

CURRICULUM & SYLLABUS



CHOICE-BASED CREDIT SYSTEM (CBCS)

FOR

MASTER OF SCIENCE (M.Sc.)

(2 Year Postgraduate Degree Program)

IN

PHYSICS

[w. e. f. 2023-24]

FACULTY OF SCIENCE AND HUMANITIES

SRM UNIVERSITY DELHI-NCR, SONEPAT

Plot No.39, Rajiv Gandhi Education City, P.S. Rai, Sonapat Haryana-131029

SRM UNIVERSITY DELHI-NCR, SONEPAT (HARYANA)

VISION

SRM University Haryana aims to emerge as a leading World Class Institution that creates and disseminates knowledge upholding the highest standards of instruction in Engineering & Technology, Science & Humanities, Commerce, Management, Hotel Management & Medicine & Health Science. Along with academic excellence, our curriculum imparts integrity and social sensitivity so that our graduates may best serve the Nation and the World.

MISSION

- To create a diverse community campus that inspires freedom and innovation.
- Strengthen Excellence in educational & skill development processes.
- Continue to build productive international alliances.
- Explore optimal development opportunities available to students and faculty.
- Cultivate an exciting and rigorous research environment.

DEPARTMENT OF PHYSICS

VISION

The Department of Physics at SRM University Delhi-NCR is a young and dynamic Department. However, it is growing rapidly in every aspect. At present, we are offering a four-year B.Sc. (Hons), four-year B.Sc. (Hons) with Research/Academic Project and a two-year M.Sc. in physics. We also offer a Ph.D. program in Physics. Further, we also offer a one semester course on Physics to the first year B.Tech. students of this university. Our department strives to become a center of excellence for higher studies in Physics focused on advanced learning, innovation and knowledge transfer from lab to industry. Our vision is to establish a research-based ecosystem that will put equal stress upon the fundamental branches of physics as well as applied areas, particularly, on topics which have interfaces with other branches of physics. The faculty members as well as the research scholars at the Department are actively engaged in cutting-edge research in different areas of Physics. Our Department envisions to build an academic ambience where 'knowledge is free' of all bounds, innovative and creative ideas are encouraged, and talents are nurtured to realize their full potential.

MISSION

- We aim to offer a balanced blending of comprehensive training in the core areas of physics along with the cutting-edge recent topics of physics.
- We tried to keep a balance between the theoretical courses and experimental courses with an emphasis on problem-solving. This will help the students to develop fundamental concepts, verify them in the lab and thereby discourage the rote-learning.
- Our motto is to prepare a student with the fundamental concepts of physics as well as the skills required to apply them so that they can go on to become a professional physicist in future.
- Overall, we intend to equip a student with the right aptitude and skills so that they can go on to become a professional Physicist in future.
- Additionally, we also intends to inculcate skills like logical thinking, quantitative argumentation, and capability of analyzing a large amount of information (or data) in the students so that even those, who are not going to build a career as a professional physicist, will benefit both professionally and also as a human being.

SCIENCE GRADUATE EMPLOYMENT ATTRIBUTES

- **Able to Apply their Knowledge and Skills in the Disciplinary Area**
- **Analytical & critical thinking and problem-solving skills.**
- **Scientific Temperament Towards Research & Innovation for the Betterment of Society**
- **Efficient Communication & Presentation Skills**
- **Dependability, reliability, responsibility, and independent leadership abilities**

M. Sc. PHYSICS PROGRAM EDUCATIONAL OBJECTIVES

The primary objective of the Master program in Physics is imparting students with an in-depth knowledge and understanding of the subject. While the core courses such as Mathematical Physics, Classical Mechanics, Quantum Mechanics, Statistical Mechanics, and Electrodynamics aims to prepare the students with deep understanding of the fundamental laws of Physics, the elective courses such as Solid-State Physics, Plasma Physics, Electronics, Nuclear and Particle Physics, and Atomic and Molecular Physics should make them familiar with manifestation of these fundamental laws in specific systems or conditions.

Through dissertations and tutorials, it aims to inculcate creative thinking and problem-solving capabilities in the students. The elective and open elective courses are designed in a manner that it will equip the students with a broader knowledge of advanced topics of Physics. The core and elective labs are designed to develop an appreciation for the fundamental concepts and working of devices used in everyday life employing scientific methods/tools of physics. Computational physics course is aimed to equip the students to use computers as a tool for scientific investigations/understanding. The dissertation(s) in both theory and experimental stream are expected to give a flavor of how research leads to new findings. In addition, the M.Sc. course is to lay a solid foundation for a doctorate in Physics/allied subjects later.

M. Sc. PHYSICS PROGRAM LEARNING OUTCOMES

- Understanding the basic concepts of core courses such as classical mechanics, quantum mechanics, statistical mechanics, and electrodynamics to appreciate the underlying principles governing the natural phenomena through logical and mathematical reasoning.
- Understanding the basic concepts of certain advanced fields such as nuclear physics, atomic and molecular physics, solid state physics, plasma physics, and astrophysics, general theory of relativity, nonlinear dynamics, and complex system.
- Learning how to carry out experiments in basic as well as advanced areas of physics.
- Gaining hands-on experience to work in applied fields.
- Developing an attitude and capability for critical thinking and reasoning that can be applied to diverse fields.

M.Sc. Physics Programme Structure

S. No.	Course Type	No. of Courses	Credits	%
1	Core Courses	14	$14 \times 4 + 2 \times 2 = 52$	57.8
2	Generic (GE)	2	$2 \times 4 = 8$	8.9
3	Discipline Specific Elective (DSE)	6	$6 \times 4 = 24$	26.7
4	Project	1	06	6.7
	Total	23	90	100

M.Sc. Physics Programme structure component-wise distribution

S. No .	Course Type	No. of Courses	Component	Course division	Credits	Total Credit	%
1	Core Courses	14	Theory	10	$10 \times 4 = 40$	52	57.8%
			Practical	4	$2 \times 2 + 2 \times 4 = 4$		
2	Generic Elective (GE)	2	Theory	2	$2 \times 4 = 8$	8	8.9%
3	Discipline Specific Elective (DSE)	6	Theory	4	$4 \times 4 = 16$	24	26.7%
			Practical	2	$2 \times 4 = 8$		
4	Project	1	--	1	$1 \times 6 = 6$	6	6.7%
	Total	23	Theory	$64/90 = 71\%$		90	100%

SUMMARY OF CREDITS

Category	I Sem	II Sem	III Sem	IV Sem	Total	%
CORE	20	18	10	04	52	57.8
GENERIC ELECTIVE	04	04	-	-	08	8.9
DISCIPLINE SPECIFIC ELECTIVE	-	-	12	12	24	26.7
PROECT	-	-	-	06	06	6.7
TOTAL	24	22	22	22	90	100

COURSE REVISION DETAILS

1. Following discipline-specific elective paper introduced:
 - a. Quantum Field Theory
 - b. Quantum Informatics and Quantum Computation.

SEMESTER-I

Code	Category	Course	L	T	P	C
THEORY						
23PHMS 101	Core Course	Mathematical Physics	3	1	0	4
23PHMS 102		Classical Mechanics	3	1	0	4
23PHMS 103		Quantum Mechanics I	3	1	0	4
23PHMS 104		Electrodynamics	3	1	0	4
23OEPH101	Generic Elective I	Clean and Renewable energy Physics	3	1	0	4
23OEPH102		Biophysics				
PRACTICAL						
23PHMS 151	Core	Physics Lab I (General)	0	0	8	4
Total			15	5	8	24

SEMESTER-II

Code	Category	Course	L	T	P	C
THEORY						
23PHMS 201	Core Course	Solid State Physics	3	1	0	4
23PHMS 202		Quantum Mechanics II	3	1	0	4
23PHMS 203		Electronics	3	1	0	4
23OEPH201	Generic Elective II	MATLAB	3	1	0	4
23OEPH202		Programming in C				
PRACTICAL						
23PHMS 251	Core	Physics Lab II (General)	0	0	8	4
23PHMS 252	Core	Computational Physics Lab I	0	0	4	2
Total			12	4	12	22

SEMESTER-III

Code	Category	Course	L	T	P	C
THEORY						
23PHMS 301	Core Course	Atomic & Molecular Physics	3	1	0	4
23PHMS 302		Statistical Mechanics	3	1	0	4
23PHMS 303	Discipline Specific Elective 1	Advanced Solid State Physics I	3	1	0	4
23PHMS 304		Nanomaterials				
23PHMS 305		Soft Matter Physics				
23PHMS 306		Laser Physics & Applications				
23PHMS 307		Nanophotonics				
23PHMS 308		Nonlinear Spectroscopy				
23PHMS 309		Analog Communication				
23PHMS 310		Digital Communication	3	1	0	4
23PHMS 311		Optoelectronics				
23PHMS 312		Nuclear Physics I				
23PHMS 313	Astrophysics I					
	Quantum Field Theory					
PRACTICAL						
23PHMS 351	Core Lab	Computational Physics Lab II	0	0	4	2
23PHMS352	Discipline specific Lab	Advanced Solid State Physics Lab I	0	0	8	4
23PHMS353		Laser &Spectroscopy Lab I				
23PHMS354		Electronics Lab I				
Total			12	4	12	22

Note: The student will opt any one option which will be continued in IV Semester as well.

SEMESTER-IV

Code	Category	Course	L	T	P	C
Theory						
23PHMS 401	Core Course	Nuclear and Particle Physics	3	1	0	4
23PHMS 402	Discipline Specific Elective III	Advanced Solid State Physics II	3	1	0	4
23PHMS 403		Characterization of materials				
23PHMS 404		Nanomagnetism And Spintronics				
23PHMS 405		Fiber Optics Sensors				
23PHMS 406		Applied Optics				
23PHMS 407		Rotational & Vibrational Molecular Spectroscopy				
23PHMS 408		Novel and Smart Materials				
23PHMS 409		Microprocessor & Interfacing				
23PHMS 410	Discipline specific Elective IV	Semiconductor Physics	3	1	0	4
23PHMS 411		Nuclear Physics II				
23PHMS 412		Astrophysics II				
		Quantum Informatics and Quantum Computation				
Practical						
23PHMS 451	Discipline specific Lab	CMPLab II	0	0	8	4
23PHMS 452		Laser&Spectroscopy Lab I1				
23PHMS 453		Electronics Lab II				
23PHMS 491	Project	Dissertation (Compulsory)	0	0	12	6
Total			12	0	20	22