Barrackpore Rastraguru Surendranath College

Teaching Plan

Department of Physics

2022-23

B.Sc in Physics Honours / B.Sc in Physics General

PROGRAMME OUTCOME

After completing the program me, the students will gain a strong analytical skill to study critically a physics problem. They will be able to solve the problem using different tools and will present the result with a nice conclusion. A good communication skill will also be developed between them so that they can explain complicated physics terminologies in a simple manner. They using internet frequently will be aware of the information nowadays and will be fully familiar how to collect information from e-libraries and other e-sources on the internet. Their ethical and moral values will be developed and will not practise fabrication and plagiarism. The will be aware of their duty to preserve our environment and the world. Finally, a nice personality will be developed so that they will be ready to work individually and as a member in a group.

Notes:
You can merge cells in between and add students' seminars and class tests / internal assessment.
For incorporating PO / CO at UG level, you may refer to your WBSU CBCS syllabus.
If not there you can refer to the UGC model syllabus
https://www.ugc.ac.in/ugc_notices.aspx?id=MTA3Nw==

Semester	1
Course Title	PHSA-Mathematical Physics-1, Mathematical Physics-1 Lab, Mechanics, Mechanics Lab PHSG-Mechanics, Mechanics Lab

Course Code		Credit	
Course Code	PHSACOR01T,	Credit	4
	PHSACOR01P,		2
	PHSACOR02T,		4
	PHSACOR02P,		2
	PHSGCOR01T/		4
	PHSHGEC01T,		
	PHSGCOR01P/		
	PHSHGEC01P		2

Course Outcome: The students of B.Sc. Physics Honours will be covering Mechanics and Mathematical Methods in the first semester. Along with these, they will study one generic elective either chemistry or mathematics. They will also study one paper on Environmental Studies. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt. They also learn Python language and how to write programme in this language.

The students of B.Sc. Physics General will be covering Mechanics in the first semester. They will one paper on Environmental Studies. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt.

Scheme of Instruction					
Total Duration	24 hours per week	**Class/Week**	24 classes per week	**Hours/week**	24 hours per week
Instruction Mode	**Lectures method with board work, ICT enabled – PPT, Online Lectures, Audio-video class**				
Scheme of Examination					
Maximum Score	Theory-50 Ptractical-25	**Internal**	Theory-8+2 Practical-12+3	**End Semester**	Theory - 40 Practical-10
Course Mapping					

Units	Course Content	Lecture Hour (Cumulative)
	Mathematical Physics-1T	60 lectures
1.	Calculus	20 lectures
2.	Vector Calculus	30 lectures
3.	Introduction to probability	10 lectures
	Mathematical Physics-IP	60 lectures

	Mechanics	60 lectures
1.	Fundamentals of dynamics	5 lectures
2.	Work and Energy	4 lectures
3.	Collisions	3 lectures
4.	Rotational Dynamics	10 lectures
5.	Elasticity	6 lectures
6.	Fluid Motion	4 lectures
7.	Gravitation and Central Force Motion	9 lectures
8.	Oscillations	7 lectures
9.	Non-inertial System	4 lectures
10.	Special Theory of Relativity	8 lectures
	Mechanics Lab	60 lectures
	Mechanics	60 lectures
1.	Mathematical Methods	10 lectures
2.	Particle Dynamics	21 lectures
3.	Gravitation	8 lectures
4.	Oscillations	6 lectures
5.	Elasticity	8 lectures

6.	Special Theory of Relativity	7 lectures
	Mechanics Lab	60 lectures

	Semester	2
Course Title	**PHSA- Electricity and Magnetism , E&M Lab, Wave and Optics, Wave and Optics Lab, PHSG-Electricity and Magnetism , E&M Lab**	
Course Code	**PHSACOR03T,** **Credit**	**4**
	PHSACOR03P,	**2**
	PHSACOR04T,	**4**
	PHSACOR04P,	**2**
	PHSGCOR02T/	**4**
	PHSHGEC02T,	
	PHSGCOR02P/	**2**
	PHSHGEC02P,	
Course Outcome	The students of B.Sc. Physics Honours will be covering Electricity and Magnetism and Wave and Optics in the second semester. Along with these, they will study one generic elective either chemistry or mathematics. They will also study one	

language paper. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt.

The students of B.Sc. Physics General will be covering Electricity and Magnetism in the second semester. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt.

Scheme of Instruction					
Total Duration	24 hours per week	**Class/Week**	24 classes per week	**Hours/week**	24 hours per week
Instruction Mode	**Lectures method with board work, ICT enabled – PPT, Online Lectures, Audio-video class**				
Scheme of Examination					
Maximum Score	Theory-50 Ptractical-25	**Internal**	Theory-8+2 Practical-	**End Semester**	Theory - 40 Practical-10

		12+3	

	Course Mapping	
Units	**Course Content**	**Lecture Hour (Cumulative)**
	Electricity and Magnetism	60 lectures
1.	Electric Field and Electric Potential	15
2.	Dielectric Properties of Matter	8
3.	Magnetic Field	10
4.	Magnetic Properties of Matter	5
5.	Electromagnetic Induction	6
6.	Electric circuits	10
7.	Network Theorems	6
	Electricity and Magnetism Lab	60 lectures
	Wave and Optics	60 lectures
1.	Superposition of collinear harmonic oscillations	4
2.	Superposition of two perpendicular harmonic oscillations	3
3.	Wave Motion	4

4.	Velocity of waves	5
5.	Superposition of two harmonic waves	7
6.	Wave Optics	4
7.	Interference	9
8.	Interferometer	4
9.	Diffraction and Holography	20
	Wave and Optics Lab	60 lectures
	Electricity and Magnetism	60 lectures
1.	Vector Analysis	12
2.	Electrostatics	18
3.	Magnetism	10
4.	Electromagnetic Induction	6
5.	Linear Network	5
6.	Maxwell's equation and Electromagnetic Wave Propagation	9
	Electricity and Magnetism Lab	60 lectures

Semester	**3**

Course Title	PHSA-Mathematical Physics-II, Mathematical Physics-II Lab, Thermal Physics, Thermal Physics Lab, Digital System and Applications, Digital System and Applications Lab, Basic Instrumentation Skill		
	PHSG-Thermal Physics and Statistical Mechanics, Thermal Physics and Statistical Mechanics Lab, Basic Instrumentation Skill		
Course Code	PHSACOR05T,	Credit	4
	PHSACOR05P,		2
	PHSACOR06T,		4
	PHSACOR06P,		2
	PHSACOR07T,		4
	PHSACOR07P,		2
	PHSGCOR03T/		4
	PHSHGEC03T,		
	PHSGCOR03P/		2
	PHSHGEC03P,		
	PHSSSEC01M		2
Course Outcome	The students of B.Sc. Physics Honours will be covering Mathematical Methods, Thermal Physics and Digital System and Applications in the third semester. Along with these, they will		

study one generic elective either chemistry or mathematics. They will also study one paper on skill enhancement course. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt. They also learn Python language and how to write programme in this language.

The students of B.Sc. Physics General will be covering Thermal and Statistical Mechanics in the third semester. They will study one paper on skill enhancement course. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt.

Scheme of Instruction					
Total Duration	34 hours per week	**Class/Week**	34 classes per week	**Hours/week**	34 hours per week
Instruction Mode	**Lectures method with board work, ICT enabled – PPT, Online Lectures, Audio-video class**				
Scheme of Examination					
Maximum Score	Theory-50 Ptractical-	**Internal**	Theory-8+2	**End Semester**	Theory - 40

	25		Practical- 12+3		Practical-10

Course Mapping		
Units	Course Content	Lecture Hour (Cumulative)
	Mathematical Physics-II	60 lectures
1.	Fourier Series	10
2.	Frobenius Method and Special Functions	25
3.	Some Special Integrals	4
4.	Variational Calculus in Physics	5
5.	Analytical Dynamics	10
6.	Partial Differential Equations	6
	Mathematical Physics II Lab	60 lectures
	Thermal Physics	60 lectures
1.	Introduction to Thermodynamics	25
2.	Thermodynamics Potentials	15
3.	Kinetic Theory of Gases	20
	Thermal Physics Lab	60 lectures
	Digital Systems and Application	60 lectures

1.	Introduction	4
2.	Integrated Circuits	5
3.	Digital Circuits	16
4.	Arithmetic Circuits	5
5.	Data Processing Circuits	5
6.	Sequential Circuits	6
7.	Timers	4
8.	Registers	4
9.	Counters	4
10.	Computer Organisation	7
	Digital Systems and Applications Lab	60 lectures
	Thermal and Statistical Mechanics	60 lectures
1.	Laws of Thermodynamics	22
2.	Thermodynamic Potentials	10
3.	Kinetic Theory of gases	10
4.	Theory of radiation	6
5.	Statistical Mechanics	12
	Thermal and Statistical Lab	60 lectures

	Basic Instrumentation Skill	30 lectures

Semester	4
Course Title	**PHSA-Mathematical Physics-III, Mathematical Physics-III Lab, Elements of Modern Physics, Elements of Modern Physics Lab, Analog System and Applications, Analog System and Applications Lab, Basic Instrumentation Skill** **PHSG-Wave and Optics, Wave and Optics Lab, Computation Physics Skill**	

Course Code	**PHSACOR08T,**	**Credit**	**4**
	PHSACOR08P,		**2**
	PHSACOR09T,		**4**
	PHSACOR09P,		**2**
	PHSACOR010T,		**4**
	PHSACOR010P,		**2**
	PHSGCOR04T/		**4**
	PHSHGEC04T,		
	PHSGCOR04P/		**2**
	PHSHGEC04P,		

	PHSSSEC02M		**2**
Course Outcome	The students of B.Sc. Physics Honours will be covering Mathematical Methods, Modern Physics and Alalog System and Applications in the fourth semester. Along with these, they will study one generic elective either chemistry or mathematics. They will also study one paper on skill enhancement course. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt. They also learn Python language and how to write programme in this language. The students of B.Sc. Physics General will be covering Wave and Optics in the fourth semester. They will study one paper on skill enhancement course. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt.		

Scheme of Instruction					
Total Duration	34 hours per week	**Class/Week**	34 classes per week	**Hours/week**	34 hours per week
Instruction	**Lectures method with board work, ICT enabled – PPT, Online**				

Mode	Lectures, Audio-video class				
Scheme of Examination					
Maximum Score	Theory-50 Ptractical-25	**Internal**	Theory-8+2 Practical-12+3	**End Semester**	Theory - 40 Practical-10
Course Mapping					

Units	Course Content	Lecture Hour (Cumulative)
	Mathematical Physics-III	60 lectures
1.	Complex Analysis	20
2.	Integral Transforms	15
3.	Boundary Value Problems	10
4.	Matrices	7
5.	Eigen values and Eigenvectors	8
	Mathematical Physics-III Lab	60 lectures
	Elements of Modern Physics	60 lectures
1.	Relativistic Dynamics	12
2.	Collection of identical particles-classical	6

	approach	
3.	Emergence of Quantum theory	20
4.	Lasers	4
5.	Nuclear Physics	18
	Elements of Modern Physics Lab	60 lectures
	Analog Systems and Applications	60 lectures
1.	History of the development of electronics	3
2.	Semiconductor diodes	7
3.	Two terminal devices and their applications	7
4.	Bipolar Junction Transistor	8
5.	Field Effect transistors	3
6.	Amplifiers	8
7.	Coupled Amplifier	3
8.	Feedback in Amplifiers	4
9.	Sinusoidal Oscillators	4
10.	Operational Amplifiers	4
11.	Applications of OP-Amps	7

12.	Conversion	2
	Analog Systems and Applications Lab	60 lectures
	Waves and Optics	60 lectures
1.	Superposition of two collinear Harmonic oscillations	4
2.	Superposition of two perpendicular Harmonic oscillations	2
3.	Wave Motion-General	7
4.	Fluids	6
5.	Sound	6
6.	Wave Optics	3
7.	Interference	10
8.	Michelson's Interferometer	3
9.	Diffraction	14
10.	Polarization	5
	Waves and Optics Lab	60 lectures
	Computation Physics skill	30 lectures

Semester		5
Course Title	**PHSA-Quantum Mechanics and Applications, Quantum Mechanics and Application Lab, Solid State Physics, Solid State Physics Lab, Advanced Dynamics, Nuclear and Particle Physics** **PHSG-Digital, Analog Circuits and Instrumentations, Digital, Analog Circuits and Instrumentations Lab**	
Course Code	**PHSACOR011T,** **PHSACOR011P,** **PHSACOR012T,** **PHSACOR012P,** **PHSADSE02T,** **PHSADSE03T,** **PHSGDSE01T,** **PHSGDSE01P,**	**Credit** 4 2 4 2 6 6 4 2
Course Outcome	The students of B.Sc. Physics Honours will be covering Quantum Mechanics and Application, Solid State Physics , Advanced Dynamics and Nuclear and Particle Physics in the fifth semester.. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt. They also learn Python language and how to write	

| | programme in this language.

The students of B.Sc. Physics General will be covering Digital, Analog Circuits and Instrumentations in the fifth semester. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt. |

Scheme of Instruction					
Total Duration	34 hours per week	**Class/Week**	34 classes per week	**Hours/week**	34 hours per week
Instruction Mode	**Lectures method with board work, ICT enabled – PPT, Online Lectures, Audio-video class**				
Scheme of Examination					
Maximum Score	Theory-50 Ptractical-25 Non-Practical	**Internal**	Theory-8+2 Practical-12+3	**End Semester**	Theory - 40 Practical-10 50

	Paper- 75		20+5		
Course Mapping					

Units	Course Content	Lecture Hour (Cumulative)
	Quantum Mechanics and Applications	60 lectures
1.	Basic Formalism	12
2.	Schrodinger Equation	12
3.	Bound States in an arbitrary Potential	8
4.	Quantum-Theory of hydrogen like atoms	10
5.	Applications of Quantization rules in Atomic Physics	18
	Quantum Mechanics and Applications Lab	60 lectures
	Solid State Physics	60 lectures
1.	Crystal Structures	12
2.	Elementary lattice dynamics	10
3.	Magnetic Properties of Matter	8
4.	Dielectric Properties of Material	8
5.	Ferroelectric Properties of Material	6

6.	Drude's theory	6
7.	Elementary Band Theory	10
8.	Superconductivity	6
	Solid State Physics Lab	60 lectures
	Advanced Dynamics	75 lectures
1.	Lagrangian and Hamiltonian Dynamics	15
2.	Rigid Body Mechanics	10
3.	Small Amplitude Oscillation	10
4.	Dynamical Systems	25
5.	Fluid Dynamics	15
	Nuclear and Particle Physics	75
1.	General Properties of Nuclei	10
2.	Nuclear Models	12
3.	Radioactive Decay	10
4.	Nuclear Reactions	8
5.	Interaction of Nuclear Radiation with matter	8
6.	Detector for Nuclear Radiations	8

7.	Particle Accelerators	5
8.	Particle Physics	14
	Digital, Analog Circuits and Instrumentation	60 lectures
1.	Digital Circuits	15
2.	Semiconductor Devices and Amplifiers	15
3.	Operational Amplifiers	14
4.	Instrumentations	16
	Digital, Analog Circuits and Instrumentation Lab	60 lectures

Semester		6	
Course Title	**PHSA-Electromagnetic Theory, Electromagnetic Theory Lab, Statistical Mechanics, Statistical Mechanics Lab, Advanced Mathematical Physics II, Astronomy and Astrophysics** **PHSG-Nuclear and Particle Physics**		
Course Code	**PHSACOR013T,** **PHSACOR013P,**	**Credit**	**4** **2**

	PHSACOR014T,		4
	PHSACOR014P,		2
	PHSADSE04T,		6
	PHSADSE05T,		6
	PHSGDSE04T		6
Course Outcome	The students of B.Sc. Physics Honours will be covering Electromagnetic Theory, Statistical Mechanics, Advanced Mathematical Methods and Astronomy and Astrophysics in the sixth semester. In these courses they will have extensive hands-on experiences on different experiments based on the theoretical knowledge they have learnt. They also learn Python language and how to write programme in this language. The students of B.Sc. Physics General will be covering Nuclear and Particle Physics in the sixth semester. In these courses they will have extensive the theoretical knowledge.		
	Scheme of Instruction		

Total Duration	32 hours per week	Class/Week	32 classes per week	Hours/week	34 hours per week
Instruction Mode	**Lectures method with board work, ICT enabled – PPT, Online Lectures, Audio-video class**				
Scheme of Examination					
Maximum Score	Theory-50 Ptractical-25 Non-Practical Paper- 75	**Internal**	Theory-8+2 Practical-12+3 20+5	**End Semester**	Theory - 40 Practical-10 50

Course Mapping		
Units	**Course Content**	**Lecture Hour (Cumulative)**
	Electromagnetic Theory	60 lectures
1.	Maxwell Equations	12
2.	Electromagnetic Wave Propagation in Unbounded Media	10
3.	EM Wave in Bounded Media	10

4.	Polarization of Electromagnetic Wave	17
5.	Wave guides	8
6.	Optical Fibres	3
	Electromagnetic Theory Lab	60 lectures
	Statistical Mechanics	60 lectures
1.	Classical Statistical Mechanics	20
2.	Chemical Equilibrium	5
3.	Theory of Black Body Radiation	6
4.	System of identical particles	6
5.	Bose-Einstein Statistics	12
6.	Fermi-Dirac Statistics	11
	Statistical Mechanics Lab	60 lectures
	Advanced Mathematical Physics-II	75 lectures
1.	Partial Differential Equations	20
2.	Group Theory	30
3.	Advanced Probability Theory	25
	Astronomy and Astrophysics	75 lectures
1.	Astronomical Scales	24

2.	Astronomical techniques	5
3.	Physical Principles	4
4.	The Sun and Solar Family	11
5.	The Milky Way	14
6.	Galaxies	7
7.	Large Scale Structure and Expanding Universe	10
	Nuclear and Particle Physics	75 lectures
1.	Preliminary Topics	3
2.	General Properties of Nuclei	9
3.	Nuclear Models	11
4.	Radioactive Decay	10
5.	Nuclear Reactions	8
6.	Interaction of Nuclear Radiation with matter	8
7.	Detection for Nuclear Radiations	7
8.	Particle Accelerators	5
9.	Particle Physics	14

Semester		
Course Title		
Course Code		**Credit**	
Course Outcome		

Scheme of Instruction

Total Duration		**Class/Week**		**Hours/week**	
Instruction Mode				

Scheme of Examination

Maximum Score		**Internal**		**End Semester**	

Course Mapping

Units	Course Content	Lecture Hour (Cumulative)

	Semester	
Course Title		
Course Code		**Credit**	
Course Outcome		
Scheme of Instruction		
Total Duration		**Class/Week**		**Hours/week**	
Instruction Mode		

Scheme of Examination					
Maximum Score		**Internal**		**End Semester**	
Course Mapping					
Units	**Course Content**			**Lecture Hour (Cumulative)**	

Semester	
Course Title	

Course Code		Credit	
Course Outcome			

Scheme of Instruction					
Total Duration		Class/Week		Hours/week	
Instruction Mode					

Scheme of Examination					
Maximum Score		Internal		End Semester	

Course Mapping		
Units	Course Content	Lecture Hour (Cumulative)

Semester		
Course Title		
Course Code		**Credit**	
Course Outcome		
Scheme of Instruction		
Total Duration		**Class/Week**		**Hours/week**	
Instruction Mode		
Scheme of Examination		
Maximum Score		**Internal**		**End Semester**	

Course Mapping		
Units	Course Content	Lecture Hour (Cumulative)

Semester		
Course Title		
Course Code		**Credit**	
Course Outcome		

Scheme of Instruction					
Total Duration		**Class/Week**		**Hours/week**	
Instruction Mode					

Scheme of Examination					
Maximum Score		**Internal**		**End Semester**	

Course Mapping		
Units	**Course Content**	**Lecture Hour (Cumulative)**

Semester		
Course Title		
Course Code		**Credit**	
Course Outcome		
Scheme of Instruction		
Total Duration		**Class/Week**		**Hours/week**	
Instruction Mode		
Scheme of Examination		
Maximum Score		**Internal**		**End Semester**	
Course Mapping		
Units	**Course Content**	**Lecture Hour (Cumulative)**