
20.	Trapezoidal rule	K6	
21.	Simpson‘s 1/3 rule	K6	
22.	Simpson‘s 3/8 rule	K6	
23.	Boole‘s rule	K6	
24.	Gaussian quadrature method (2 point and 3 point formula)	K5	
25.	Giraffe‘s root square method for solving algebraic equation	K5	
Course Outcome	**CO1**: Analyze the Program for matrix addition, subtraction and multiplication.	K1-K6	
	CO2: Explore the Newton forward interpolation with Algorithm, Flow chart and output.	K1-K5	
	CO3: Calculating the Numerical solution of ordinary first-order differential equations by the Runge- Kutta method with Algorithm, Flow chart and output.	K1-K6	
	CO4: Determination of Newton‘s cotes formula.	K1-K6	
	CO5: Experimenting the Program for the Simpson‘s 1/3 rule and Simpson‘s 3/3 rule.	K1-K5	

Learning Resources				
Text Books	1. Numerical methods using Matlab – John Mathews &Kurtis Fink, Prentice Hall, New Jersey 2006. 2. Numerical Methods for Engineers | 8th Edition Paperback – 29 October 2021 by Steven C. Chapra (Author), Raymond P. Canale (Author). 3. Computer oriented numerical methods, Rajaraman V, 1 Nov, 2018.			
Reference Books	1. Elementary Numerical Analysis An Algorithmic Approach, *3rd Ed* De Boor Pdf. Version, 2014. 2. Applied Numerical Analysis, 7th Edition, Curtis F. Gerald and Patrick O. Wheatly, 2016. 3. S.S. Kuo, 1996, Numerical Methods and Computers, Addison - Wesley, London.			
Website Link	1. https://youtu.be/r9X_zqhblsw?si=KEERqwL0R313NQm- 2. https://youtu.be/1PiYGhzHRrU?si=6-I8QTDTnuT9lBDG 3. https://youtu.be/8cALWEiebPg?si=S_SOknQxk93Wg2Ux 4. https://youtu.be/hoJw1d-AMjw?si=4o_WcssY38_62Mr0 5. https://youtu.be/FCzyu8UVQMA?si=D8Y_TdbNHaZufEUE 6. https://youtu.be/El0o_vCHL7Y?si=aQMfityFOHauiQvI 7. https://youtu.be/xkgkzPnssRU?si=Wfnil3F8QQ6aWmi_			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C	
23M4PPHP04	**PRACTICAL:NUMERICAL METHODS AND COMPUTER PROGRAMMING(FORTRAN/C)**	**DSC PRACTICAL - IV**	**IV**	**6**	**-**	**-**	**6**	**3**	

CO-PO Mapping										
CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	S	M	S	M
CO2	M	S	M	S	M	S	S	S	M	S
CO3	S	S	S	M	S	S	S	M	S	S
CO4	S	S	S	S	S	S	M	S	M	M
CO5	S	M	S	S	S	S	S	M	M	S
Level of Correlation between CO and PO	L-LOW			M-MEDIUM			S-STRONG			

Tutorial Schedule	-
Teaching and Learning Methods	Demonstration and practical sessions
Assessment Methods	CIA-I, CIA-II , ESE

Designed By	Verified By	**Approved By Member Secretary**
Dr. S. MANIKANDAN	Dr. M.REVATHI	Dr. S. SHAHITHA

Elective Subjects Details
SYLLABUS - CBCS PATTERN
EFFECTIVE FROM THE ACADEMIC YEAR 2023-2024 Onwards
LIST OF ELECTIVES

S.NO	SUB_CODE	TITLE OF THE SUBJECT
LIST-I		
1	23M3PPHE04	ENERGY PHYSICS
2	23M2PPHE02	CRYSTAL GROWTH AND THIN FILMS
3	23M2PPHE03	ANALYSIS OF CRYSTAL STRUCTURES
4	23M1PPHE01	MATERIALS SCIENCE
5	23M3PPHE05	PHYSICS OF NANO SCIENCE AND TECHNOLOGY
LIST-II		
6	23M3PPHE06	PLASMA PHYSICS
7	23M3PPHE07	BIO PHYSICS
8	23M3PPHE08	NON-LINEAR DYNAMICS
9	23M2PPHE09	GENERAL RELATIVITY AND COSMOCOLOGY
10	23M2PPHE10	ADVANCED OPTICS
LIST-III INDUSTRY ORIENTED ELECTIVE (IOE)		
11	23M3PPHE11	ADVANCED SPECTROSCOPY
12	23M2PPHE12	MICROPROCESSOR 8085 AND MICROCONTROLLER 8051
13	23M3PPHE13	MEDICAL PHYSICS
14	23M3PPHE14	SOLID WASTE MANAGEMENT(SWM)
15	23M3PPHE15	SOLAR ENERGY UTILIZATION

M.Sc. - PHYSICS Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1PPHE01	**MATERIALS SCIENCE**	**DSE THEORY-I**	**I**	**5**	**3**	**2**	**-**	**3**
Objective	Students are understand the concepts and working principles of optoelectronic devices. Gaining knowledge on the ceramics and its types. Understanding the basics of polymers, its formation and polymerization types.							

Unit	Course Content	Knowledge Levels	Sessions
I	**OPTOELECTRONIC MATERIALS:** Importance of optical materials – properties Band gap and lattice matching – optical absorption and emission – charge injection, quasi-Fermi levels and recombination – optical absorption, loss and gain. Optical processes in quantum structures: Inter-band and intra-band transitions Organic semiconductors. Light propagation in materials – Electro-optic effect and modulation, electro-absorption modulation – exciton quenching.	K3	12
II	**CERAMIC MATERIALS:** Ceramic processing: powder processing, milling and sintering - structural ceramics: zirconia, almina, silicon carbide, tungsten carbide – electronic ceramics – refractories – glass and glass ceramics	K3	12
III	**POLYMERIC MATERIALS :** Polymers and copolymers – molecular weight measurement - synthesis: chain growth polymerization – polymerization techniques – glass transition temperature and its measurement – viscoelasticity – polymer processing techniques - applications: conducting polymers, biopolymers and high temperature polymers.	K3	12

IV	**COMPOSITE MATERIALS :** Particle reinforced composites – fiber reinforced composites – mechanical behavior – fabrication methods of polymer matrix composites and metal matrix composites – carbon/carbon composites: fabrication and applications	K5	12
V	**NEW MATERIALS:** Shape memory alloys: mechanisms of one-way and two-way shape memory effect, reverse transformation, thermo-elasticity and pseudo-elasticity, examples and applications - bulk metallic glass: criteria for glass formation and stability, examples and mechanical behavior - nanomaterials: classification, size effect on structural and functional properties, processing and properties of Nano crystalline materials, single walled and multi walled carbon nanotubes	K5	12
Course Outcome	**CO1**:Identify the fundamental properties of optoelectronic devices.	K3	
	CO2: Choose about the different advanced ceramics and its applications.	K3	
	CO3: Describe the basics concepts and fundamental principles of polymers and polymerization.	K3	
	CO4: Determine the suitable matrix and reinforcement materials, to develop different composite components.	K5	

	CO5: Discuss the different Smart materials.	K5	
Text Books	1. Jasprit Singh, Electronic and optoelectronic properties of semiconductor structures, Cambridge University Press, 2007. 2. P. K. Mallick. Fiber-Reinforced Composites. CRC Press, 2008. 3. V. Raghavan, 2003, Materials Science and Engineering, 4th Edition, Prentice- Hall India, New Delhi(For units 2,3,4 and 5). 4. G.K. Narula, K.S. Narula and V.K. Gupta, 1988, Materials Science, Tata McGraw-Hill. 5. M. Arumugam, 2002, Materials Science, 3rd revised Edition, Anuratha Agencies.		
Reference Books	1. B. S. Murty, P. Shankar, B. Raj, B. B. Rath and J. Murday. Textbook of Nanoscience and Nanotechnology. Springer- Verlag, 2012. 2. K. Yamauchi, I. Ohkata, K. Tsuchiya and S. Miyazaki (Eds). Shape Memory and Super Elastic Alloys: Technologies and Applications. Wood head Publishing Limited, 2011. 3. Lawrence H. Van Vlack, 1998. Elements of Materials Science and Engineering, 6th Edition, Second ISE reprint, Addison-Wesley. 4. H. Iabch and H. Luth, 2002, Solid State Physics – An Introduction to Principles of Materials Science, 2nd Edition, Springer. 5. D. Hull & T. W. Clyne, An introduction to composite materials, Cambridge University Press, 2008.		
Website Link	1. https://onlinecourses.nptel.ac.in/noc20_mm02/preview 2. https://nptel.ac.in/courses/112104229 3. https://archive.nptel.ac.in/courses/113/105/113105081 4. https://nptel.ac.in/courses/113/105/113105025/ 5. https://eng.libretexts.org/Bookshelves/Materials_Science/Supplemental_Modules_(Materials_Science)/Electronic_Properties/Lattice_Vibrations		
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - PHYSICS Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1PPHE01	MATERIALS SCIENCE	DSE THEORY-I	I	5	3	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	S	S	M	L	S	M	L	M
CO2	S	M	L	S	M	L	M	S	S	M
CO3	S	M	L	L	S	M	S	L	M	S
CO4	S	M	L	L	M	S	S	M	L	M
CO5	L	M	S	S	M	L	L	M	L	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Group Discussion, Quiz program
Teaching and Learning Methods	Chalk and talk method, Power point presentations, Group discussions, Interactions, Audio video lectures.
Assessment Methods	Assignments, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Dr. M.MEENACHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc.-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHE02	**CRYSTAL GROWTH AND THIN FILMS**	**DSE THEORY - V**	**II**	**4**	**2**	**2**	**-**	**3**
Objective	Students to acquire the knowledge on Nucleation and Kinetics of crystal growth ,To understand the Crystallization Principles and Growth techniques and thin films							

Unit	Course Content	Knowledge Levels	Sessions
I	**CRYSTAL GROWTH KINETICS:** Basic Concepts, Nucleation and Kinetics of growth Ambient phase equilibrium - super saturation - equilibrium of finite phases equation of Thomson - Gibbs - Types of Nucleation - Formation of critical Nucleus - Classical theory of Nucleation - Homo and heterogeneous formation of 3D nuclei - rate of Nucleation - Growth from vapor phase solutions, solutions and melts - epitaxial growth - Growth mechanism and classification - Kinetics of growth of epitaxial films	K5	12
II	**CRYSTALLIZATION PRINCIPLES:** Crystallization Principles and Growth techniques Classes of Crystal system - Crystal symmetry - Solvents and solutions - Solubility diagram - Super solubility - expression for super saturation - Metastable zone and introduction period - Miers TC diagram - Solution growth - Low and high temperatures solution growth - Slow cooling and solvent evaporation methods - Constant temperature bath as a Crystallizer.	K4	12

III	**GEL, MELT AND VAPOUR GROWTH:** Gel, Melt and Vapour growth techniques Principle of Gel techniques - Various types of Gel - Structure and importance of Gel - Methods of Gel growth and advantages - Melt techniques - Czochralski growth - Floating zone - Bridgeman method - Horizontal gradient freeze - Flux growth - Hydrothermal growth - Vapour phase growth - Physical vapour deposition - Chemical vapour deposition - Stoichiometry.	K5	12
IV	**THIN FILM DEPOSITION METHODS:** Thin film deposition methods of thin film preparation, Thermal evaporation, Electron beam evaporation, pulsed LASER deposition, Cathodic sputtering, RF Magnetron sputtering, MBE, chemical vapour deposition methods, Sol Gel spin coating, Spray pyrolysis, and Chemical bath deposition.	K4	12
V	**THIN FILM FORMATION:** Thin Film Formation and thickness Measurement Nucleation, Film growth and structure - Various stages in Thin Film formation, Thermodynamics of Nucleation, Nucleation theories, Capillarity model and Atomistic model and their comparison. Structure of Thin Film, Roll of substrate, Roll of film thickness, Film thickness measurement - Interferometry, Ellipsometry, Micro balance, Quartz Crystal Oscillator techniques. ***Current Trends:** Crystal Nucleation	K4	12
	*** Self Study.**		
	CO1: Explain the crystal growth kinetics.	K5	
	CO2: Analyze the Crystallization Principles and Growth techniques	K4	

Course Outcome	**CO3:** Interpret the various methods of Crystal growth techniques	K5	
	CO4: Categorize the Thin film deposition methods	K4	
	CO5: Evaluate the techniques of Thin Film Formation and thickness Measurement	K5	

Learning Resources

Text Books	1.P.Santhana Raghavan and P. Ramasamy, "Crystal Growth Processes", KRUPublications. 2.A. Goswami, Thin Film Fundamentals (New Age, New Delhi, 2008)
Reference Books	1. J.C. Brice, Crystal Growth Process (John Wiley, New York, 1986) 2. P. Ramasamy and F. D. Gnanam, 1983, "UGC Summer School Notes".
Website Link	1. https://www.youtube.com/playlist?list=PLbMVogVj5nJRjLrXp3kMtrIO8kZl1D1Jp 2. https:/www.youtube.com/playlist?list=PLADLRin7kNjG1Dlna9MDA53CMKFHPSim 3. https://www.youtube.com/playlist?list=PLXHedI-xbyr8xIl_KQFs_R_oky3Yd1Emw 4. https://www.electrical4u.com/thermal-conductivity-of-metals
Self Study Material	https://doi.org/10.3390/ASEC2023-15281

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Physics Syllabus LOCF-CBCS with effect from2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2PPHE02	CRYSTAL GROWTH AND THIN FILMS	DSE THEORY -V	II	4	2	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	M	S	L	M	M	S	M
CO2	M	S	S	M	M	M	S	S	M	M
CO3	S	S	M	S	S	M	M	S	S	S
CO4	S	M	S	M	M	S	M	M	S	S
CO5	M	S	M	S	M	M	S	S	M	M

Level of Correlation Between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	group discussions
Teaching and Learning Methods	chalk and talk , power point presentation
Assessment Methods	Seminar, CIA-I,CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
V.SATHEESHKUMAR	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHE03	**ANALYSIS OF CRYSTAL STRUCTURES**	**DSE THEORY - VI**	**II**	**4**	**2**	**2**	**-**	**3**
Objective	Obtaining knowledge on fundamentals of single crystal X-ray diffraction and advanced knowledge of practical steps in crystal structure determination.							

Unit	Course Content	Knowledge Levels	Sessions
I	**CRYSTAL LATTICE:** Unit cell and Bravais lattices - crystal planes and directions - basic symmetry elements operations - translational symmetries - point groups - space groups - equivalent positions - Bragg's law - reciprocal lattice concept -Laue conditions - Ewald and limiting spheres - diffraction symmetry - Laue groups.	K3	10
II	**DIFFRACTION:** X-ray generation, properties - sealed tube, rotating anode, synchrotron radiation - absorption - filters and monochromators Atomic scattering factor - Fourier transformation and structure factor - anomalous dispersion - Laue, rotation/oscillation, moving film methods- interpretation of diffraction patterns - cell parameter determination - systematic absences - space group determination.	K3	10
III	**STRUCTURE ANALYSIS:** Single crystal diffractometers - geometries - scan modes - scintillation and area detectors -intensity data collection - data reduction - factors affecting X-ray intensities - temperature and scale factor - electron density - phase problem - normalized structure factor - direct method fundamentals and procedures -Patterson function and heavy atom method - structure refinement - least squares method - Fourier and difference Fourier synthesis - R factor - structure interpretation - geometric calculations - conformational studies - computer program packages.	K5	8

IV	**POWDER METHODS:** Fundamentals of powder diffraction - Debye Scherrer method - diffractometer geometries - use of monochromators and Soller silts - sample preparation and data collection - identification of unknowns - powder diffraction files (ICDD) - Rietveld refinement fundamentals - profile analysis - peak shapes - whole pattern fitting - structure refinement procedures – auto-indexing – structure determination from powder data - new developments. Energy dispersive X-ray analysis – texture studies - crystallite size determination - residual stress analysis - high and low temperature and high pressure crystallography (basics only).	K5	10
V	**PROTEIN CRYSTALLOGRAPHY** Globular and fibrous proteins, nucleic acids - primary, secondary, tertiary and quaternary structures - helical and sheet structures - Ramachandran map and its significance – crystallization methods for proteins - factors affecting protein crystallization - heavy atom derivatives – methods used to solve protein structures - anomalous dispersion methods. ***Current Trends:** Protein data bank.	K6	10
	*** Self Study.**		
Course Outcome	**CO1:** Applying the concept of translational symmetry in crystal lattices, lattice points repeat in a regular pattern, crystallographic axes.	K3	
	CO2: Identification of Diffraction pattern is utilized to establish each mineral's uniqueness.	K3	
	CO3: Determine advanced crystallographic techniques to analyze complex crystal structures.	K5	
	CO4: Evaluate the applicability of powder diffraction methods to study structural transformations, phase transitions and disorder phenomena in crystalline materials.	K5	

	CO5: Create visualizations and graphical representations of protein crystal structures.	K6	

Learning Resources	
Text Books	1. Cullity, B.D. and Stock, S.R. "Elements of X-ray Diffraction", Pearson, 2014. 2. H.L. Bhat, Introduction to Crystal Growth Principles and Practice CRC Press, Taylor & Francis Group, Boca Raton, Florida, 2015. **3.** William ,Clegg (Author), Alexander J.Blake (Author), Robert O.Gould, CrystalStructure Analysis: Principles and Practice, 2001.
Reference Books	1. Sam Zhang, Lin Ki, Ashok Kumar, Materials Characterization Techniques, CRC Press, Taylor & Francis Group, Boca Raton, Florida, 2009. 2. Jenny Pickworth Glusker, Crystal Structure Analysis: A Primer, Kenneth N True blood, Published: 27 May 2010. 3. Crystals and Crystal Structures, 2nd Edition, Richard J. D. Tilley, ISBN: 978-1-119-54838-6 May 2020.
Website Link	1. https://archive.nptel.ac.in/courses/112/106/112106227/ 2. https://archive.nptel.ac.in/courses/104/108/104108098/ 3. https://www.digimat.in/nptel/courses/video/102107086/L11.html 4. https://onlinecourses.nptel.ac.in/noc19_cy35/
Self Study Material	https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/protein-data-bank

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
23M2PPHE03	ANALYSIS OF CRYSTAL STRUCTURES	DSE THEORY - VI	II	4	2	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	S	S	S	M	S	S	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	M	S	S	M
CO5	S	S	S	M	S	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
MOHANDASS GANDHI A	Dr.M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE04	**ENERGY PHYSICS**	**DSE THEORY - IV**	**III**	**4**	**2**	**2**	**-**	**3**

Objective	This course enables the students to acquire the knowledge of Principles of renewable energy, energy conversion system, thermal energy and energy storage systems.

Unit	Course Content	Knowledge Levels	Sessions
I	**INTRODUCTION TO ENERGY SOURCES** Conventional and non-conventional energy sources and their availability-prospects of Renewable energy sources-Energy from other sources-chemical energy-Nuclear energy- Energy storage and distribution.	K3	10
II	**ENERGY FROM THE OCEANS** Energy utilization-Energy from tides-Basic principle of tidal power-utilization of tidal energy - Principle of ocean thermal energy conversion systems.	K5	10
III	**WIND ENERGY SOURCES :** Basic principles of wind energy conversion-power in the wind-forces in the Blades- Wind energy conversion-Advantages and disadvantages of wind energy conversion systems (WECS) - Energy storage-Applications of wind energy.	K3	8
IV	**ENERGY FROM BIOMASS:** Biomass conversion Technologies - wet and dry process-Photosynthesis -Biogas Generation: Introduction-basic process: Aerobic and anaerobic digestion - Advantages of anaerobic digestion- factors affecting bio digestion and generation of gas- bio gas from waste fuel- properties of biogas- utilization of biogas.	K4	10

V	**SOLAR ENERGY SOURCES:** Solar radiation and its measurements–solar cells: Solar cells for direct conversion of solar energy to electric powers-solar cell parameter–solar cell electrical characteristics-Efficiency–solar water Heater –solar distillation- solar cooking–solar greenhouse – Solar pond and its applications. ***Current Trends- Future energy : Improved, sustainable and clean options for our planet .**	K4	10
	***Self Study**		
Course Outcome	**CO1:** Apply about conventional and Non-Conventional and Renewable Energy Sources	K3	
	CO2: Interpret ocean energy conversion technologies.	K5	
	CO3: Utilize wind energy and its applications.	K3	
	CO4: Examine various bio energy technologies and identify their applications.	K4	
	CO5: Compare various solar energy technologies and identify its applications.	K4	

Learning Resources				
Text Books	1. G.D.Rai, Non-Conventional Sources of Energy, Khanna Publishers, 4th Edn ,(2009). 2. S P Sukhstme, J K Nayak, Solar Energy, Principles of Thermal Collection and Storage, McGraw Hill, 3rd Edn , (2008). 3. D P Kothari, K P Singal, Rakesh Rajan, PHI Learning Pvt Ltd, 2nd Edn , (2011).			
Reference Books	1. John Twidell & Tony Weir, Renewable Energy Resources, Taylor & Francis, 2ndEdn, (2006). 2. S.A. Abbasi and Nasema Abbasi, Renewable Energy sources and their environmental impact, PHI Learning Pvt. Ltd, (2008).			
Website Link	1. https://nptel.ac.in/courses/103103206 2. https://onlinecourses.nptel.ac.in/noc22_ch27/preview			
Self Study Material	1. https://nlist.inflibnet.ac.in/search/Record/EBC1562334			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PPHE04	ENERGY PHYSICS	DSE THEORY -IV	V	4	3	1	-	4

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	S	S	M	S	S
CO2	M	S	M	S	M	M	S	M	M	M
CO3	S	M	S	M	S	M	M	S	S	S
CO4	S	S	S	S	S	S	S	M	M	M
CO5	S	M	S	S	M	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Group discussions, Quiz.
Teaching and Learning Methods	Chalk and Talk, Power Point presentations.
Assessment Methods	Seminar, CIA-I,CIA-II,ESE

Designed By	Verified by	Approved By Member Secretary
Dr. M.MEENACHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE05	**PHYSICS OF NANO SCIENCE AND TECHNOLOGY**	**DSE THEORY - VII**	**III**	**4**	**2**	**2**	**-**	**3**
Objective	On successful completion of the course students can learn the fundamental principles underlying and connecting the structure, processing, properties, and performance of materials.							

Unit	Course Content	Knowledge Levels	Sessions
I	**FUNDAMENTALS OF NANOSCIENCE AND TECHNOLOGY** Fundamentals of NANO – Historical Perspective on Nanomaterial and Nanotechnology – Classification of Nanomaterials – Metal and Semiconductor Nanomaterials - 2D, 1D, 0D nanostructured materials - Quantum dots – Quantum wires – Quantum wells - Surface effects of nanomaterials.	K2	10
II	**PROPERTIES OF NANOMATERIALS** Physical properties of Nanomaterials: Melting points, specific heat capacity, and lattice constant – Mechanical behavior: Elastic properties – strength - ductility - superplastic behavior- Optical properties: - Surface Plasmon Resonance – Quantum size effects – Electrical properties - Conductivity, Ferroelectrics and dielectrics - Magnetic properties – super para magnetism – Diluted magnetic semiconductor (DMS).	K3	10
III	**SYNTHESIS AND FABRICATION** Physical vapour deposition - Chemical vapour deposition – sol-gel – Wet deposition techniques – electrochemical deposition method – Plasma arching - Electrospinning method - ball milling technique - pulsed laser deposition – Nanolithography: photolithography –Nano manipulator.	K4	8
IV	**CHARACTERIZATION TECHNIQUES** Powder X-ray diffraction – X-ray photoelectron spectroscopy (XPS) - UV-visible spectroscopy – Photoluminescence - Scanning electron microscopy (SEM) - Transmission electron microscopy (TEM) - Scanning probe microscopy (SPM) - Scanning tunnelling microscopy (STM) – Vibrating sample Magnetometer.	K5	10

V	**APPLICATIONS OF NANOMATERIALS** Sensors: Nanosensors based on optical and physical properties - Electrochemical sensors – Nano- biosensors. Nano Electronics: Nanobots - display screens - GMR read/write heads - Carbon Nanotube Emitters –Photocatalytic application: Air purification, water purification - Medicine:Imaging of cancer cells – biological tags - drug delivery - photodynamic therapy - Energy: fuel cells - rechargeable batteries –super capacitors- photovoltaics. ***Current Trends:** Nanotechnology from lab to industry- Top Nanotechnology Startups in 2024.	K6	10
	*** Self Study**		
Course Outcome	**CO1**: Outline the physics behind the small systems (Nanomaterials).	K2	
	CO2: Identify the fundamental properties and principles relevant to Nanomaterials.	K3	
	CO3: Categorize the various methods for synthesis of nanoparticles.	K4	
	CO4: Evaluate the various characterization techniques of Nano materials	K5	
	CO5: Identify the applications of nanomaterials.	K6	

Learning Resources	
Text Books	1. Pradeep T., A textbook of Nanoscience and Nanotechnology, Tata McGraw-Hill Publishing Co. (2012). 2. M.A. Shah, Tokeer Ahmad ,Principles of Nanoscience and Nanotechnology, , Narosa Publishing House Pvt Ltd., (2010). 3. K. K. Chattopadhyay and A.N. Banerjee, Introduction to Nanoscience and Nanotechnology, PHI Learning Pvt. Ltd., New Delhi, (2012).
Reference Books	1. HuozhongGao ,Nanostructures and Nanomaterials -- Imperial College Press (2004). 2. Richard Booker and Earl Boysen, Nanotechnology, Wiley Publishing Inc. USA , (2005).
Website Link	1. www.its.caltec.edu/feyman/plenty.html 2. http://www.library.ualberta.ca/subject/nanoscience/guide/index.cfm 3. http://www.understandingnano.com
Self Study Material	1.https://pubs.rsc.org/en/content/articlehtml/2022/na/d2na00439a 2.https://www.failory.com/startups/nanotechnology

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
23M3PPHE05	PHYSICS OF NANO SCIENCE AND TECHNOLOGY	DSE THEORY - VII	III	4	2	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S	S	M	S	S	S
CO2	S	S	M	L	S	S	M	S	S	M
CO3	S	S	M	M	S	M	L	M	S	S
CO4	M	M	S	S	L	S	M	L	M	S
CO5	S	S	M	S	S	S	M	M	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Discussions, Hands on experiments, project work
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I,CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
Dr. C.INDIRA PRIYADHARSINI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE06	**PLASMA PHYSICS**	**DSE THEORY-VIII**	**III**	**4**	**2**	**2**	**-**	**3**
Objective	Students understand what is plasma and introduces various properties of plasma and various descriptions of plasma. Few major applications involving plasma physics will be introduced.							

Unit	Course Content	Knowledge Levels	Sessions
I	**FUNDAMENTAL CONCEPTS OF PLASMA:** Kinetic pressure in a partially ionized - mean free path and collision cross section - Mobility of charged particles - Effect of magnetic field on the mobility of ions and electrons- Thermal conductivity- Effect of magnetic field- Quasi-neutrality of plasma Debye shielding distance - Optical properties of plasma.	K4	10
II	**MOTION OF CHARGED PARTICLES IN ELECTRIC AND MAGNETIC FIELD:** Particle description of plasma- Motion of charged particle in electrostatic field- Motion of charged particle in uniform magnetic field - Motion of charged particle in electric and magnetic fields- Motion of charged particle inhomogeneous magnetic field - Motion of charged particle in magnetic mirror confinement - motion of an electron in a time varying electric field- Magneto- hydrodynamics - Magneto-hydrodynamic equations – Condition for magneto hydrodynamic behavior.	K4	9
III	**PLASMA OSCILLATIONS AND WAVES:** Introduction, theory of simple oscillations - electron oscillation in a plasma – Derivations of plasma oscillations by using Maxwell‘s equation - Ion oscillation and waves in a	K5	9

	magnetic field - thermal effects on plasma oscillations - Landau damping - Hydro magnetic waves - Oscillations in an electron beam.		
IV	**PLASMA DIAGNOSTICS TECHNIQUES:** Single probe method - Double probe method - Use of probe technique for measurement of plasma parameters in magnetic field - microwave method - spectroscopic method - -laser as a tool for plasma diagnostics-X-ray diagnostics of plasma - acoustic method - conclusion.	K5	10
V	**APPLICATIONS OF PLASMA PHYSICS:** Magneto hydrodynamic Generator - Basic theory - Principle of Working-Fuel in MHD Generator - Generation of Microwaves Utilizing High Density Plasma - Plasma Diode. ***Current Trends: Magnetic confinement fusion.**	K6	10
	***Self Study**		
Course Outcome	Distinguish plasma state, give examples of different kinds of plasma and explain the parameters characterizing them	K4	
	Analyze the motion of charged particles in electric and magnetic fields	K4	
	Choose the interaction between particles and waves, Landau damping.	K5	
	Explain the plasma resistivity and diffusion in plasma based on the charged particle motion	K5	
	Estimates of various parameters in plasmas.	K6	

Learning Resources

Text Books

1. Plasma Physics- Plasma State of Matter - S.N. Sen, Pragatiprakashan, Meerut.
2. Introduction to Plasma Physics-M. Uman
3. Krall, N. A., and A. W. Trivelpiece. Principles of Plasma Physics. Berkeley, CA: San Francisco Press, 1986. ISBN: 9780911302585.
4. Tanenbaum, B. S. Plasma Physics. New York, NY: McGraw-Hill, 1967. ISBN: 9780070628120.
5. Goldston, R. J., and P. H. Rutherford. Introduction to Plasma Physics. Philadelphia, PA: IOP Publishing, 1995. ISBN: 9780750301831.
6. Hutchinson, I. H. Principles of Plasma Diagnostics. Cambridge, UK: Cambridge

	University Press, 2005. ISBN: 9780521675741.
Reference Books	1. Chen, F. F. Introduction to Plasma Physics. 2nd ed., New York, NY: Springer, 1984.ISBN: 9780306413322. 2. Introduction to Plasma Theory-D.R. Nicholson, John Wiley & Sons, 1983. 3. Shohet, J. L. The Plasma State. San Diego, CA: Academic Press Inc., 1971. ISBN: 9780126405507. 4. Hazeltine, R. D., and F. L. Waelbroeck. The Framework of Plasma Physics. Boulder,CO: West view Press, 2004. ISBN: 9780813342139.
Website Link	1. https://fusedweb.llnl.gov/Glossary/glossary.html 2. http://farside.ph.utexas.edu/teaching/plasma/lectures1/index.html 3. http://www.plasmas.org/ 4. http://www.phy6.org/Education/whplasma.html 5. http://www.plasmas.org/resources.htm
Self Study Material	1. https://en.wikipedia.org/wiki/Magnetic_confinement_fusion

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PPHE06	PLASMA PHYSICS	DSE THEORY-VIII	III	4	2	2	-	3

CO - PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	M	S	S	M	S
CO2	S	S	M	S	M	S	M	S	S	M
CO3	M	S	S	S	S	M	S	M	S	M
CO4	S	S	M	S	S	M	S	S	M	S
CO5	S	S	S	M	M	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method, Power point presentations, Group discussions, Interactions
Assessment Methods	Seminar, CIA – I,CIA – II,ESE

Designed By	Verified By	Approved By Member Secretary
M.SARANYA	Dr. M.REVATHI	Dr. S. SHAHITHA

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE07	**BIO PHYSICS**	**DSE THEORY - IX**	**III**	**4**	**2**	**2**	**-**	**3**
Objective	Students will gain a foundational understanding of the Cellular, Size, Shape, Molecular, Membrane, Radiation, and Physical approaches of Biophysics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**CELLULAR BIOPHYSICS:** Architecture and Life Cycle of cells – Organelles of Prokaryotic and Eukaryotic cell – Cell size and shape – Fine structure of Prokaryotic and Eukaryotic cell organization - Compartment & assemblies membrane system - Extracellular matrix - Molecular mechanisms of Vesicular traffic - Electrical activities of cardiac and neuronal cells.	K4	10
II	**MOLECULAR BIOPHYSICS:** Macromolecular structure: Protein structure – amino acids, peptide bonds, primary, secondary, tertiary and quaternary structures of proteins Nucleic acid structure: nucleosides and nucleotides, RNA structure, DNA structure and conformation. Special Bio-macromolecules: Metalloproteins, nucleoproteins, ribozymes, chaperons and prions.	K4	10
III	**MEMBRANE AND NEURO BIOPHYISCS:** Models membranes - Biological membranes and dynamics - Membrane Capacitors – Transport across cell and organelle membranes – Ion channels. Nervous system: Organization of the nervous system –Membrane potential – Origins of membrane potential - Electrochemical potentials – Nernst equation – Goldman equation.	K5	8
	RADIATION BIO PHYSICS:	K5	10

IV	X-Ray: Effects on bio-macromolecules – Gamma Radiation: Molecular effects of gamma radiation, Radiation effects on nucleic acids and membranes, Effects on cell and organelles – UV radiation: Effects on bio-macromolecules and proteins – Radiation hazards and protection – use of radiations in cancer.		
V	**PHYSICAL METHODS IN BIOLOGY:** Spectroscopy: UV-Visible absorption spectrophotometry – Optical Rotatory Dispersion (ORD) – Structure Determination: X-ray Crystallography, Electron spin resonance (ESR) and biological applications. Chromatography: Thin layer chromatography (TLC), Gas liquid chromatography (GLC) – Centrifugation: Differential centrifugation, density gradient centrifugation. Electrophoresis: Gel electrophoresis, polyacrylamide gel electrophoresis. ***Current trends:** Inter-Bacterial Nano-Wiring. ***Self Study.**	K5	10
Course Outcome	**CO1:** List of the life of cells, Electrical activities of cardiac and neuronal cells.	K4	
	CO2: Analyze Remember the concept of Macromolecular structure and Bio-macromolecules.	K4	
	CO3: Compare the concepts of Biological membranes, dynamics and Nervous system.	K5	
	CO4: Evaluate the concepts of X-Ray, Gamma Radiation, and UV radiation.	K5	
	CO5: Explain the Bio-physics of Physical methodology in Optical Rotatory Dispersion and Electrophoresis.	K5	

Learning Resources

Text Books	1. The cell: A molecular approach, Geoffrey M. Cooper, ASM Press, 2013. 2. Biophysics, VasanthaPattabhi, N. Gautham, Narosa Publishing, 2009. 3. Biophysics, P. S. Mishra VK Enterprises, 2010.

Reference Books	1. Chemical Biophysics by Daniel A Beard (Cambridge University Press, 2008). 2. Essential cell biology by Bruce Albert et al (Garland Science) 3. Membrane Biophysics by Mohammad Ashrafuzzaman, Jack A. Tuszynski, (Springer science & business media).			
Website Link	1. General Bio: http://www.biology.arizona.edu/DEFAULT.html 2. Spectroscopy: http://www.cis.rit.edu/htbooks/nmr/inside.htm 3. Electrophoresis:http://learn.genetics.utah.edu/content/labs/gel/			
Self-Study Material	https://doi.org/10.1016/j.cej.2019.123951			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
23M3PPHE07	BIO PHYSICS	DSE THEORY - IX	III	4	2	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	M	M	S	M	S	M
CO2	M	S	M	M	S	M	S	M	S	M
CO3	S	M	M	S	M	S	M	S	M	M
CO4	M	S	M	S	S	M	M	S	M	S
CO5	S	M	S	S	M	S	M	S	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	quiz online test
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I,CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
Dr. S. MANIKANDAN	Dr. M. REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE08	**NON-LINEAR DYNAMICS**	**DSE THEORY - X**	**III**	**4**	**2**	**2**	**-**	**3**
Objective	Students learning of Advanced level Nonlinear Dynamics, Chaos, and applications and nonlinear differential equations							

Unit	Course Content	Knowledge Levels	Sessions
I	**GENERAL:** Linear waves-ordinary differential equations(ODEs)-Partial differential equations(PDEs)- Methods to solve ODEs and PDEs.- Numerical methods – Linear and Nonlinear oscillators-Nonlinear waves-Qualitative features	K4	10
II	**COHERENT STRUCTURES:** Linear and Nonlinear dispersive waves - Solitons – KdB equation – Basic theory of KdB equation –Ubiquitous soliton equations – AKNS Method, Backlund transformation, Hirotabi linearization method, Painleve analysis - Perturbation methods- Solitons in Optical fibers - Applications.	K5	10
III	**BIFURCATIONS AND ONSET OF CHAOS:** One dimensional flows – Two dimensional flows – Phase plane – Limit cycles – Simple bifurcations – Discrete Dynamical system – Strange attractors – Routes to chaos.	K4	10
IV	**FRACTALS, CELLULAR AUTOMATA AND PATTERN FORMATION:** Dimension of regular and chaotic attractors – Fractals – Koch curve – Cantor set – Sierpinski set – Julia and Mandelbrot sets – Self organized criticality – Stochastic resonance.	K5	10
V	**APPLICATIONS:** Soliton based communication systems – Solition based computation – Synchronization of chaos – Chaos based communication – Cryptography – Image processing – Stochastic	K5	8

	- Resonance - Chaos based computation - Time Series analysis. *Current Trends: Bio-Impedance Modelling and Encryption Systems.		
	*** Self Study.**		
Course Outcome	**CO1:** Categorize the Linear waves	K4	
	CO2: Explain the One dimensional flows, Two dimensional flows, and Phase plane	K5	
	CO3: Categorize bifurcations and onset of chaos	K4	
	CO4: Evaluate the stability of fixed points and the period Doubling route to chaos in logistic map.	K5	
	CO5: Determine Hirota's bilinearization methods and apply it	K5	

Learning Resources				
Text Books	1. M. Lakshmanan and S. Rajasekar, Nonlinear Dynamics: Integrability, Chaos and Patterns. Springer, 2003. 2. Strogatz, Steven H. Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering, West view Press, (2024).			
Reference Books	1. C. Misbah, Complex Dynamics and Morphogenesis: An Introduction to Nonlinear Science (Springer, 2017) 2. S. Strogatz. Nonlinear Dynamics and Chaos. Addison Wesley, 2024.			
Website Link	1. https://www.digimat.in/nptel/courses/video/108106135/L06.html 2. http://digimat.in/nptel/courses/video/115105124/L01.html			
Self Study Material	https://www.mdpi.com/2073-8994/13/11/2151			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PPHE08	NON-LINEAR DYNAMICS	DSE THEORY - X	III	4	2	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	M	S	S	M	S	M	M
CO2	L	M	S	S	M	M	M	S	M	S
CO3	L	M	M	S	M	S	M	M	S	S
CO4	M	S	M	M	S	M	M	S	M	S
CO5	M	M	S	M	M	S	M	S	M	M
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	group discussions
Teaching and Learning Methods	chalk and talk , power point presentation
Assessment Methods	Seminar,CIA-I,CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
V.SATHEESHKUMAR	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHE09	**GENERAL RELATIVITY AND COSMOCOLOGY**	**DSE THEORY – XI**	**II**	**4**	**2**	**2**	**-**	**3**
Objective	Provide a detailed knowledge of the general relativity and its applications in Cosmology and solve the problems and help in research in these broad areas.							

Unit	Course Content	Knowledge Levels	Sessions
I	**TENSORS:** Tensors in index notation - Kronecker and Levi Civita tensors - inner and outer products - contraction - symmetric and antisymmetric tensors - quotient law - metric tensors - covariant and contravariant tensors - vectors - the tangent space - dual vectors - tensors - tensor products - the Levi-Civita tensor - tensors in Riemann spaces.	K3	10
II	**TENSORS FIELD:** Vector-fields, tensor-fields, transformation of tensors - gradient and Laplace operator in general coordinates - covariant derivatives and Christoffel connection - Elasticity: Field tensor - field energy tensor - strain tensor - tensor of elasticity- curvature tensor	K4	8
III	**GENERAL RELATIVITY:** The space time interval - the metric - Lorentz transformations - space-time diagrams - world-lines - proper time - energy-momentum vector - energy-momentum tensor - perfect fluids – energy momentum conservation - parallel transport - the parallel propagator - geodesics - affine parameters - the Riemann curvature tensor - symmetries of the Riemann tensor - the Bianchi identity	K5	10

IV	**TENSOR IN RELATIVITY:** Ricci and Einstein tensors - Weyl tensor - Killing vectors - the Principle of Equivalence - gravitational redshift - gravitation as space-time curvature - the Newtonian limit - physics in curved space-time - Einstein's equations - the Weak Energy Condition - causality - spherical symmetry - the Schwarzschild metric - perihelion precession.	K6	10
V	**COSMOLOGY:** Expansion of the Universe - thermal history - and the standard cosmological model - Friedmann - Robertson-Walker type models of the Universe - Primordial inflation and the theory of cosmological fluctuations - Theory and observations of the cosmic microwave background and of the large-scale structure of the Universe - Dark matter and dark energy - theoretical questions and observational evidence - inflation - origin of galaxies and other open problems ***Current Trends:** Hyper Suprime-Cam	K6	10
	*** Self Study.**		
Course Outcome	**CO1:** Identifying the mathematical concept of tensors as multidimensional arrays or objects that represent linear transformations between vector spaces.	K3	
	CO2: Examine the notion of tensor field components in local coordinate systems	K4	
	CO3: Evaluate the geometric foundations of general relativity, including the concept of spacetime as a four-dimensional manifold equipped with a Lorentzian metric tensor.	K5	
	CO4: Formulate the role of tensors in the mathematical formalism of general relativity.	K6	

	CO5: Create advanced models of the universe based on the principles of cosmology, including FLRW metric and its extensions to incorporate dark energy, dark matter, and spatial curvature.	K6	

Learning Resources	
Text Books	1. James Hartle, Gravity: An introduction to Einstein's general relativity, San Francisco, Addison-Wesley, 2002 2. Sean Carroll, Spacetime and Geometry: An Introduction to General Relativity, (AddisonWesley, 2004). 3. Jerzy Plebanski and AndrzejKrasinski, An Introduction to General Relativity and Cosmology, Cambridge University Press 2006 4. Meisner, Thorne and Wheeler: Gravitation W. H. Freeman & Co., San Francisco 1973.
Reference Books	1. Robert M. Wald: Space, Time, and Gravity: the Theory of the Big Bang and Black Holes, Univ. of Chicago Press. 2. J. V. Narlikar, Introduction to Cosmology, Jones & Bartlett, 1983. 3. Jerzy Plebanski and AndrzejKrasinski, An Introduction to General Relativity and Cosmology, Cambridge University Press 2006. 4. R Adler, M Bazin& M Schiffer, Introduction to General Relativity, McGraw Hill Higher Education; 2nd edition, 1975.
Website Link	1. http://www.fulviofrisone.com/attachments/article/486/A%20First%20Course%20In%20Gener al%20Relativity%20-%20Bernard%20F.Schutz.pdf 2. https://link.springer.com/book/9780387406282 3. https://ocw.mit.edu/courses/8-962-general-relativity-spring-2020/resources/lecture-18- cosmology-i/ 4. https://arxiv.org/abs/1806.10122
Self Study Material	https://academic.oup.com/pasj/article/73/3/735/6272540

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C	
23M2PPHE09	GENERAL RELATIVITY AND COSMOCOLOGY	DSE THEORY – XI	II	4	2	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	S	M	M	S
CO2	S	M	S	L	S	S	M	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	L	M	M	L	M	M
CO5	S	M	M	S	S	M	M	M	L	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Online-quiz
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, CIA-I, CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
MOHANDASS GANDHI A	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHE10	**ADVANCED OPTICS**	**DSE THEORY - II**	**II**	**4**	**2**	**2**	**-**	**3**
Objective	To enable the students to understand the aspects of principles of polarization, and double refraction, LASERS, fiber optics, non-linear optics and magneto optics and electro optics.							

Unit	Course Content	Knowledge Levels	Sessions
I	**POLARIZATION AND DOUBLE REFRACTION:** Classification of polarization - Transverse character of light waves - Polarizer and analyzer - Malu's law - Production of polarized light - Wire grid polarizer and the polaroid - Polarization by reflection - Polarization by double refraction - Polarization by scattering - The phenomenon of double refraction - Normal and oblique incidence - Interference of polarized light: Quarter and half wave plates - Analysis of polarized light - Optical activity.	K4	10
II	**LASERS :** Basic principles - Spontaneous and stimulated emissions - Components of the laser - Resonator and lasing action - Types of lasers and its applications - Solid state lasers - Ruby laser - Nd:YAG laser - gas lasers - He-Ne laser - CO2 laser - Chemical lasers - HCl laser - Semiconductor laser.	K4	8
III	**FIBER OPTICS :** Introduction - Total internal reflection - The optical fiber - Glass fibers - The coherent bundle - The numerical aperture - Attenuation in optical fibers - Single and multi-mode fibers - Pulse dispersion in multimode optical fibers - Ray dispersion in multimode step index fibers -Parabolic-index fibers - Fiber-optic sensors: precision displacement sensor - Precision vibration sensor.	K5	10
IV	**NON-LINEAR OPTICS:** Basic principles - Harmonic generation - Second harmonic generation - Phase matching - Third harmonic generation - Optical mixing - Parametric generation of light - Self-focusing of light.	k5	10

V	**MAGNETO-OPTICS AND ELECTRO-OPTICS :** Magneto-optical effects – Zeeman effect – Inverse Zeeman effect – Faraday effect – Voigt effect – Cotton-mouton effect – Kerr magneto-optic effect – Electro-optical effects – Stark effect – Inverse stark effect – Electric double refraction – Kerr electro-optic effect – Pockels electro-optic effect.	k5	10
Course Outcome	**CO1:** Classify the basic concept of polarization, and double refraction.	K4	
	CO2: Examine basic principles LASERS.	K4	
	CO3: Categorize the fiber optics	K4	
	CO4: Comparethe non-linear optics .	K5	

	CO5: Design the Magneto optics.	K5	
Learning Resources			
Text Books	1. B. B. Laud, 2017, Lasers and Non – Linear Optics, 3rd Edition, New Age International (P) Ltd. 2. Ajoy Ghatak, 2017, Optics, 6th Edition, McGraw – Hill Education Pvt. Ltd. 3. William T. Silfvast, 1996, Laser Fundamentals Cambridge University Press, New York. 4. J. Peatros, Physics of Light and Optics, a good (and free!) electronic book. 5. B. Saleh, and M. Teich, Fundamentals of Photonics, Wiley-Interscience.		
Reference Books	1. F. S. Jenkins and H. E. White, Fundamentals of Optics, (4th Edition), McGraw – Hill International Edition,1981. 2. Dieter Meschede, 2004, Optics, Light and Lasers, Wiley – VCH, Varley GmbH. 3. Lipson, S. G. Lipson and H. Lipson,Optical Physics, 4th Edition, Cambridge University Press, New Delhi, 2011. 4. Y. B. Band, Light and Matter, Wiley and Sons (2006). 5. R. Guenther, Modern Optics, Wiley and Sons (1990).		
Website Link	1. https://www.youtube.com/watch?v=WgzynezPiyc 2. https://www.youtube.com/watch?v=ShQWwobpW60 3.https://www.ukessays.com/essays/physics/fiber-optics-and-it-applications.php 4. https://www.youtube.com/watch?v=0kEvr4DKGRI 5. http://optics.byu.edu/textbook.aspx		
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHE10	**ADVANCED OPTICS**	**DSE THEORY -II**	**II**	**4**	**2**	**2**	**-**	**3**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	S	S	S	M	S	M	M
CO2	S	S	S	M	S	S	S	S	M	S
CO3	S	M	S	M	S	S	M	S	S	S
CO4	S	S	S	S	S	S	L	S	S	S
CO5	S	M	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session
Teaching and Learning Methods	Chalk and talk method, Power point presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Ms. L. MOHANA	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE11	**ADVANCED SPECTROSCOPY**	**DSE THEORY - XII**	**III**	**4**	**2**	**2**	**-**	**3**

Objective	This subject are to provide students with an increased knowledge and understanding of advanced chemical principles, with emphasis on background spectroscopic theory, use of instrumentation, analysis of experimental spectroscopic data.

Unit	Course Content	Knowledge Levels	Sessions
I	**MOLECULAR SPECTROSCOPY AND GROUP THEORY:** Group axioms – subgroup, simple group, Abelian group, cyclic group, order of a group, class-Lagrange's theorem statement and proof - Symmetry operations and symmetry elements -Application: construction of group multiplication table (not character table) for groups of order 2,3, cyclic group of order 4, noncyclic group of order 4 – reducible and irreducible representations-Unitary representations – Schur's lemmas – Great orthogonality theorem - point group –Simple applications : Symmetry operations of water and ammonia- Construction of character table for C2v (water) and C3v (ammonia) molecules.	K6	10
II	**LASER SPECTROSCOPY:** Lasers as Spectroscopy Light sources – Special Characteristics of Laser emission- ultra short pulses- laser cooling -Single and multi-mode lasers- Laser tenability- Fluorescence spectroscopy with lasers- Laser Raman Spectroscopy – Non-linear Spectroscopy – Applications of Laser Spectroscopy in medical fields, materials science research.	K5	10

III	**MOSSBAUER SPECTROSCOPY:** Basic idea of Mossbauer spectroscopy - Principle- Mossbauer effect- Recoilless emission and absorption- Chemical shift -Effect of electric and magnetic fields – hyperfine interactions-instrumentation-Applications: understanding molecular and electronic structures.	K3	10
IV	**X-RAY PHOTOELECTRON SPECTROSCOPY:** Principle – XPS spectra and its interpretation- ECSA-EDAX- other forms of XPS – chemical shift -Applications : - stoichiometric analysis- electronic structure- XPES techniques used in astronomy, glass industries, paints and in biological research.	K5	10
V	**MOLECULAR MODELLING:** Determination of force constants- force field from spectroscopic data-normal coordinate analysis of a simple molecule (H2O) – analyzing thermodynamic functions, partition functions, enthalpy, specific heat and related parameters from spectroscopic data- molecular modelling using data from various spectroscopic studies. ***Current Trends:** Thermal Methods: TGA, DSC and DTA.	K5	8
	*** Self Study:**		
Course Outcome	**CO1:** Predicting various spectra of molecules and finding the molecule's point group or its particular symmetry operations.	K6	
	CO2: Evaluate method based on the fluorescence properties of the sample under study.	K5	
	CO3: Developing the molecular and electronic structures.	K3	
	CO4: Evaluating the method based study the sample.	k5	

	CO5: Determine thermodynamic functions and various Spectroscopic Studies.	K5	
Learning Resources			
Text Books	1. D.N. Satyanarayana, 2001, Vibrational Spectroscopy and Applications, New Age International Publication. 2. B.K. Sharma , 2015, Spectroscopy, Goel Publishing House Meerut. 3. J M Hollas, 2002, Basic Atomic and Molecular Spectroscopy, Royal Society of Chemistry RSC, Cambridge		
Reference Books	1. J. L.McHale, Molecular Spectroscopy, Pearson Education India, New Delhi, 2008. 2. David. L. Andrews, Introduction to Laser Spectroscopy, Springer, 2020. 3. Kalsi.P.S, Spectroscopy of Organic Compounds (7th Edition) New Age International Publishers, 2016		
Website Link	1. Fundamentals of Spectroscopy - Course (nptel.ac.in) 2. http://mpbou.edu.in/slm/mscche1p4.pdf 3. https://onlinecourses.nptel.ac.in/noc20_cy08/preview 4.https://www.coursera.org/lecture/spectroscopy/nmr-spectroscopy-introduction-XCWRu 5.https://serc.carleton.edu/research_education/geochemsheets/techniques/moss bauer.html		
Self Study Material	https://ieeexplore.ieee.org/servlet/opac?bknumber=9218805 Emerging Trends in Advanced Spectroscopy Editor(s): Yang Weiman; Jibin K.P.; Praveen G.L.; Sabu Thomas; Nandakumar Kalarikkal- 2019		
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C	
23M3PPHE11	ADVANCED SPECTROSCOPY	DSE THEORY - XII	III	4	2	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S	S	S	S
CO3	S	S	S	M	S	S	S	S	M	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	S	S	M	S	S	S	S	S	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

Tutorial Schedule	Experimentally demonstrate
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Assignment, CIA-I, CIA-II, ESE

Designed By	Verified By	Approved By Member Secretary
MOHANDASS GANDHI A	Dr.M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHE12	**MICROPROCESSOR 8085 AND MICROCONTROLLER 8051**	**DSE THEORY - III**	**II**	**4**	**2**	**2**	**-**	**3**
Objective	To provide students with a comprehensive understanding of the fundamental principles, architecture, programming, and applications of Microprocessor 8085 and Microcontroller 8051 in various embedded systems and real-time applications.							

Unit	Course Content	Knowledge Levels	Sessions
I	**8085 PROGRAMMING, PERIPHERAL DEVICES AND THEIR INTERFACING:** Instruction set - Addressing modes - Programming techniques - Memory mapped I/O scheme- I/O mapped I/O scheme - Memory and I/O interfacing- Data transfer schemes - Interrupts of 8085 - Programmable peripheral interface (PPI) - Control group and control word- Programmable DMA controller - Programmable interrupt controller - Programmable communication interface - Programmable counter /interval timer.	K3	10
II	**8085 INTERFACING APPLICATIONS:** Seven segment display interface - Interfacing of Digital to Analog converter and Analog to Digital converter - Stepper motor interface - Measurement of electrical quantities - Voltage and current) Measurement of physical quantities (Temperature and strain).	K3	8
III	**8051 MICROCONTROLLER HARDWARE:** Introduction – Features of 8051 – 8051 Microcontroller Hardware: Pin-out 8051, Central Processing Unit (CPU), internal RAM, Internal ROM, Register set of 8051 – Memory organization of 8051 – Input/ Output pins, Ports and Circuits – External data memory and program memory: External program memory, External data memory.	K3	10

IV	**8051 INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING:** Addressing modes – Data moving (Data transfer) instructions: Instructions to Access external data memory, external ROM / program memory, PUSH and POP instructions, Data exchange instructions – Logical instructions: byte and bit level logical operations, Rotate and swap operations – Arithmetic instructions: Flags, Incrementing and decrementing, Addition, Subtraction, Multiplication and division, Decimal arithmetic – Jump and CALL instructions: Jump and Call program range, Jump, Call and subroutines – Programming	K4	10
V	**INTERRUPT PROGRAMMING AND INTERFACING TO EXTERNAL WORLD:** 8051 Interrupts – Interrupt vector table – Enabling and disabling an interrupt – Timer interrupts and programming – Programming external hardware interrupts – Serial communication interrupts and programming – Interrupt priority in the 8051 : Nested interrupts , Software triggering of interrupt. LED Interface Seven segment display interface- Interfacing of Digital to Analog converter and Analog to Digital converter - Stepper motor interface - Measurement of electrical quantities – Voltage and current) Measurement of physical quantities (Temperature and strain).	K5	10
Course Outcome	**CO1**: Acquire knowledge of various peripheral devices of 8085 microprocessor,	K3	
	CO2: Learn to interface them with the 8085 microprocessor, enabling them to design real-world embedded systems with practical applications.	K3	
	CO3: Understand the architecture and internal organization of 8051 microcontroller.	K3	
	CO4: Demonstrate a comprehensive understanding of the 8051 microcontroller and its instruction set and implement assembly language programs.	K4	
	CO5: Acquire skills in interfacing microcontrollers with external devices and sensors, enabling real-world applications in embedded systems.	K5	

Learning Resources				
Text Books	1. A. Nagoor Kani, Microprocessors & Microcontrollers, RBA Publications (2009). 2. A. P. Godse and D. A. Godse, Microprocessors, Technical Publications, Pune (2009). 3. Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, Penram International Publishing (2013). 4. B. Ram, Fundamentals of Microprocessors & Microcontrollers, DhanpatRai publications New Delhi (2016). 5.V. Vijayendran, 2005, Fundamentals of Microprocessor-8085", 3rd Edition S.Visvanathan Pvt, Ltd.			
Reference Books	1. Douglas V. Hall, Microprocessors and Interfacing programming and Hardware, Tata McGraw Hill Publications (2008) 2. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. Mckinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education (2008). 3. Barry B. Brey, 1995, The Intel Microprocessors 8086/8088, 80186, 80286, 80386 and 80486, 3rd Edition, Prentice- Hall of India, New Delhi. 4. J. Uffrenbeck, "The 8086/8088 Family-Design, Programming and Interfacing, Software,Hardware and Applications", Prentice-Hall of India, New Delhi. 5. W. A. Tribel, Avtar Singh, "The 8086/8088 Microprocessors: Programming, Interfacing, Software, Hardware and Applications", Prentice-Hall of India, New Delhi.			
Website Link	1.https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.html 2.http://www.electronicsengineering.nbcafe.in/peripheral-mapped-io-interfacing/ 3. https://www.geeksforgeeks.org/programmable-peripheral-interface-8255/ 4. http://www.circuitstoday.com/8051-microcontroller 5. https://www.elprocus.com/8051-assembly-language-programming/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHE12	**MICROPROCESSOR 8085 AND MICROCONTROLLER 8051**	**DSE THEORY – III**	**II**	**4**	**2**	**2**	**-**	**3**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	M	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	S	S	M	S	M	M	M
CO5	S	M	S	S	M	S	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Assignments, Group discussions
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	**Verified By**	**Approved By Member Secretary**
Dr.K.SANGEETHA	Dr. M.REVATHI	Dr. S. SHAHITHA

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE13	**MEDICAL PHYSICS**	**DSE THEORY - XIII**	**III**	**4**	**2**	**2**	**-**	**3**
Objective	Medical Physics is the application of physics in medicine. It helps students comprehend physics ideas and techniques related to illness prevention, diagnosis, and treatment.							

Unit	Course Content	Knowledge Levels	Sessions
I	**X-RAYS AND TRANSDUCERS:** Electromagnetic Spectrum – Production of X-Rays – X-Ray Spectrum –Bremsstrahlung – Characteristic X-Ray – X-Ray Tubes – Coolidge Tube – X-Ray Tube Design – Thermistors – photo electric transducers – Photo voltaic cells – photo emissive cells –Photoconductive cells– piezoelectric transducer.	K4	10
II	**BLOOD PRESSURE MEASUREMENTS:** Introduction – sphygmomanometer – Measurement of heart rate – basic principles of electrocardiogram (ECG) –Basic principles of electro-neurography (ENG) – Basic principles of magnetic resonance imaging (MRI).	K4	9
III	**RADIATION PHYSICS:** Radiation Units – Exposure – Absorbed Dose – Rad to Gray – Kera Relative Biological Effectiveness –Effective Dose – Sievert (Sv) – Inverse Square Law – Interaction of radiation with Matter – Linear Attenuation Coefficient – Radiation Detectors –Thimble Chamber – Condenser Chambers – Geiger Counter – Scintillation Counter.	K4	10

IV	**MEDICAL IMAGING PHYSICS:** Radiological Imaging – Radiography – Filters – Grids – Cassette – X-Ray Film – Film processing – Fluoroscopy – Computed Tomography Scanner–Principal Function–Display Mammography – Ultrasound Imaging – Magnetic Resonance Imaging – Thyroid Uptake System – Gamma Camera (Only Principle, Function and display).	K5	9
V	**RADIATION PROTECTION:** Principles of Radiation Protection – Protective Materials – Radiation Effects – Somatic – Genetic Stochastic and Deterministic Effect – Personal Monitoring Devices – TLD Film Badge – Pocket Dosimeter. ***Current Trends:** Photon-counting CT takes the spotlight	K5	10
	***Self Study**		
Course Outcome	**CO1:** Analyzes the Characteristic X-Ray, Thermistors, and Photoconductive cells.	K4	
	CO2: Discuss the Measurement of heart rate, ECG, and MRI.	K4	
	CO3: Contrast the Radiation Units, Inverse Square Law, and Geiger Counter.	K4	
	CO4: Explain the medical instrumentations of Radiological Imaging, X-Ray Film, Ultrasound Imaging and their principle.	K5	
	CO5: Describe the Radiation Protection and effects, Personal Monitoring Devices, and Pocket Dosimeter.	K5	
Learning Resources			
Text Books	1. FM Khan, Physics of Radiation Therapy, William and Wilkins, 3rd ed, 2003. 2. D. J. Dewhurst, An Introduction to Biomedical Instrumentation, 1st ed, Elsevier Science, 2014. 3. R.S. Khandpur, Hand Book of Biomedical Instrumentations, 1st ed, TMG, New Delhi, 2005.		

Reference Books	1. Muhammad Maqbool, An Introduction to Medical Physics, 1st ed, Springer nternational Publishing, 2017. 2. Daniel Jirák, FrantišekVítek, Basics of Medical Physics, 1st ed, Charles University, Karolinum Press, 2018 3. Anders Brahme, Comprehensive Biomedical Physics, Volume 1, 1st ed, ElsevierScience, 2014.
Website Link	1. https:nptel.ac.in/courses/108/103/108103157/ 2. https://www.studocu.com/en/course/university-of-technology-sydney/medical-devices-and- diagnostics/225692 3. https://www.modulight.com/applications-medical/
Self Study Materials	1. https://doi.org/10.1364/JOSAA.451319 2. https://doi.org/10.1364/OE.471439

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards							
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PPHE13	MEDICAL PHYSICS	DSE THEORY - XIII	III	4	2	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	M	S	S	M	M	S
CO2	M	S	S	M	M	S	M	S	M	S
CO3	S	M	M	S	S	M	S	M	S	S
CO4	M	S	M	S	M	M	S	S	M	M
CO5	S	S	M	M	S	M	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	quiz online test
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I,CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
Dr. S. MANIKANDAN	Dr. M. REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHE14	**SOLID WASTE MANAGEMENT**	**DSE THEORY – XIV**	**III**	**4**	**2**	**2**	**-**	**3**

Objective	To equip students with the knowledge, skills, and tools necessary to address the complex challenges associated with solid waste management effectively.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**SOLID WASTE MANAGEMENT:** Introduction - Definition of solid waste - Types – Hazardous Waste: Resource conservation and Renewal act – Hazardous Waste: Municipal Solid waste and non-municipal solid waste.	K3	10
II	**SOLID WASTE CHARACTERISTICS:** Solid Waste Characteristics: Physical and chemical characteristics - SWM hierarchy - factors affecting SW generation.	K2	10
III	**TOOLS AND EQUIPMENT:** Tools and equipment - Transportation - Disposal techniques - Composting and land filling technique.	K3	10
IV	**ECONOMIC DEVELOPMENT:** SWM for economic development and environmental protection - Linking SWM and climate change and marine litter.	K4	8
V	**INDUSTRIAL VISIT:** SWM Industrial visit – data collection and analysis – presentation. ***Current Trends:** Current scenario of solid waste management techniques and challenges in Covid-19	K5	10
	*** Self Study**		
	CO1: Develop the components of solid waste management and the laws governing it.	K3	

Course Outcome	**CO2:** Understand the solid waste collection systems, route optimization techniques and processing of solid wastes.	K2	
	CO3: Apply the design, operation, and maintenance of different methods of treatment.	K3	
	CO4: Analyze the operation, and maintenance of sanitary landfill.	K4	
	CO5: Evaluate the recent trends in reuse of solid waste through industrial visit.	K5	

Learning Resources				
Text Books	1. George Tchobanoglous, Handbook of Solid Waste Management /Second Edition, McGraw Hill, 2002. 2. Prof. B. B.Hosett, Prospects and Perspectives of Solid Waste Management, New Age International (P) Ltd, 2006. 3. M.N Rao, Solid and Hazardous Waste Management, Second Edition, BS Publications / BSP Books, 2020.			
Reference Books	1. Christian Ludwig, Samuel Stucki, Stefanie Hellweg, Municipal Solid Waste Management, , Springer Berlin Heisenberg, 2012. 2. George Kreith, Solid Waste Techobanoglous, Frank McGraw Hill Publication, New Delhi 2002, ISBN 9780071356237. 3. Manjunath D. L ,Environmental Studies. Pearson Education Publication, New Delhi, 2006,1SBN-I3: 978-8131709122.			
Website Link	1. https://www.meripustak.com/Integrated-Solid-Waste-Management-Engineering-Principles- And-Management-Issues-125648 2. https://testbook.com/learn/environmental-engineering-solid-waste-management/			
Self Study Material	**https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9249431/**			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C	
23M3PPHE14	SOLID WASTE MANAGEMENT	DSE THEORY – XIV	III	4	2	2	-	3	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	M	S	M	S	S	S	S	M	S
CO3	S	S	M	S	L	S	M	S	L	S
CO4	M	S	S	S	S	S	S	M	M	M
CO5	S	M	S	L	M	M	S	M	M	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Case studies, project presentations
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I,CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
Dr. C.INDIRA PRIYADHARSINI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PPHE15	SOLAR ENERGY UTILIZATION	DSE THEORY – XV	III	4	2	2	-	3
Objective	Students should adequate to give adequate exposure to solar energy related industries. To harness entrepreneurship skills. To develop an industrialist mindset by utilizing renewable source of energy.							

Unit	Course Content	Knowledge Levels	Sessions
I	**HEAT TRANSFER & RADIATION ANALYSIS:** Conduction, Convection and Radiation – Solar Radiation at the earth‘s surface - Determination of solar time – Solar energy measuring instruments.	K3	10
II	**FLAT PLATE COLLECTORS:** Physical principle of solar thermal conversion – general description of FPC‟s – Thermal losses and efficiency of FPC – Types of solar water heaters – description of solar water heaters and their installation details – series and parallel arrays – selective absorber coatings – effect of dust and shading – selection of materials for FPC’s	K4	10
III	**SOLAR HEATERS:** SOLAR DRIERS AND PHOTOVOLTAICS: Types of air heaters – applications – heating and drying of agricultural products – types of driers in use – psychrometric chart and it‟s use in crop drying. Photovoltaic principles – pn junction fabrication – power output and conversion efficiencies – advantages and disadvantages of photovoltaic solar energy conversion – Cu2S/CdS solar cells.	K5	10

IV	**SOLAR ENERGY CONVERSION:** Photo Voltaic principles – Types of solar cells – Crystalline silicon/amorphous silicon and Thermo - electric conversion - process flow of silicon solar cells- different approaches on the process- texturization, diffusion, Antireflective coatings, metallization.	K5	10
V	**MISCELLANEOUS APPLICATIONS:** Solar pumping – solar components – design options – solar cooking – design, principle and construction of a box type solar cooker – application of solar energy in space – satellite solar power station concept. Solar passive space heating-space cooling–Solar green house. ***Current Trends:** Advanced Solar Utilization and Control Technologies in Buildings in India.	K6	8
	*** Self Study.**		
Course Outcome	**CO1:** Utilize the fundamental aspects of solar energy.	K3	
	CO2: Analyze to take up related job by gaining industry exposure.	K4	
	CO3: Evaluate entrepreneurial skills.	K5	
	CO4: Support to approach the need society with different types of solar cells.	K5	
	CO5: Design enhanced sensitivity of nanomaterial based sensors and their novel applications in fuel cells.	K6	
Learning Resources			
Text Books	1. G.D. Rai ,Solar energy utilization, Khanna publishers first edition,(1995). 2. Maheshwar Sharon, Madhuri Sharon, Carbon -Nano forms and Applications, McGraw-Hill, (2010). 3. Sukhatme S.P. Solar Energy, Tata McGraw Hill Publishing Company Ltd., New Delhi, fourth edition (2017).		

Reference Books	1. John W. Twidell & Anthony D.Weir, Renewable Energy Resources, third edition (2015). 2. John A. Duffie, William A. Beckman, Solar Energy: Thermal Processes, John Wiley and Sons, fourth edition, (2013). 3. Duffie, J.A., Beckman, W.A., Solar Engineering Thermal Process, John Wiley and Sons, fourth edition (2013).			
Website Link	1. https://www.geeksforgeeks.org/difference-between-conduction-convection-and-radiation/ 2. https://www.energy.gov/energysaver/solar-water-heaters 3. https://www.azonano.com/article.aspx?ArticleID=3032 4. https://energyeducation.ca/encyclopedia/Solar_pond			
Self Study Material	1. https://www.frontiersin.org/articles/10.3389/fenrg.2024.1417477/full			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PPHE15	SOLAR ENERGY UTILIZATION	DSE THEORY - XV	III	4	2	2	-	3

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S	M	S	S	S	M
CO2	S	S	S	S	M	S	M	M	M	S
CO3	M	S	M	S	S	S	S	S	S	S
CO4	S	M	S	M	S	S	S	M	S	S
CO5	S	S	S	M	S	M	S	S	M	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Design Solar water heater. Design a box type solar cooker.
Teaching and Learning Methods	Chalk and talk method, Power point presentations, Group discussions Interactions
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Ms. M.SARANYA	Dr. M.REVATHI	Dr. S. SHAHITHA

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	I	23M1PPHPC1	SEMICONDUCTOR DEVICES

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M1PPHPC1	**SEMICONDUCTOR DEVICES**	**PCC**	**I**	**2**	**2**	**-**	**-**	**2**
Objective	To enable the students to understand the aspects of semiconductor diode, metal semiconductor devices, power control devices, microwave devices and photonic devices							

Unit	Course Content	Knowledge Levels	Sessions
I	**SEMICONDUCTOR DIODE :** Semiconductors – characteristics and applications of PN Junction diode – Zener diode – Gunn diode – Varactor diode – Schottky diode – LED.	K2	5
II	**METAL - SEMICONDUCTOR DEVICES :** JFET - Structure and Characteristics – MOSFET - Depletion and Enhancement type MOSFFT	K4	5
III	**POWER CONTROL DEVICES:** Construction, V-I characteristics and applications of UJT, SCR , DIAC, TRIAC.	K5	5
IV	**MICROWAVE DEVICES:** Tunnel diode – I-V characteristics of Tunnel diode – IMPATT diode – MISS diode)	k5	5
V	**PHOTONIC DEVICES :** Photoconductor, Photodiode, quantum efficiency, PIN photodiode, Heterojunction photodiode, avalanche photodiode - Photo transistors	k5	4
Course Outcome	**CO1:** Understand the basic concept of semiconductor diode.	K2	
	CO2: Examine the metal semiconductor devices.	K4	
	CO3: Determine the power control devices.	K5	
	CO4: Evaluating the microwave devices.	K5	

	CO5: Design the photonic devices .	K5	

Learning Resources				
Text Books	1.V.K.Mehta, Principles of Electronics S.Chand and Company, New Delhi (2015). 2. R.S.Sedha, A text book of Applied Electronics S.Chand & Company, New Delhi (2017). 3. R.P.Jain, Modern Digital Electronics ,Tata McGraw-Hill Edn., Publishing Company Ltd., New Delhi (2010). 4. B.G. Streetman, S. Banerjee, Solid State Electronic Devices , Prentice Hall (2009). 5. S.M.Sze, Kwok K.Ng, John Wiley & Sons, Physics of Semiconductor Devices , New Delhi (2011).			
Reference Books	1. D.A. Neamen, Semiconductor Physics and Devices: Basic Principles , McGraw-Hill (2003). 2. Dilip K. Roy, Physics of Semiconductor Devices , Universitys Press (India) Private Limited, Hyderabad (2004). 3. ParthaKumar and Ganguly, Principles of Electronics , PHI Learning (P) Ltd., New Delhi (2015). 4. Shun Lien Chuang, John Wiley & Sons, Physics of Photonic Devices 2nd Edition (2009). 5. Jia-Ming Liu, Photonic Devices ,Cambridge University Press (2005).			
Website Link	1. https://open.umn.edu/opentextbooks/textbooks/573 2. https://www.khanacademy.org/science/electrical-engineering/ee-semiconductor-devices 3. https://www.cambridge.org/core/books/abs/computational-electromagnetics-for-rf-and-microwave-engineering/web-resources/5DFE109913C5411D2E60C828A4F96F77 4. https://technav.ieee.org/topic/microwave-devices 5. https://www.nature.com/subjects/photonic-devices			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards							
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M1PPHPC1	SEMICONDUCTOR DEVICES	PCC	I	2	2	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	S	S	S	M	S	M	M
CO2	S	S	M	M	S	S	L	S	M	S
CO3	S	M	M	M	S	S	M	S	S	S
CO4	S	S	S	S	S	S	M	S	S	S
CO5	M	M	S	S	S	S	M	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Problem solving session
Teaching and Learning Methods	Chalk and talk method, Power point presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Ms. L. MOHANA	Dr.M.REVATHI	Dr. S. SHAHITHA

S.No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	II	23M2PPHSE1	ELECTRONICS IN DAILY LIFE
2	III	23M3PPHSE2	COMMUNICATION ELECTRONICS
3	IV	23M4PPHSE3	CHARACTERISATION OF MATERIALS

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHSE1	**ELECTRONICS IN DAILY LIFE**	**SEC THEORY-I**	**II**	**2**	**2**	**-**	**-**	**2**

Objective	Understand the role of electronics in daily life for improved efficiency and convenience in various applications.		
Unit	**Course Content**	**Knowledge Levels**	**Sessions**
I	**ELECTRONIC COMPONENTS:** Resistors – Capacitors – Resistance values – Capacitor value – Fuse wire – Transistors – Integrated chips.	K4	5
II	**ELECTRICAL APPLIANCES:** Switch board – Main box – Metal circuit breakers (MCB) – AC - DC currents – Two Phase – Three Phase electrical connections - generators – un intrepid power supply (UPS)- stabilizer - voltage regulators – Electrical devices – Iron box – Fan - Electrical Oven – water Heaters Air conditioners - Refrigerators – washing machines.	K4	5
III	**ELECTRONIC HOME APPLIANCES:** Radio – Audio taper - speaker- televisions – VCR – CD Players - DVD – calculators – Computers – scanner – Printer – Digital Camera – LCD Projectors – Display devices.	K5	5
IV	**COMMUNICATIONS ELECTRONICS:** Principles of optical fiber Cables (OFC) – Telephone – Mobile phones – wireless phone – Antenna - Internet - Intranet.	K5	4
V	**SAFETY MECHANISM:** Handling Electrical appliances - Power saving methods - Hazards Prevention Methods - Protection of Hi –Fi electronic devices.	K5	5
Course Outcome	**CO1**: Master the use and application of resistors, capacitors, transistors, integrated chips, and fuse wires in electronic circuits.	K4	
	CO2: Develop competence in understanding and effectively utilizing electrical components, devices, and connections commonly used in households.	K4	
	CO3: Attain proficiency in the operation, maintenance, and practical application of electronic devices.	K5	

	CO4: Analyzing in-depth knowledge of communications electronics.	K5	
	CO5: Acquire essential safety knowledge and techniques for handling electrical appliances.	K5	

Learning Resources				
Text Books	1.S.S. Kamble – Electronics and Mathematics Data book – Allied publishers Ltd, 1997. 2. William David Cooper, Electronic Instrumentation and Measurement Technique,Second Edition, Prentice-Hall, 1978. 3. Electronics In Every Day Life, William Charles Vergara, Dover Publications, 1983. 4. The Importance of Electronics in Modern Life, Edubirdie, 2022.			
Reference Books	1. Electronics in Every Day Life, Text book solutions, HW Solutions, 2003-2023, CheggInc. 2. Making Every day Electronics Work: A Yourself Guide, Stan Gibilisco, First Edition,2013. 3. Human Activity Recognition: Using wearable Sensors and Smart phones, Miguel A.Labrador, Oscar D. Lara Yejas, Chapman and Hall / CRC Computer and InformationScience Series, First Edition, 2013. 4. Study of Electrical Appliances and Devices –Bhatia, Kanna Publications, 2014.			
Website Link	1. https://byjus.com/physics/electronics-in-daily-life/ 2. https://www.linkedin.com/pulse/e-commerce-our-daily-life-dash-technologies-inc 3. https://www.quora.com/What-are-the-most-important-electronic-devices-for- everyday-life 4. https://edubirdie.com/examples/the-importance-of-electronics-in-modern-life/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M2PPHSE1	ELECTRONICS IN DAILY LIFE	SEC THEORY-I	II	2	2	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	M	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	S	S	M	S	M	M	M
CO5	S	M	S	S	M	S	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Assignments, Group discussions
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Dr. K. SANGEETHA	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHSE2	**COMMUNICATION ELECTRONICS**	**SEC THEORY-II**	**III**	**2**	**2**	**-**	**-**	**2**
Objective	Students are gain knowledge in the generation and propagation of microwaves. To learn the working principle of fiber optics and its use in telecommunication.							

Unit	Course Content	Knowledge Levels	Sessions
I	**ANTENNAS AND WAVE PROPAGATION :** Radiation field and radiation resistance of short dipole antenna-grounded antenna-ungrounded antenna-antenna arrays-broadside and end side arrays-antenna gain-directional high frequency antennas-sky wave-ionosphere- Ecles and Larmor theory- Magneto ionic theory-ground wave propagation.	K3	5
II	**MICROWAVES :** multi cavity Klystron-reflex klystron-magnetron travelling wave tubes (TWT) and other microwave tubes-MASER-Gunn diode-wave guides-rectangular wave guides- standing wave indicator and standing wave ratio(SWR).	K4	5
III	**RADAR AND TELEVISION :** Elements of a radar system-radar equation-radar performance Factors radar transmitting systems- radar antennas-duplexers-radar receivers and indicators-pulsed systems-other radar systems- color TV transmission and reception-color mixing principle-color picture tubes- Delta gun picture tube-PIL color picture tube- CCTV and theatre TV.	K4	5
IV	**OPTICAL FIBER :** Propagation of light in an optical fiber-acceptance angle-numerical aperture-step and graded index fibers-optical fibers as a cylindrical wave guide-wave guide equations-wave	K4	5

	guide equations in step index fibers - fiber losses and dispersion-applications.		
V	**SATELLITE COMMUNICATION :** Orbital satellites-geostationary satellites-orbital patterns-satellite system link models-satellite system parameters-satellite system link equation link budget-INSAT communication satellites. ***Current Trends: New Generation Networks, New emerging Technology.**	K5	4
	*** Self Study.**		
Course Outcome	**CO1:** Examine the propagation of electromagnetic waves through sky and on earth's surface. Explain the energy and power radiated by the different types of antenna.	K3	
	CO2: Analyze the methods of generation of microwaves analyze the propagation of microwaves through wave guides - discuss and compare the different methods of generation of microwaves.	K4	
	CO3: Comparing the working of different radar systems - apply the principle of radar in detecting locating, tracking, and recognizing objects of various kinds at considerable.	K4	
	CO4: Justify, discuss and compare the different types of optical fiber and also to justify the need of it-discover the use of optical fiber as wave guide.	K4	
	CO5: Improve the importance of satellite communication in our daily life-distinguish between orbital and geostationary satellites.	K5	
Learning Resources			
Text Books	1. Gupta and Kumar, Hand book of Electronics, Pragati Prakashan, latest edition,(2022). 2. George Kennedy and Davis , Electronic communication systems , Tata McGraw Hill, 4th edition, (2017).		

	3. Herbut Taub and Schilling, principles of communication systems, Tata Mc Graw Hill, 4th edition, (2017). 4. M. Kulkarani, Microwave and radar engineering, Umesh Publications, (2003).
Reference Books	1. Wayne Tomasi, Advanced electronics communication systems, Prentice Hall of India, 6th edition (2014). 2.. S. Salivahanan, N. Suersh Kumar & A. Vallavaraj, Electronic Devices and Circuits, Tata McGraw-Hill Publishing Company Limited, New Delhi, Fifth Edition(2022).
Website Link	1. https://www.daenotes.com/electronics/microwave-radar/microwave-tube-devices 2.https://www.meetoptics.com/academy/optical-fiber-loss#intrinsic-losses 3. https://byjus.com/physics/satellite-communication/ 4. https://www.tutorialspoint.com/antenna_theory/antenna_theory_arrays.htm
Self Study Material	1. https://www.taylorfrancis.com/books/edit/10.1201/9781003193838/recent-trends-communication-electronics-sanjay-sharma-astik-biswas-brajesh-kumar-kaushik-vibhav-sachan

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023 - 2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M3PPHSE2	COMMUNICATION ELECTRONICS	SEC THEORY-II	III	2	2	-	-	2

CO - PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	S	S	M	S	S	M	S
CO2	S	S	M	S	M	S	M	S	S	M
CO3	M	S	S	S	S	M	S	M	S	M
CO4	S	S	M	S	S	M	S	S	M	S
CO5	S	S	S	M	M	S	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method, Power point presentations, Group discussions, Interactions
Assessment Methods	Seminar, CIA – I,CIA – II, ESE

Designed By	Verified By	Approved By Member Secretary
Ms. M.SARANYA	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PPHSE3	**CHARACTERISATION OF MATERIALS**	**SEC THEORY-III**	**IV**	**2**	**2**	**-**	**-**	**2**

Objective	The course aims to provide students with a comprehensive understanding of the fundamental principles, techniques, and methodologies used in the characterization of materials.

Unit	Course Content	Knowledge Levels	Sessions
I	**THERMAL ANALYSIS:** Introduction – Thermo Gravimetric analysis (TGA) – instrumentation – determination of weight loss and decomposition products – differential thermal analysis (DTA)- cooling curves – Differential Scanning Calorimetry (DSC) – instrumentation – specific heat capacity measurements .	K2	5
II	**MICROSCOPIC METHODS:** Optical Microscopy: optical microscopy techniques – Bright field optical microscopy – Dark field optical microscopy – Dispersion staining microscopy - phase contrast microscopy – differential interference contrast microscopy - oil immersion objectives - quantitative metallography - image analyzer.	K3	5
III	**ELECTRON MICROSCOPY AND SCANNING PROBE MICROSCOPY:** X-ray photoelectron spectroscopy (XPS), Atomic emission spectroscopy (AES), Field emission scanning electron microscopy(FE-SEM), Electron probe micro-analyzer (EPMA), Transmission electron microscopy (TEM): working principle and Instrumentation – sample preparation –Data collection, processing and analysis.	K4	5
	ELECTRICAL METHODS AND OPTICAL CHARACTERISATION: Two probe and four probe methods- van der Pauw method – Hall probe and measurement – scattering mechanism – C-V	K5	5

IV	characteristics – Schottky barrier capacitance – impurity concentration – electrochemical - C-V profiling – limitations. Photoluminescence – light – matter interaction - instrumentation – electroluminescence – instrumentation – Applications.		
V	**X-RAY AND SPECTROSCOPIC METHODS:** Principles and instrumentation for UV-Vis-IR, FTIR spectroscopy, Raman spectroscopy, ESR, NMR, NQR, XPS, AES and SIMS-proton induced X-ray Emission spectroscopy (PIXE) – Rutherford Back Scattering (RBS) analysis- indexing - phase identification - residual stress analysis - Particle size, texture studies - X-ray fluorescence spectroscopy - uses.	K6	4
Course Outcome	**CO1:** Remember the fundamental principles of the synthesis and characterization techniques discussed in the course, along with their typical applications, benefits, and limitations.	K2	
	CO2: Understand a variety of advanced microscopic techniques work and their purposes in characterizing different materials and compounds.	K3	
	CO3: Apply the basic principles microscopic techniques to electron microscopy.	K4	
	CO4: Evaluate the reliability and suitability of optical characterization techniques.	K5	
	CO5: Discuss the precision and accuracy of spectroscopic methods.	K6	
Learning Resources			
Text Books	1. D. Kealey and P. J. Haines. Analytical Chemistry. Viva Books Private Limited, New Delhi, 2002. 2. Li, Lin, Ashok Kumar Materials Characterization Techniques Sam Zhang; CRC Press, (2008). 3. W.Gaddand, D.Brenner, S.Lysherski and G.J.Infrate (Eds.), Handbook of NanoScience, Engg. and Technology, CRC Press, 2002. 4. K. Barriham, D.D. Vvedensky, Low dimensional semiconductor structures: Fundamental		

	and Device applications, Cambridge University Press, 2001. 5. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties &Applications, Imperial College Press, 2004. 6. J. George, Preparation of Thin Films, Marcel Dekker, Inc., New York.2005.
Reference Books	1. Murphy, Douglas B, Fundamentals of Light Microscopy and Electronic Imaging, Wiley-Liss, Inc. USA, 2001. 2. Tyagi, A.K., Roy, Mainak, Kulshreshtha, S.K., and Banerjee, S., Advanced Techniques for Materials Characterization, Materials Science Foundations (monograph series), Volumes 49 – 51, (2009).Volumes 49 – 51, 2009. 3.Cullity, B.D., and Stock, R.S., "Elements of X-Ray Diffraction‖, Prentice-Hall, 2001.
Website Link	1. https://cac.annauniv.edu/uddetails/udpg_2015/77.%20Mat%20Sci(AC).pdf 2. http://www.digimat.in/nptel/courses/video/113106034/L11.html 3. https://nptel.ac.in/courses/104106122 4. https://nptel.ac.in/courses/118104008 5. https://www.sciencedirect.com/journal/materials-characterization

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M4PPHSE3	CHARACTERISATION OF MATERIALS	SEC THEORY-III	IV	2	2	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	L	M	S	M
CO2	S	S	S	M	S	S	S	S	M	S
CO3	S	S	L	S	S	S	S	S	S	S
CO4	M	S	S	L	S	S	S	M	S	M
CO5	S	M	S	S	M	M	S	M	M	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I , CIA-II, ESE

Designed By	Verified By	Approved By Member Secretary
Dr. C.INDIRA PRIYADHARSINI	Dr. M.REVATHI	Dr. S. SHAHITHA

S. No.	SEM	COURSE_CODE	TITLE OF THE COURSE
1	I	23M1PPHS01	ATMOSPHERIC PHYSICS
2	II	23M2PPHS02	LASER PHYSICS AND APPLICATIONS
3	IV	23M4PPHS03	SOLAR PHYSICS

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PPHS01	**ATMOSPHERIC PHYSICS**	**AECC-SOFT SKILL-I**	**I**	**2**	**2**	**-**	**-**	**2**

Objective	Atmospheric Physics attempts to further the understanding of fundamental issues related to the dynamics, radioactive transfer and thermodynamics of the atmosphere. students are provided the opportunity to gain knowledge to learn atmosphere as a physics.

Unit	Course Content	Knowledge Levels	Sessions
I	**INTRODUCTION:** The atmosphere as a physical system - Atmospheric models - Two simple atmospheric models - Some atmospheric observations - Weather and climate.	K2	5
II	**ATMOSPHERIC THERMODYNAMICS:** The ideal gas law - Atmospheric composition - Hydrostatic balance - Entropy and potential temperature - Parcel concepts - tephigram - Cloud formation.	K3	5
III	**ATMOSPHERIC RADIATION:** Atmospheric radiation - Basic physical concepts – Plank's and Boltzmann - Basic spectroscopy of molecules – vibrational and rotational states – Line shapes – Transmittance.	K4	5
IV	**BASIC FLUID DYNAMICS:** Mass conservation - The material derivative - An alternative form of the continuity equation - The Navier – Stokes equation - Equations of motion in coordinate form – Spherical - thermodynamic energy equation.	K3	5
V	**ATMOSPHERIC REMOTE SOUNDING:** Atmospheric remote sounding from space - Thermal emission measurements - Backscatter measurements - Atmospheric remote sounding from the ground - The Dobson ozone spectrophotometer – Radars – Lidars.	k5	4
Course Outcome	**CO1**: Understand the atmosphere as a physical system.	k2	
	CO2: Know the basic thermodynamic concepts for the atmosphere and be able to apply thermodynamic diagrams to assess stability and cloud conditions and explain weather phenomena as fohn wind and convective showers.	K3	
	CO3: Be able to quantify how absorption and emission of short and long wave radiation cause heating or cooling I	K4	

	different vertical layers.		
	CO4 : Explain fluid dynamics and thermodynamic energy equation.	K3	
	CO5: Explain the thermal emission of atmosphere and how to measure the thermal emission.	K4	

Learning Resources	
Text Books	1.David G. Anderws, 2000, An Introduction to Atmospheric Physics Second Edition,Cambridge University Press. 2. Murry L. Salby, 1995, Fundamentals of Atmospheric Physics, Academic Press. 3. R. M. Goody and Y. L. Yung, 1989, Atmospheric Radiation Theoretical Basis SecondEdition, Library of Congress Cataloging-in-Publication. 4. D. G. Andrews, 2000, *An Introduction to Atmospheric Physics,* Cambridge UniversityPress. 5. C. F. Bohren and B. A. Albrecht 1998, *Atmospheric Thermodynamics,* Oxford University Press, New York.
Reference Books	1. Shaun Lovejoy 2019, Weather, Macroweather, and the Climate: Our Random YetPredictable Atmosphere, Oxford University Press Inc. 2. Neil C. Wells, 2011, The Atmosphere and Ocean: A Physical Introduction, John Wileyand Sons Inc. 3. John E Frederick, 2007, Principles of Atmospheric Science, Jones & Bartlett Publishers. 4. J.V.Iribarne, H.R.Cho, 1980, Atmospheric Physics, D.Reidel Publishing Company, London, 4. Blundell, S.J. and Blundell,K.M, 2009, Concepts in Thermal Physics, Oxford University Press, 2nd edition.
WebsiteLink	1. http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/home.rxml 2. https://www.britannica.com/science/atmospheric-pressure 3. http://site.ebrary.com/lib/berkeley/Doc?id=10378944 4. http://www.sciencedirect.com/science/book/9780127329512 5. https://www.embibe.com/exams/atmospheric-pressure/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M1PPHS01	**ATMOSPHERIC PHYSICS**	**AECC- SOFT SKILL- I**	**I**	**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	M	M	M	M	M	M	M	M	M	M
CO2	M	L	M	M	S	S	L	M	M	S
CO3	M	M	S	S	S	M	M	M	S	M
CO4	S	S	S	L	S	M	L	M	S	S
CO5	S	M	S	M	S	M	M	S	M	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	UNIT- 1 Discuss about the basic Atmospheric levels. UNIT- 2 Thermodynamic concepts for the atmosphere and be able to apply thermodynamic diagrams. UNIT- 3 Discuss about Atmospheric radiation. UNIT- 4 Determine the thermodynamic energy levels. UNIT- 5 Measure the thermal emission of atmosphere.
Teaching and Learning Methods	Chalk and talk method, Power Point Presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	Verified By	**Approved By Member Secretary**
Mr. A.MOHANDASS GANDHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHS02	**LASER PHYSICS AND APPLICATIONS**	**AECC-SOFT SKILL-II**	**II**	**2**	**2**	**-**	**-**	**2**

Objective	To impart a comprehensive understanding of lasers' principles, mechanisms, and applications, enabling students to utilize laser technology effectively in scientific, industrial, medical, and research settings.

Unit	Course Content	Knowledge Levels	Sessions
I	**PRINCIPLE:** Interaction of light with matter –absorption – transmission - Stimulated absorption - spontaneous and stimulated emission - Einstein coefficients – their relations – population inversion.	K4	5
II	**CHARACTERISTICS:** Monochromaticity – Coherence – Directionality - Brightness - Short Time Duration – Light Amplification - laser pumping – two level laser – three level laser – four level laser.	K4	5
III	**COMPONENTS:** Components of laser - resonators – vibrational modes of resonators – open resonantors - control resonators – Q- factor - losses in the resonance cavity - Modes of laser beam – transverse modes.	K4	5
IV	**TYPES:** Five types of lasers - Gas laser – Co_2 – Solid state laser – Helium Neon laser - Fiber laser – Liquid laser – Dye laser – Semiconductor laser – diode laser.	K5	5
V	**APPLICATIONS:** Application of lasers in industry – medicine – Science - Research – instrumentation.	K5	4
Course Outcome	CO1: Students will be able to understand and analyze the principles governing the interaction of light with matter	K4	
	CO2: Understanding of the principles of Monochromaticity, Coherence, Laser Pumping.	K4	
	CO3: Gain comprehensive knowledge of laser components, and transverse modes of laser beams.	K4	
	CO4: Familiarize students with five types of lasers.	K5	

	CO5: Understand and explore the diverse applications of lasers in various fields.		K5	
Learning Resources				
Text Books	1. M.N.Aravamudhan, An introduction to Laser theory and application, S. Chand & Co. Pvt. Ltd, 2012. 2. Nityanand Chowdry and Richa Verma, Laser systems and applications, PHI, 2011. 3. R. Murugeshan and Kiruthigasivaprasath, Optics and Spectroscopy, S.Chand & Co, 2010. 4. Subrahmanyam and Brijlal, A textbook of Optics, S.Chand & Co., 2001, 5. R. Murugeshan and Kiruthigasivaprasath, Modern Physics, S.Chand & Co, 2014.			
Reference Books	1. Lasers, Fundamentals and Applications, K. Thyagarajan, Ajoy Ghatak, Springer, 2011. 2. Lasers and Nonlinear Optics - B.B. Laud, Cambridge University Press, Second Edition, 2004. 3. Laser Physics, Peter W. Milonni, Joseph H. Eberly, John Wiley & Sons, Inc., 2010. 4. An Advances in Optics, Photonics and Optoelectronics,Prem B Bishit, IOP Publishing Ltd, 2022. 5. An introduction to Laser Spectroscopy, David L.Andrews and Andrey,A.Demidov, Springer (India) Private Limited, New Delhi, 1995			
Website Link	1.https://ocw.mit.edu/courses/res-6-005-understanding-lasers-and-fiberopticsspring-2008/resources/laser-fundamentals-i/ 2. https://ehs.msu.edu/_assets/docs/laser/laser-fundamentals-pt1-springer- 2005.pdf 3. https://technav.ieee.org/topic/laser-applications 4. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470409718 5. https://www.olympus-lifescience.com/en/microscope-resource/primer/Light and color/lasers intro/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards										
Course Code	**Course Title**			**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M2PPHS02	**LASER PHYSICS AND APPLICATIONS**			**AECC- SOFT SKILL-II**	**II**	**2**	**2**	**-**	**-**	**2**

CO-PO Mapping

CO Number	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	S	M	S	M
CO2	S	S	M	S	M	S	S	M	M	M
CO3	S	S	S	M	S	S	M	S	S	S
CO4	M	S	S	S	S	M	S	M	M	M
CO5	S	M	S	S	M	S	S	M	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	Assignments, Group discussions
Teaching and Learning Methods	Chalk and talk method, PowerPoint Presentation
Assessment Methods	Seminar, CIA – I, CIA – II, ESE

Designed By	**Verified By**	**Approved By Member Secretary**
Dr.K.SANGEETHA	Dr .M.REVATHI	Dr. S. SHAHITHA

M. Sc-Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem.**	**Hours**	**L**	**T**	**P**	**C**
23M4PPHS03	**SOLAR PHYSICS**	**AECC-SOFT SKILL-III**	**IV**	**2**	**2**	**-**	**-**	**2**

Objective	Modern solar physics aims to help students comprehend the various phenomena detected using modern telescopes and satellites. Sunspots, the coronal heat issue, and the structure of the solar photosphere are of particular interest.

Unit	Course Content	Knowledge Levels	Sessions
I	**THE STRUCTURE OF THE SUN:** The interior – Thermonuclear Fusion- The Surface Atmosphere- The inner Corona- The outer Corona – Sun spots- Solar Wind – Solar Flare – Coronal mass ejection.	K4	4
II	**STARS:** Colour –magnitude relation, H R diagrams, Different spectral types of stars, Star formation in Molecular clouds, Stellar Evolution, End state of stars: Supernova, Neutron star and Black hole.	K4	5
III	**OUR GALAXY:** Our Galaxy: Milky way, structure and morphology of our galaxy, Galactic rotation, Missing Mass Problem - Normal Galaxies, Classification scheme for external galaxies, Hubble‘s law .	K4	5
IV	**ASTRONOMICAL MEASUREMENTS AND TELESCOPES:** Basic optics and optical telescopes, Detectors: photographic plate, Photo Multiplier Tube (PMT).	K5	5
V	**COSMOLOGY:** The origin and evolution of universe, Standard and Alternate cosmologies - Big Bang Theory. ***Current Trends:** Satellite city. ***Self Study**	K5	5

Course Outcome	**CO1:** Analyze the concept of Thermonuclear Fusion, Solar Wind, and Solar Flare.	K4	
	CO2: Comparison of Different spectral types of stars, Supernova, Neutron star and Black hole.	K4	
	CO3: Sketching our galaxy and its structure, morphology, and Classification scheme for external galaxies.	K4	
	CO4: Illustrate the Basic optics and optical telescopes, Detectors.	K5	
	CO5: Evaluate the origin and evolution of universe and cosmologies.	K5	

Learning Resources				
Text Books	1. Textbook of Astronomy and Astrophysics with elements of cosmology – V.B. Bhatia, Narosa Publication, 2001. 2. Physics of Solar Flares and Coronal Mass Ejections – Dr. Bojan Vrnak, Create Space Independent Publishing Platform, 2015.			
Reference Books	1. Physics of the Sun: A First Course, Dermott J. Mullan, CRC Press, 2022. 2. New Millennium Solar Physics, MJ. Aschwanden ·Springer, 2019. 3. Introduction to Ultrahigh Energy Cosmic Ray Physics, Pierre Sokolsky, Gordon Thomson, CRC Press, 2020.			
Website Link	1. https://est-east.eu/web-resources#EducationalProjects 2. https://www.nso.edu/for-public/educators/journeytothesun/jtts-curriculum/ 3. http://solar-center.stanford.edu/			
Self Study Material	https://doi.org/10.1016/j.rser.2023.113276			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc - Physics Syllabus LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem.	Hours	L	T	P	C
23M4PPHS03	SOLAR PHYSICS	AECC-SOFT SKILL-III	IV	2	2	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S	M	M	S	S	M
CO2	M	S	M	S	S	M	S	S	M	S
CO3	M	M	S	S	M	S	M	S	S	M
CO4	S	S	M	M	M	S	S	M	M	S
CO5	S	S	S	M	S	M	S	M	S	M

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	Chalk and talk method Power Point Presentation
Assessment Methods	Seminar, CIA-I,CIA-II,ESE

Designed By	Verified By	Approved By Member Secretary
Dr. S. MANIKANDAN	Dr. M. REVATHI	Dr. S. SHAHITHA

M. Sc Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M3PPHIS1	**INTERNSHIP**	**INTERNSHIP**	**III**	**-**	**-**	**-**	**-**	**2**
Objective	Learn to appreciate work and its function in the economy and develop work habits and attitudes.							

S. No.	Guidelines for Internship Training Programme	Knowledge Levels	Sessions
1	The student should undergo **15 Days Internship** training in any individual students have to identify the Institution / Industry / University of their choice during the vacation which falls at the end of the 2nd Semester.	K6	15 DAYS
2	The training bridges the gap between the theoretical knowledge gained in the college and the practical application of the same in the industry / company / stores. The student will have a better exposure about the workplace and its nuances.		
3	Schedule of visit to be made by the staff is to be prepared by the HOD / Staff-in-charge.		
4	The trainees should strictly adhere to the rules and regulations and office timings of the institutions to which they are attached.		
5	A Staff member of a Department (Guide) will be monitoring the performance of the Candidate.		
6	The students should maintain a daily logbook where the student should record his details of the training.		
7	The trainees have to obtain a certificate on successful completion of the internship from the chief executive of an organization.		
8	The student should submit an attendance certificate to the institution for 15 days internship training from an		

	organization.		
9	Internship Training Report (30 – 50 pages) should be prepared by the student and submitted in a month's time and at the end of the semester student should present the report with a power point presentation.		
10	Industrial training reports shall be prepared by the students under the supervision of the faculty of the department.		
11	Industrial training report must contain the following: Cover page Copy of training certificate, Profile of an industry report about the work undertaken by them during the tenure of training observation about the concern findings.		
12	Practical viva – voce examination will be conducted with internal & external examiners at the end of the **3rd semester** and the credits will be awarded.		
13	Report Evaluation: External Viva-Voce examination will be conducted and the maximum mark is 100.		
Course Outcome	**CO1:** Apply new techniques and ideas in field of physics	K3	
	CO2: Analyze the results of new initiatives	K4	
	CO3: Create a new work plan with greater output	K6	
	CO4: Create a framework of work execution ideas	K6	
	CO5: Create a detailed technical work plan and terminologies to be followed in industry.	K6	

Learning Resources				
Text Books	1.J.C. Brice"Crystal Growth Processes" John Wiley and Sons, New York			
Reference Books	1. Smith Donald. L"Thin Film Deposition" McGraw Hill, London., 2. A. Goswami "Thin film fundamentals" New Age International Pub.,			
Website Link	1. http://gen.lib.rus.ec/physics 2. https://www.sanfoundry.com/best-reference-books-msc-physics/			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc Physics Syllabus LOCF-CBCS with effect from 2023-2024 Onwards								
Course Code	Course Title	Course Type	Sem	Hours	L	T	P	C
23M3PPHIS1	INTERNSHIP	INTERNSHIP	III	-	-	-	-	2

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	S	S	S	S
CO2	S	M	S	S	S	S	M	S	S	S
CO3	M	S	S	M	S	M	S	S	S	S
CO4	M	M	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	M	S	S	S	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	**CIA - 100 Marks** 1. Work Log Book – 25 Marks 2. Training Report and Viva-Voce – 75 Marks

Designed By	Verified By	Approved By Member Secretary
Dr. M.REVATHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus for Project Work LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PPHPR1	**PROJECT WORK**	**PROJECT WORK**	**IV**	**8**	**-**	**-**	**8**	**4**

Objective	Demonstrate a technical knowledge in their selected project topic. Undertake problem identification, formulation and solution. Develop plans with relevant people to achieve the goals of the project.

Details	**Course Content**	**Knowledge Levels**	**Sessions**
PROJECT PREPARATION FORMAT			
Cover Page & Title Page	**Cover Page & Title Page:** The fonts and locations of various items on this page should be exactly as shown in a specimen copy.		
Inside cover page	Inside cover page Same as cover page.		
Bonafide Certificate	**Bonafide Certificate**: The Bonafide Certificate shall be in double line spacing using Font Style Times New Roman and Font Size 14.		
Acknowledgement	**Acknowledgement:** This should not exceed one page.		
Contents	**Table of Contents:** The table of contents should list all headings, sub headings after the table of contents page, as well as any titles preceding it. The title page and Bonafide Certificate will not find a place among the items listed in the Table of Contents. One and a half spacing should be adopted for typing the matter under this head.		

Tables	**List of Tables**: The list should use exactly the same captions as they appear above the tables in the text. 1.5 spacing		
	should be adopted for typing the matter under this head.		
Figures	**List of Figures**: The list should use exactly the same captions as they appear below the figures in the body of the text. One and a half spacing should be adopted for typing the matter under this head. All charts, graphs, maps, photographs and diagrams should be designated as figures. X and Y axes titles are mandatory for all the graphs.		
Symbols	**List of Symbols, Abbreviations and Nomenclature:** 1.5 spacing should be adopted or typing the matter under this head. Standard symbols, abbreviations etc. should be used.		
Chapters	**Chapter I - Introduction:** Statement of the Problem, Significance, Need for the study, Objectives		
	Chapter II- Review of literature		
	Chapter III- Methodology: Tools used, Procedures, Hypothesis.		
	Chapter IV- Results and Discussion: Tables and Figures, Statistical Presentations, Hypothesis Testing.		
	Chapter V- Summary and conclusion		
	Chapter VI- Scope of the Project		
	References		
Guidelines For Project Preparation			

Numbering	• Every page in the project report, except the project report title page, must be accounted for and numbered. • The page numbering, starting from acknowledgements and till the beginning of the introductory chapter, should be printed in small Roman numbers, i.e, i, ii, iii, iv..	K6
	• The page number of the first page of each chapter should not be printed (but must be accounted for). All page numbers from the second page of each chapter should be printed using Arabic numerals, i.e. 2,3,4,5.. • All printed page numbers should be located at the right corner at the bottom of the page.	
Chapters	• Use only Arabic numerals. Chapter numbering should becentered on the top of the page using large bold print. <Size 14><Times New Roman>	K6
TEXT		
Regular Text	**Regular Text**: Times Roman 12 pts and normal print.	K6
Chapter Heading	**Chapter Heading -** Times Roman 14 pts. Bold and capital.	K6
Section Headings	**Section Headings -** Times roman 12 pts. Bold and capital.	K6
Subsection Headings	**Subsection Headings** - times roman 12 pts. bold print and Leading capitals i.e, only first letter in each word should bein capital.	K6
Special Text	**Special Text-** Italics/Superscript /Subscript/Special symbols, etc., as per necessity. Special text may include footnotes, endnotes, physical or chemical symbols, mathematical notations, etc.	K6

Sections	**Sections:** Use only Arabic numerals with decimals. Sectionnumbering should be left justified using bold print. Example: 1.1, 1.2, 1.3, etc.	K6
Sub Sections	**Sub Sections:** Use only Arabic numerals with two decimals. Subsection numbering should be left Justified using boldprint. Example: 1.1.1, 1.1.2, 1.1.3, etc.	K6
References	Use only Arabic numerals. Serial numbering should be carried out based on Alphabetical order of surname or last name of first author.	K6

	The format is written like, author name followed by year followed by title of the work followed by details of the journal. Same font as regular text, serial number and all authors names to be in bold print. Title and Journal names should be in italic. One Author: Williams, G. State and Society in. Onco State, Nigeria, Afrographika, 1980. Two Authors: Phizacklea, A & Miles, R. Labour and Racism. London, Routledge & Kegan Paul, 1980. 3+ Authors: O'Donovan, P., et al. The United States. Amsterdam, Time-Life International, 1966.		
Typing Instructions	**Typing Instructions:** The impression on the typed copies should be black in color. One and a half spacing should be used for typing the general text. The general text shall be typed in the Font style 'Times New Roman' and Font size 12. Use A4 (210 mm X 297 mm) bond un-ruled paper (80 gsm) for all copies submitted. Use one side of the paper for all printed/typed matter.	K6	
Justification	**Justification:** The text should be fully justified	K6	
Margins	**Margins:** The margins for the regular text are as follows LEFT - 1.5" RIGHT - 1" TOP - 1" BOTTOM - 1"	K6	
Paragraph Spacing	Use 6 pts before & 6 pts after paragraphs. All paragraphs in the seminar/project report should be left justified	K6	

	completely, from the first line to the last line. Use 1.5 spacing between the regular text and quotations. Provide double spaces between: (a) From top of page to chapter title, (b) Chapter title and first sentence of a chapter, Use single spacing (a) In footnotes and endnotes for text. (b) In explanatory notes for tables and figures. (c) In text corresponding to bullets, listings, and quotations in the main body of seminar/project report. (d) Use single space in references and double space between references.		
Tables	All tables should have sharp lines, drawn in black ink, to separate rows/columns as and when necessary. Tables should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for including tables on a page, should be avoided. Provide double spaces on the top and the bottom of all tables to separate them from the regular text, wherever applicable. The title of the table etc. should be placed on the top of the table. The title should be centered with respect to the table. The titles must be in the same font as the regular text and should be single spaced.	K6	
Figures	All figures, drawings, and graphs should be drawn in black ink with sharp lines and adequate contrast between different plots if more than one plot is present in the same graph. The title of the figure etc. should be placed on the bottom of the figure. Figures should follow immediately after they are referred to for the first time in the text. Splitting of paragraphs, for	K6	

	including figures on a page, should be avoided. Provide double spaces on the top and the bottom of all figures to separate them from the regular text, wherever applicable. Figures should be centered with respect to the figure. The titles must be in the same font as the regular text and should be single spaced. The title format is given below: Fig. <blank><chapter number>.<serial number><left indent><figure		
Page Dimension & Binding Specifications	The project report should be prepared in A4 size. The dissertation shall be properly bound; The bound front cover should indicate in Silver and embossed letter.		
Course Outcome	**CO1:** Identification of research idea	K6	
	CO2: Analyze of problem solving skills	K6	
	CO3: Analyze sources for conduct of Research	K6	
	CO4: Evaluate the research report	K6	
	CO5: Create the research report	K6	

Learning Resources				
Text Books	1. M.A.Shah, Principles of Nanoscience and Nanotechnology, Tokeer Ahmad. 2. S.Chand & Company Limited,Nano Technology, Rakesh Rathi, New Delhi.			
Reference Books	1.De Jongh J, Kulwer Academic Publishers,Physics and Chemistry of Metal cluster components, Dordrecht.			
Website Link	http://gen.lib.rus.ec/physics			
	L-Lecture	T-Tutorial	P-Practical	C-Credit

M. Sc - Physics Syllabus for Project Work LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M4PPHPR1	**PROJECT WORK**	**PROJECT WORK**	**IV**	**8**	**-**	**-**	**8**	**4**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	S	S	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	S	S	S	S	S	M	M
CO4	S	S	S	M	S	S	S	S	M	M
CO5	M	M	M	S	S	M	M	S	M	S

Level of Correlation between CO and PO	L-LOW	M-MEDIUM	S-STRONG

Tutorial Schedule	-
Teaching and Learning Methods	-
Assessment Methods	**EA - 100%** 1. Project Report - 150 Marks 2. Viva-Voce - 50 Marks 3. Total - 200 Marks

Designed By	Verified By	Approved By Member Secretary
Dr. M.REVATHI	Dr. M.REVATHI	Dr. S. SHAHITHA

M.Sc. - Physics Syllabus for Physics For Competitive Examinations LOCF - CBCS with effect from 2023-2024 Onwards								
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**
23M4PPHOE1	**PHYSICS FOR COMPETITIVE EXAMINATIONS**	**ONLINE COMPETITIVE EXAM**	**IV**	**-**	**-**	**-**	**-**	**2**
Objective	Creating the awareness on competitive examination among students. Imparting knowledge about the appearing for Competitive Examination and it impacts and developing an attitude of appearing for such exams.							

Details	**Course Content**	**Knowledge Levels**	**Sessions**
	A fundamental/systematic or coherent understanding of the academic field of Physics, its different learning areas and applications in basic Physics like Mathematical physics, linear and digital ics and applications, Material science, Nuclear and Particle Physics, Condensed matter Physics, Atomic and Molecular Physics, Analytical dynamics, Quantum mechanics I&II, Classical mechanics, Electronics, theory of semiconductor devices, nuclear physics, communication electronics, microprocessor and microcontroller and its linkages with related inter disciplinary areas, Advanced optics, Atmospheric Physics, Information Technology; This course aims to give a holistic view of all the topics which comprised of some factual text points, multiple choice questions (MCQ), it is extremely suitable for students pursuing their higher degree in University/institute for their entrance exams, students preparing for various national and state level competitive entrance exams such as ICAR-JRF/SRF/NET/ARS, IARI/NDRI Ph.D., SAUs; CSIR/UGC-NET/JRF/SRF; ICMR, DBT, GATE, BARC, IISc, JNU, BHU, etc. to get admission in Ph.D. in Physics. In addition, it is also useful for UPSC and states PSC. Rules for creating MCQ pattern.	K6	Self study

1. Objective type online examination will be conducted at the end of 4th semester.

2. Questions must be taken from all previous question papers of CSIR-NET, SET, NEET, UPSC, IBPS and Common Entrance Test for Ph.D.

3. Test critical thinking.

Multiple choice questions to test the superficial knowledge. Learners to interpret facts, evaluate situations, explain cause and effect, make inferences, and predict results.

4. Emphasize Higher-Level Thinking

Use memory-plus application oriented questions. These questions require students to recall principles, rules or facts in a real life context.

Eg.1

Ability to Justify Methods and Procedures

Which of the following measurements is not a unit of distance?
(A) Ammeter
(B) Cubit
(C) Parsec
(D) angstrom

Eg.2

Ability to Interpret Cause-and-Effect Relationships

What happens to your weight when you are in a lift which goes down?
(A)Decreases

(B) Increases
(C) Decreases and then increases
(D)Increases and then decreases

5. Mix up the order of the correct answers

Keep correct answers in random positions and don't let them fall into a pattern that can be detected

6. Use a Question Format

Multiple-choice items to be prepared as questions (rather than incomplete statements)

Incomplete Statement Format:

The capital of California is in Direct Question Format-------Less

effective.

In which of the following cities is the capital of California? -This is Best format.

7. Keep Option Lengths Similar

Avoid making your correct answer the long or short answer

8. Avoid the "All the Above" and "None of the Above" Options

Students merely need to recognize two correct options to get the answer correct

9. HOD's instruct to the faculty to prepare minimum 500 questions booklet (cumulatively for each programme) with solutions and circulate among the students.

10. Each Department to prepare the Questions (MCQ pattern with four answers) and submit to ICT.

Course Outcome	**CO1:** emphasis is given for in depth and quantitative understanding of physical parameters which describe behavior of the system subjected to various boundary conditions	K1	
	CO2: These physical parameters include mechanical, thermal, optical, electrical, magnetic properties.	K2	
	CO3: The system of study is from nano scale structure through micro, mesa and bulk systems.	K3	
	CO4: The prescribed course runs through various topics which include Vector integration, Gauss and Stoke's theorem, Matrices, Tensors etc.	K4	
	CO5: The special functions covered are quite useful in solving transfer of heat in different geometries.	K5	

Learning Resources

Text Books	1. Halliday & Resnick,Fundamental of physics, publishers JEARL WALKER, tenth edition,2007. 2.R.K.Gupta, Objective physics, Arihant Publications,2021 3. S.Chands, Objective physics, publishers Dr.Mahesh Jain,2014 4.Satya Prakash Arya, Objective physics,publisher MTG Learning Media,2011 5. Dr.M.Arumugam, Engineering physics,publisher anuradha agencies,2011
Reference Books	1. sathaya prakash , objective physics, publisher A.S.Prakashan, Meerut,2010
Website Link	https://testbook.com/learn/physics/

	L-Lecture	T-Tutorial	P-Practical	C-Credit

M.Sc. - Physics Syllabus for Physics For Competitive Examinations LOCF - CBCS with effect from 2023-2024 Onwards									
Course Code	**Course Title**	**Course Type**	**Sem**	**Hours**	**L**	**T**	**P**	**C**	
23M4PPHOE1	**PHYSICS FOR COMPETITIVE EXAMINATIONS**	**ONLINE COMPETITIVE EXAM**	**IV**	**-**	**-**	**-**	**-**	**2**	

CO-PO Mapping

CO Number	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S	S	M	M	S	M
CO2	S	S	S	M	M	S	S	S	S	S
CO3	M	L	S	S	S	S	S	S	S	M
CO4	S	M	M	S	M	M	L	S	M	S
CO5	S	M	M	M	L	M	M	S	M	S
Level of Correlation between CO and PO	L-LOW					M-MEDIUM			S-STRONG	

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