## B.TECH. (ENGINEERING PHYSICS) COMPONENT WISE DISTRIBUTION

Main Curriculum	Sub Components	<b>Approved Credits</b>	Approved	Proposed Credits for	<b>Proposed Credits</b>
Components	Sub Components	for B.Tech.	<b>Credits Range</b>	B.Tech. by Department	Range
	HSSC	5		5	
	HSSEC	6		6	
	MC	3		3	
<b>Institute Core</b>	BSC	12-20	52-58	16	53
Course	ESC	8-20	32-36	12	53
	DSC	4		4	
	ESSC	3		3	
	TM	4		4	
	CCCC	40-48		48	
	AI/ML	2		2	
Program Core Course	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4	87-91	4	90
Course	Technical Communication	2		2	
	BTP/Entrepreneurship/ Project-based internship/PEC	6-10		6	
	PEC	22-26		22	
	TEB	6-8		6	
	OEC	9-12	9-12	9-12	9-12
	CORE	2	2	2	2
	Total	150-1	160	154-1	57
	MSC/DHC	18/2	20	18/2	0
	Grand Total			172-1	77

# DEPARTMENT OF PHYSICS INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : 122 B.Tech. (Engineering Physics)

Department : PH Physics

#### **Teaching Scheme**

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year – wise)
1	23	20	43
2	21/22	22/23	43/45
3	24/25	22	46/47
4	16	6	22
Grand Total			154-157
Total with MSC/DHC	With addition 18-2	20 credits	172-177

Non-Credit Elements	Components	Maximum Units	Minimum Units	Comments
(NCE)	Discipline (DIS)	16	8	To be evaluated by DoSW
	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	24	8	1-week internship= 1 unit (to be coordinated by the deptt. /Centres/School)
	Participation in professional development programs by Industry experts/ field experts (PPD-1 & PPD-2)	8	4	To be coordinated by the departments/Centres/school (2 <sup>nd</sup> & 3 <sup>rd</sup> Years)
		Minimum non-credit	units to be earned	d: 24

Program Code : 122 - B.Tech.(Engineering Physics)

**Department**: **Department** of **Physics** 

Year : I

		Teaching Scheme				Contac ırs/We			xam cation cs.)		Relat	ive Weiş	ghts(%)	
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
	•		(Au	tumn)	l							•		
1	HSI-101	Soft Skills	HSSC	3	2	0	2	2	0	10-25	25	15-25	30-40	-
2	MAI-101	Mathematics-I	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHI-101	Physics-I	BSC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
4	PHC-101	Computer Programming	PCC	4	3	0	2	3	-	10-25	25	15-25	30-40	-
5	TMI-102	Tinkering and Mentoring*	TMI	2	-	-	-	-	-	60	40	-	-	-
6	TMI-103	Basics of IP and Entrepreneurship*	TMI	2	2	0	0	2	-	50	-	-	50	-
7	EEE-102	Basic Electrical Engineering	ESC	4	3	1	2/2	3	0	15-30	20	15-25	30-40	-
		Total		23										
			(Sp	oring)										
1	IKS-102	Indian Knowledge System	HSSC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	MAI-102	Mathematics-II	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	ESS-102	Environmental Science and Sustainability	ESSC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-102	Mechanics and Relativity	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	PHC-104	Analog Electronics	PCC	4	3	1	0	3	0	10-25	25	15-25	30-40	-
6	EEE-103	Measurements and Transducers	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
		Total		20										

<sup>\*</sup> These two courses were taught as single course (TMI-101: Tinkering & Mentoring – 4 Credits) for 2023-24 admitted students

Program Code : 122 - B.Tech. (Engineering Physics)

Department : Department of Physics

Year : II

		Teaching Scheme			_	Contac urs/W		Du	xam ration rs.)		Relat	ive Weiş	ghts (%)	١
S. No.	Subject Code	Course Title	Subject Area	Credits	L	Т	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
	1		(Autı	ımn)										
1	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
2	MAB-104	Mathematical Methods	BSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHC-203	Thermal & Statistical Physics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-205	Digital Electronics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	PHC-207	Physics Lab – II	PCC	2	0	0	4	-	-	-	50	-	-	50
6	HSSEC-I	HSS Elective Course	HSSEC	3										
7	OEC-I	Open Elective Course	OEC	3/4										
		Total		21/22										
			(Spri	ing)				I.	•	1		1	•	
1	DAI-101	Data Science	DSC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	ECE-102	Introduction to Communication System	ESC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHC-202	Mathematical Physics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-204	Quantum Mechanics - I	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	PHC-206	Applied Optics	PCC	4	3	0	2	3	0	10-25	25	15-25	30-40	-
6	OEC-II	Open Elective Course	OEC	3/4										
		Total		22/23										

Program Code : 122 - B.Tech. (Engineering Physics)

Department : Department of Physics

Year : III

		Teaching Scheme				Conta urs/W		Exam D (Hr			Relati	ve Weig	hts (%)	
S. No.	Subject Code	Course Title	Subject Area	Credits	L	Т	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
			(Aut	tumn)	•	•	•	•	•	•			•	
1	PHC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
2	PHC-301	Atomic and Molecular Spectroscopy	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	PHC-303	Signals and Systems	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4	PHC-391	Technical Communication	PCC	2	0	0	4	-	-	-	50	-	-	50
5	PHC-399	Community Outreach	CORE	2								100		
6	PHT-I	Talent Enhancement Course-I	TEB	2	0	1	3	-	-			100		
7	HSSEC-II	HSS Elective Course	HSSEC	3										
8	OEC-III	Open Elective Course	OEC	3/4										
9	PHL-I	Program Elective Course –I	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
		Total		24/25										
			(Spi	ring)		•	•			•	•			
1	PHC-300	Engineering Analysis and Design /Lab Based Project/ Practical Problems	PCC	4										
2	PHC-302	Condensed Matter Physics	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
3	PHC-304	Nuclear Physics & Applications	PCC	3	3	0	0	3	0	20-35	_	20-30	40-50	-
4	PHC-306	Microprocessor and Microcontroller	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5	PHC-308	Quantum Electronics and Devices	PCC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
6	PHT-II	Talent Enhancement Course-II	TEB	4	1	1	3	-	-			100		
7	PHL-II	Program Elective Course -II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
8	MSC-I	Minor Specialization Course - I	MSC	3/4										
		Total		22/25-26										

Program Code : 122 - B.Tech. (Engineering Physics)

Department : Department of Physics

Year : IV

		Teaching Scheme				Contours/	tact Week	Du	Exam uration (Hrs.)		Rela	tive Wei	ghts (%)	)
S. No.	Subject Code	Course Title	Subject Area	Credits	L	Т	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
			(A	utumn)		I	<u> </u>	ı					I	<u> </u>
1	PHL-III	Program Elective Course –III	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
2	PHL-IV	Program Elective Course –IV	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
3	PHL-V	Program Elective Course –V	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4	PHL-VI	Program Elective Course -VI	PEC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5	MSC-II	Minor Specialization Course -II	MSC	3/4										
6	MSC-III	Minor Specialization Course -III	MSC	3/4										
		Total		16/22-24										
			(S <sub>1</sub>	pring)		ı	1	1	<u> </u>	1	•	II.		l
1	PHP-400/ PHL	BTP/Project-Internship/Entrepreneurship/ PEC*	PCC/PEC*	6								100		
3	MSC-IV	Minor Specialization Course -IV	MSC	3/4										
4	MSC-IV	Minor Specialization Course -IV	MSC	3/4										
		Total		6/12-14										

### **List of Program Elective Courses**

## PECs (Programme Elective Courses) in 3<sup>rd</sup> year:

		Teaching Scheme				Contac urs/W		Dura	am ation rs.)		Relati	ve Weigl	nt (%)	
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practica 1	CWS	PRS	MTE	ETE	PRE
1.	PHC-311	Classical Electrodynamics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
2.	PHC-313	Classical Mechanics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
3.	PHC-314	Statistical Mechanics	PEC	3	3	0	0	3	0	20-35	ı	20-30	40-50	-
4.	PHC-316	Quantum Mechanics – II	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	PHL-305	Fiber and Integrated Optics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
6.	PHL-306	Accelerator Physics	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
7.	PHL-307	Essential Mathematics for AI	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
8.	PHL-308	Computer Architecture for AI	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
9.	PHL-309	Machine Learning	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
10.	PHL-310	Money, Banking and Financial Markets	PEC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
11.	PHL-311	Nuclear Instrumentation	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
12.	PHL-312	Numerical Techniques, including FEM, FDM, FDTD, FIM	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
13.	PHL-313	Solar Energy Materials and Devices	PEC											

### PECs (Programme Elective Courses) in 4<sup>th</sup> year:

		Teaching Scheme				Contac urs/W	-		am on (Hrs.)		Relati	ive Weigl	nt (%)	
S. No.	Subject Code	Course Title	Subject Area	Credits	L	Т	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
1	PHL-501	Nuclear Astrophysics	PCC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
2	PHL-502	Physics of Nano systems	PCC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
3	PHL-503	Super fluidity and Superconductivity	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
4	PHL-504	Fiber and Nonlinear Optics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
5	PHL-505	Quantum Optics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
6	PHL-506	Advanced Quantum Computing	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
7	PHL-507	Advanced topics in Mathematical Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
8	PHL-508	Introduction to Superstring Theory	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
9	PHL-509	Advanced Electroceramics Technology	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
10	PHL-510	Advanced Characterization Techniques	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
11	PHL-511	Atomic and Molecular Collision Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
12	PHL-512	A Primer in Quantum Field Theory	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
13	PHL-513	Astrophysics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
14	PHL-514	Solar-Terrestrial Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
15	PHL-515	General Relativity	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
16	PHL-516	Computational Nuclear Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
17	PHL-517	Particle Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
18	PHL-518	Advanced Atomic and Molecular Physics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
19	PHL-520	Quantum Theory of Solids	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
20	PHL-521	Weather Forecasting	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
21	PHL-522	Nuclear Instrumentation	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
22	PHL-523	Physics and Technology of Thin Films	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
23	PHL-524	Advanced Nuclear reactions	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
24	PHL-525	Semiconductor Photonics	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
25	PHL-526	Advanced Light Sources	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
26	PHL-527	Superconducting Radio Frequency for particle accelerators	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-

#### **List of Talent Enhancement Course**

		Teaching Scheme			I	Conta Hours/V		Exa Dura		]	Relati	ve Weig	ht (%)	
S. No.	Course Code	Course Title	Area	Cr.	L	T	P	Th.	Pr.	cws	PRS	MTE	ЕТЕ	PRE
			T	EB-A										
1	PHT-101	Experimental Techniques in Quantum Materials	TEB	2	0	1	3	-	-			100		
2	PHT-102	Ad. Experimental Techniques in Quantum Materials	TEB	4	1	1	3	-	-			100		
			T	EB-B										
1	PHT-103	Experimental Techniques in Laser Physics	TEB	2	0	1	3	_	_					
2	PHT-104	Ad. Experimental Techniques in Photonics	TEB	4	1	1	3	_	-	100				
			T	ЕВ-С	Г	Т		T	T	1				
1	PHT-105	Experimental Techniques in Gamma Spectroscopy	TEB	2	0	1	3	-	-			100		
2	PHT-106	Experimental Techniques in Charged Particle Spectroscopy	TEB	4	1	1	3	-	-			100		
			T	EB-D										
1	PHT-107	Methods and Experiments in Atmospheric and Space Physics	TEB	2	0	1	3	-	-			100		
2	PHT-108	Ad. Experimental Techniques in Atmospheric and Space Physics	TEB	4	1	1	3	-	-			100		
			T	EB-E										
1	PHT-109	Principles of Electroceramic Processing & Fabrication	TEB	2	0	1	3	-	-			100		
2	PHT-110	HT-110 Advanced Techniques of Electroceramic Characterization TEB 4 1 1 3 100												

			Tì	EB-F						
1	PHT-111	Theoretical & Computational Techniques	TEB	2	0	1	3	-	-	100
2	PHT-112	Ad. Computational Techniques	TEB	4	1	1	3	-	-	100

#### **Minor Specialisation Courses**

S.No.	Code	Course title	Semester	Credits
1	PHC-102	Mechanics and Relativity	Spring	3
2	PHC-206	Applied Optics	Spring	4
3	PHC-311	Classical Electrodynamics	Autumn	4
4	PHC-313	Classical Mechanics	Autumn	4
5	PHC-204	Quantum Mechanics - I	Spring	4
6	PHC-316	Quantum Mechanics - II	Spring	3
7	PHC-302	Condensed Matter Physics	Spring	3
8	PHC-308	Quantum Electronics and Devices	Spring	3