

Program Schemes for [B.Sc. (Hons/Hons with Research) Physics]

Cluster: Basic & Applied Sciences
Department: Physics

Institute: University Institute of Sciences
Type of Program: UG

First Year				Second Year			
Semester-1	Course Name	Course Category	Credits	Semester-3	Course Name	Course Category	Credits
	Mechanics	Major Core	3		Thermodynamics	Major Core	3
	Mathematical Physics -I	Major Core	3		Thermodynamics Lab	Major Core	1.5
	Mechanics lab	Major Core	1		Analog Systems and Applications	Major Core	3
	Electricity and Magnetism	Major Core	2		Analog Systems and Applications Lab	Major Core	1..5
	Electricity and Magnetism Lab	Major Core	1		Interdisciplinary Courses-III Minor elective	Minor Elective	3
	General Proficiency-1	Ability Enhancement	1		Social Internship	Internship	2
	Design Thinking and creativity for innovation	Skill Enhancement	1		Entrepreneurship Mindset	Ability Enhancement	1
	General Proficiency-2 Academic Writing Skill and IPR	Skill Enhancement	1		Critical Enquiry and Research Methodology	Ability Enhancement	1
	Interdisciplinary Course-I (Minor Elective -I)	Minor Elective	3		Professional Soft Skills – 1	Skill Enhancement	1
	General Proficiency-3 Understanding India	Ability Enhancement	1		Communication Skills-2	Skill Enhancement	2
	Universal Human Values, Ethics & Life Skills-1	Value Education	1		Universal Human Values, Ethics and Life Skills-2	Value Education	2
	Wave and Optics	Major Core	3		Elements of Modern Physics	Major Core	3
	Wave& Optics Lab	Major Core	1.5		Elements of Modern Physics Lab	Major Core	1.5
Introduction to Python programming	Major Core	3	Digital Systems and Applications	Major Core	3		
Python programming Lab	Major Core	1.5	Digital Systems and Applications Lab	Major Core	1.5		
Mathematical Physics -II	Major Core	3	Statistical Mechanics	OE	3		
Introduction to AI	Ability Enhancement	1	Open elective -1	Project	3		

	Interdisciplinary Courses-II (Minor Elective -II)	Minor elective	3		Mid Grade Project[MGP-1]	Minor Core	1
	Aptitude and Reasoning-I	Ability Enhancement	1		Sub Stream Course -I	Ability Enhancement	3
	General Proficiency-4	Skill Enhancement	1		Professional Ethics	Ability Enhancement	1
	Communication Skills-1	Skill Enhancement	1		[Track: Employability] Aptitude Reasoning-2	Skill Enhancement	1
					[Track: Innovation] Marketing & Management Essentials		
	Introduction to SDGs	Value Education	1		[Track: Employability] Professional soft skills-2	Major Core	1
[Track: Innovation] AI Automation & Sustainability				1			
Environmental science and management	Value Education	2	[Track: Research] Academic Writing	1			
			[Track: Research] Research Ethics & Intellectual Property Rights			1	

Third Year				Fourth Year			
Semester -5	Course Name	Course Category	Credit	Semester-7	Course Name	Course Category	Credit
	Solid State Physics	Major Core	4		Semiconductor Devices	Major Core	3
	Solid State Physics Lab	Major Core	2		Quantum Mechanics -II	Major Core	3
	Advance Physics Lab -I	Skill Enhancement	2		Classical Mechanics	Major Core	3
	Seminar (Presentation)	Ability Enhancement	1		Electronics lab	Major Core	2

	Sub Stream Course -II	Minor Core	3		Major Elective -1	Major lectiv	3
	Sub Stream Course -III	Minor Core	3		Interdisciplinary Courses-IV Minor Elective	Minor Elective	3
	Open elective - 2	OE	3		Certification	Minor core	2
	Domain Internship	Internship	1		Research Gap Course	Minor core	1
	Gender Equity and Empowerment	Value Education	1		Industry Internship	Internship	1
					DissertationPart-1/Capstone Project-I	Dissertation/Project	4
Semester-6	Quantum Physics -I	Major Core	4	Semester-8	Minor Elective-I	Minor elective	2
	Nuclear and Particle Physics	Major Core	4		Major Elective-II	Major Elective	3
	Electromagnetic Field Theory	Major Core	3		Major Elective-II	Major Elective	3
	Advanced Lab - II	Major Core	2		Dissertation Part - II/Capstone Project-II	Dissertation/Project	8
	Mid -Grade Project [MGP-2]	Project	1				
	Sub Stream Course-IV	Minor Core	3				
	Sub Stream Course-V	Minor Core	3				
	Open elective - 3	OE	3				

Elective Basket Name Material Science			
Semester	Course Name	Course Category	Credits
IV	Smart Materials	Minor Core	3
V	Material selection and its properties	Minor Core	3
V	Physics of resonance technique	Minor Core	3
VI	Magnetism and superconductivity	Minor Core	3
VI	Advanced characterization technique	Minor Core	3
VI	Advanced carbon materials	Minor Core	3
			3

VII	Composite Materials	Major Elective	3
VII	Low dimensional materials: fabrication and characterization	Major Elective	3
VII	Non-Destructive Testing (NDT)	Major Elective	3
VIII	Spectroscopy & Advanced characterization technique	Major Elective	3
VIII	Data Analytics in Materials Science	Major Elective	3
VIII	Advanced ceramics for biomedical applications	Major Elective	3
Elective Basket Name Nuclear & Particle Physics			
Semester	Course Name	Course Category	Credits
IV	Special theory of relativity	Minor Core	3
V	Astronomy of Stars	Minor Core	3
V	Astronomy and Astrophysics	Minor Core	3
VI	Accelerator Physics	Minor Core	3
VI	Detectors in particle Physics	Minor Core	3
VI	Experimental Technique in Nuclear and Particle Physics	Major Elective	3
VIII	Cosmology	Major Elective	3
VIII	Advanced Particle Physics	Major Elective	3
VIII	Quantum Electrodynamics	Major Elective	3
VIII	Radiation Detection and Measurement Safety	Major Elective	3
Elective Basket Name Electronics			
Semester	Course Name	Course Category	Credits
IV	Optoelectronics	Minor Core	3
V	Nano electronics	Minor Core	3
V	Embedded systems: introduction to microcontroller	Minor Core	3
VI	Digital signal processing	Minor Core	3
VI	Optical fiber communications	Minor Core	3
		Minor Core	3
VI	Physics of device instrumentations	Minor Core	3
VIII	VLSI Design	Major Elective	3
VIII	Control System	Major Elective	3
Elective Basket Name Computational Physics			
Semester	Course Name	Course Category	Credits
VII	Introduction to Quantum Computing	Major Elective	3
VII	Numerical Methods finite difference Approach	Major Elective	3
VIII	Scientific computing using MATLAB	Major Elective	3
VIII	Machine learning for physics	Major Elective	3



4th Year Curriculum Design Framework [For Hons. / Hons. with Research Tracks of Four Year Undergraduate Programs (FYUP)]

Extending Expertise	Course Category	Credit	Contextualizing Learning	Course Category	Credits	Experiential Learning	Course Category	Credit
Semiconductor Devices	Major Core	3	Major Elective -1	Major Elective	3	Industry Internship	Internship	1
Quantum Mechanics -II	Major Core	3	Interdisciplinary Courses-IV Minor Elective	Minor Elective	3	Dissertation Part - I/Capstone Project-I	Dissertation /Project	4
Classical Mechanics	Major Core	3	Minor Elective-I	Minor Elective	2	Dissertation Part - II/Capstone Project-II	Dissertation /Project	8
Electronics lab	Major Core	2	Major Elective-II	Major Elective	3			
Certification	Minor Core	2	Major Elective-II	Major Elective	3			
Project Gap Course	Minor Core	1						

IDC Nano Science and Nano Materials		
Semester	Course Name	Credit
I	Physics of Nano scale Materials	3
II	Synthesis Techniques of Nano Materials	3
III	Instrumentation technique in Nano Materials	3
VII	Nano devices	3
IDC Computational Technique in Physics		
I	Fundamental of scientific computing	3
II	Data Visualization with Python in Physics	3
III	Data Science with Python	3
VII	Web Development with Python	3
IDC Mathematics		
I	Algebra and Calculus	3
II	Ordinary and Partial Differential Equations	3
III	Numerical Analysis	3
VII	Real and Complex Analysis	3
IDC CHEMISTRY		
I	State of Matter & Ionic Equilibria	3
II	Electrochemistry & Surface Chemistry	3
III	Polymer Chemistry	3
VII	Green Chemistry	3

Additional Minor Artificial Intelligence in Physics		
Semester	Course Name	Credit
III	AI Foundations & Ethics	3
IV	Programming for AI	3
V	AI in Physics	3
V	AI in experimental Physics Lab	2
VI	Quantum Computing with AI	3
VI	Disciplinary Project/ Interdisciplinary Project	4/6*
Additional Minor Semiconductor Devices and Technology		
III	Electronics Devices	3
IV	Nano electronics and Nano Photonics	3
V	Materials Characterization	3
V	Electronic Devices Lab	2
VI	Thin Films and Semiconductor Fabrication Technology	3
VI	Disciplinary Project/ Interdisciplinary Project	4/6*
Additional Minor Quantum Technology		
III	Quantum Mechanics	3
IV	Quantum Materials and Devices	3
V	Introduction to Quantum Computing	3
V	Basic Quantum Computing Lab	2
VI	Quantum Communication and Cryptography	3
VI	Disciplinary Project/ Interdisciplinary Project	4*/6*
Additional Minor Renewable Energy Technology		
III	Introduction to Renewable Energy	3
IV	Solar PV concepts, technology and application	3
V	Hydrogen Energy and Fuel cells	3
V	Renewable Energy Systems Lab	2
VI	Energy Storage Devices	3
VI	Disciplinary Project/ Interdisciplinary Project	4/6*