

Programme Template

1. Name of the Programme and Code	Engineering Physics PH1
2. Degree (UG/PG)	UG
3. Minimum Duration of the Programme (Specify for FT and PT, if applicable)	4 years
4. Maximum Duration of the Programme (Specify for FT and PT, if applicable)	6 years
5. Capacity (Max. Student Strength) of the Programme	63
6. Number of Regular Faculty Members Involved as Teaching Faculty in the Programme	42
7. Minimum Credit Requirements for the Degree	152
8. Articulate the Program Learning Outcomes (PLO) <i>[For example see: Objectives vs. Outcomes and Student Outcomes]</i> PLO1. Students will be able to have a strong background in basic sciences, applied sciences, mathematics, engineering fundamentals and will also be to develop problem solving skills. PLO2. The student will be able to effectively engage and propose creative solution to both national and international challenges like sustainability, emerging technologies, environmental issues, etc. PLO3. The student will be able to bridge the gap between the industry and academia owing to their rigorous training in both basic science and engineering.	

9. Map PLOs with Institute Learning Outcomes (ILOs) of the Degree

[Indicate '1' for weak, '2' for good, and '3' for excellent relation. Leave the cell blank to indicate no relation]

	PLO1	PLO2	PLO3	...
ILO1	3	2	3	
ILO2	3	2	3	
ILO3	2	3	3	
ILO4	2	3	2	

10. Number of Programme Core Credits

59

11. Number of Programme Elective Credits

18

12. Number of Open Credits

9

13. Number of Project Core Credits

3

14. Details of Creative Expression and Ethical Reasoning (CEER) Component in the Programme [Only for UG]

Number of Credits Assigned	3 credits
Courses Involved and Credits Accounted [e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]	1. BTP/Capstone (1 credits) 2. Computational Physics (0.5 credits) 3. AI and its applications in physics (1 credit) 4. Experimental methods in Physics (0.5 credits)

15. Details of Emerging Trends (ETT) Component in the Programme [Only for UG]

Number of Credits Assigned	3 credits
Courses Involved and Credits Accounted [e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]	1. BTP/Capstone (1 credits) 2. Quantum Mechanics II (0.5 credits) 3. Artificial Intelligence and its

<i>write AMLXXX (Z credits)</i>	applications in physics (1 credit) 4. Experimental methods in physics (0.5 credits)
16. Details of Environment and Sustainability (E&S) Component in the Programme [Only for UG]	
Number of Credits Assigned	
Courses Involved and Credits Accounted <i>[e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]</i>	1. Engineering Visualization (0.75 credits) 2. Manufacturing for Product Innovation (0.75 credits) 3. Nuclear and Elementary Particle Physics (0.5 credit) 4. Biology for Engineers: Microbes in health and disease (0.25 credits) 5. The Art and Science of Building Molecules and Materials (0.25) 6. Engineering Physics Laboratory-I (0.5 credit) 7. Engineering Physics Laboratory-II (0.5 credit) 8. Engineering Physics Laboratory-III (0.5 credit) 9. Engineering Physics Laboratory-IV (0.5 credit)
17. Details of Research/Technical Communication Component in the Programme [Only for PG]	
Number of Credits Assigned	
Courses Involved and Credits Accounted <i>[e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then</i>	10. xxx (Z1 credits) 11. xxx (Z2 credits) 12. ...

write AMLXXX (Z credits)]			
18. Details of Professional Ethics Component in the Programme [Only for PG]			
Number of Credits Assigned			
Courses Involved and Credits Accounted [e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]	1. xxx (Z1 credits) 2. xxx (Z2 credits) 3. ...		
19. Details of External Connect Component in the Programme [Only for PG]			
Number of Credits Assigned			
Courses Involved and Credits Accounted [e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]	4. xxx (Z1 credits) 5. xxx (Z2 credits) 6. ...		
20. List of prescribed courses in all baskets (BS, GE, DC/PC, DE/PE, ...)			
Basic Sciences (BS)	General Engineering (GE)	Departmental/ Programme Core (DC/PC)	Departmental/ Programme Elective (DE/PE)
Calculus (4 credits)	Introduction to Computer science (4 credits)	Engineering Physics Laboratory-I (3 credits)	PYL7XXX Foundations in Astronomy
Linear Algebra and differential equation (4 credits)	Introduction to Electrical Engineering (4 credits)	Mathematical Physics (4 credits)	PYL7XXX Extragalactic Astronomy and Cosmology
Waves and Oscillations (3 credits)	Digital Electronics (4 credits)	Quantum Mechanics I (4 credits)	PYL7XXX Particle Physics and Cosmology
The art and science of building molecules and materials (3 credits)	Thermodynamics (4 credits)	Optics and Photonics (4 credits)	PYL7XXX Physics of fluids
-Biology for Engineers: Microbes in	Engineering Visualization (2 credits)	Condensed Matter Physics (4 credits)	PYL7XXX Soft and Biological Matter Physics

health and disease (2 credits)			
Physics Laboratory (2 credits)	Manufacturing for Product Innovation (2 credits)	Classical Mechanics (4 credits)	PYL7XXX Quantum field Theory II
Chemistry Laboratory (2 credits)		Statistical Physics (4 credits)	PYS300 Independent Study
Experimental Biology for Engineers (1 credits)		Computational Physics (4 credits)	PYL301 Vacuum Technology & Surface Science
		Electrodynamics (4 credits)	PYL302 Nuclear Science and Engineering
		Artificial Intelligence and its application in Physics (4 credits)	PYL303 Materials Science and Engineering
		Nuclear and elementary Particle Physics (4 credits)	PYL304 Superconductivity and Applications
		Experimental Methods in Physics (3 credits)	PYL305 Engineering Applications of Plasmas
		Engineering Physics Laboratory-II (3 credits)	PYL306 Microelectronic Devices
		Engineering Physics Laboratory-III (3 credits)	PYL307 Elements of Material Processing
		Engineering Physics Laboratory-IV (3 credits)	PYL311 Lasers
		Project-I/Capstones project (3 credits)	PYL312 Semiconductor Optoelectronics
		Quantum Mechanics II (4 credits)	PYL313 Fourier Optics and Holography
			PYL321 Low Dimensional Physics
			PYL322 Nanoscale Fabrication
			PYL323 Nanoscale Microscopy
			PYL324 Spectroscopy of Nanomaterials
			PYL7XXX Special Theory of Relativity & Tensor Analysis
			PYL411 Quantum Electronics
			PYD412 Project-II
			PYL412 Ultrafast Laser Systems and Applications

			PYL413 Fiber and Integrated Optics
			PYD414 Project-III
			PYL414 Engineering Optics
			PYV418 Selected Topics in Photonics
			PYV419 Special Topics in Photonics
			PYL421 Functional Nanostructures
			PYL423 Nanoscale Energy Materials & Devices
			PYV428 Selected Topics in Nanotechnology
			PYV429 Special Topics in Nanotechnology
			PYL431 Relativistic Quantum Mechanics
			PYL432 Quantum Electrodynamics
			PYL433 Introduction to Gauge Field Theories
			PYL434 Particle Accelerators
			PYL435 Advanced Computational Physics
			PYL701 Physical Foundations of Materials Science
			PYL702 Physics of Semiconductor Devices
			PYL707 Characterization Techniques for Materials
			PYL711 Introduction to Nonlinear Dynamics
			PYL723 Vacuum Science and Cryogenics
			PYL726 Semiconductor Device Technology
			PYL727 Energy Materials and Devices
			PYL730 Plasma Theory and Simulations
			PYL740 Advanced Theory of Condensed Matter
			PYLXXXX Quantum Field Theory I
			PYL742 General Relativity
			PYL743 Group Theory and its Applications
			PYL744 High Energy Physics

			PYL745 Advanced Statistical Mechanics
			PYL746 Non-equilibrium Statistical Mechanics
			PYL748 Quantum Optics
			PYL749 Quantum Information and Computation
			PYL750 Topology in Condensed Matter Physics
			PYL753 Optical Systems Design
			PYL756 Fourier optics and holography
			PYL759 Computational optical imaging
			PYL760 Biomedical optics and Bio-photonics
			PYL800 Numerical and Computational Methods
			PYLXXXX Advanced Optics and Photonics
			PYLXXXX Advanced Solid State Physics
			PYLXXXX Advanced Topics in AI/ML for physics

21. Nominal Semester-wise Academic Plan [*An example is provided below*]

Semester	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6	Course 7	Course 8	L	T	P	Total crec	Contact hrs	
I	ELL101 GE1-Introduction to Electrical Engineering 2-1-2 4	GE2-Thermodynamics 3-0-2 4	BS1-Waves and Oscillations 2-1-0 3	BS2-Calculus 3-1-0 4	BS3-Physics Laboratory 0-0-4 2					10	3	10	17	23
	PYL2003 DC2-Mathematical Physics 3-1-0 4	COL100 GE5-Introduction to Computer Science 3-0-2 4	CWL101 BS4-The art and science of building molecules and materials 2-1-0 3	MTL101 BS5-Linear Algebra and Differential Equations 3-1-0 4	CMP100 BS6-Chemistry Laboratory 0-0-4 2					11	3	6	17	20
III	PYL2001 DC3-Classical Mechanics 3-1-0 4	ELL200X GE4-Digital Electronics 3-0-2 4	PYL2005 DC3-Quantum Mechanics I 3-1-0 4	PYL2007 DC4-Electrodynamics 3-1-0 4	HUL200XSSW00X DC5-Engineering Physics Laboratory-I 0-0-6 3	PYP2001 DC5-Engineering Physics Laboratory-II 0-0-6 3				15	3	8	22	26
	PYL2002 DC6-Optics & Photonics 3-1-0 4	PYL2004 DC7-Statistical Physics 3-1-0 4	PYL2006 DC8-Quantum Mechanics II 3-1-0 4	GE6-Engineering Visualisation 1-0-2 2	BS9 DC9-Engineering Physics Laboratory-II 0-0-6 3	PYP2002 DC9-Engineering Physics Laboratory-III 0-0-6 3	SBP00X BS7-Experimental Biology for Engineers 0-0-2 1	SBL00X BS8-Biology for Engineers: Microbes in health and disease 2-0-0 2		14	4	10	23	28
V	PYL3001 DC10-Artificial Intelligence and its Applications in Physics 3-1-0 4	PYL3003 DC10-Condensed matter 3-1-0 4	PYL3005 DC12-Computational Physics 3-0-2 4	HUL200XSSW00X DC13-Experimental Methods in Physics 3-0-0 3	PYL3007 DC13-Experimental Methods in Physics 3-0-0 3	PYP3001 DC14-Engineering Physics Laboratory-III 0-0-6 3				15	2	8	21	25
	PYL3002 DC15-Nuclear and elementary particle physics 3-1-0 4	PYL300X DE1 3-0-0 3	PYL3002 DC16-BTP-ICapstone Project 0-0-6 3	HUL200XSSW00X DE3 3-0-0 3	PYL300X DE4 3-0-0 3	PYP3002 DC17-Engineering Physics Laboratory-IV 0-0-6 3	GE8-Manufacturing for Product Innovation 1-0-2 2			13	2	14	22	29
VII	PYL300X DE 2 3-0-0 3	PYL300X DE 2 3-0-0 3	PYL300X DE 3 3-0-0 3	PYL300X DE 3 3-0-0 3	PYL300X DE 4 3-0-0 3					15	0	0	15	15
	PYL300X DE5 3-0-0 3	PYL300X DE6 3-0-0 3	PYL300X DE6 3-0-0 3	PYL300X DE6 3-0-0 3	HUL300XSSW00X DE 3 3-0-0 3					15	0	0	15	15

22. Average Contact Hours per Faculty *per Week*, for this Programme

2.41 = 1.33 (DC+DE)+1.08(BS) (BS elective not included)

	$\frac{112 \times 4}{42 \times 8} = 1.33 \quad \frac{91 \times 1}{42 \times 2} = 1.08$
23. Average Credit Students per Faculty per Semester, for this Programme	134.4 = 60 (DC+DE) + 74.4 (BS) (BS elective not included) $\frac{63 \times 80 \times 4}{42 \times 8} = 60 \quad \frac{1250 \times 5 \times 1}{42 \times 2} = 74.4$
24. If the program is a revision of an existing program, please list the major changes made.	We have introduced new core courses in AI, Experimental methods, Nuclear & elementary particle physics and Quantum Mechanics II in place of mathematical physics II, optics and photonics II and solid state physics II. The number of core course credit have been increased from 58 to 62 credits. The number of DE have been increased from 12 to 18 credits. BTP-I/Capstone project have been moved to 6th semester from 7th semester.
25. Please elaborate on,	
a) how flexibility for the students has increased?	New courses in both theory, computation and experiment have been introduced as core courses. New elective courses have been introduced keeping in mind keeping in mind the vision of the institute.
b) how engagement and interaction with the student have increased?	The electives in the program have been increased for more effective interaction with the subject expert.
c) how hands-on learning is emphasized in the program?	New laboratory courses have been introduced for the students to have a well-rounded education.