DEPARTMENT OF PHYSICS

5 year BSMS (Physics) with exit policy

Component wise distribution

Main Curriculum Components	**Sub Components**	**Approved Credits for 5 year BSMS**	**Approved Credits Range**	**Proposed credits for 5 year BSMS by Department**	**Proposed Credits Range**	**Approved Credits for 4 year BSMS exit**	**Approved Credits Range**	**Proposed credits for 4 year BSMS exit by Department**	**Proposed Credits Range**
Institute Core Course	HSSC	5	52-58	**5**	**53**	5	45-65	**5**	**53**
	HSSEC	6		**6**		6		**6**	
	MC	3		**3**		3		**3**	
	BSC	12-20		**16**		12-20		**16**	
	ESC	8-20		**12**		8-20		**12**	
	DSC	4		**4**		4		**4**	
	ESSC	3		**3**		3		**3**	
	TM	4		**4**		4		**4**	
Program Core Course	CCCC	52-62	127-133	**51**	**126**	40-48	82-100	**51**	**90**
	AI/ML	2		**2**		2		**2**	
	Engg. Analysis and design (design thinking based project)/Industry Oriented Problem Solving/ Lab based Project/ Practical Problem/ Case study	4		**4**		4		**4**	
	Technical Communication	2		**2**		2		**2**	
	BTP/Entrepreneurship/ Project-based internship/PEC	16		**16**		6-10		**6**	
	PEC	32-40		**45**		22-26		**19**	
	TEB	6-8		**6**		6-8		**6**	
	OEC	9-12	9-12	**9-12**	**9-12**	9-12	9-12	**9-12**	**9-12**
	CORE	2	2	**2**	**2**	2	2	**2**	**2**
	Total	**190-200**		**190-193**		**138-179**		**154-157**	
	MSC/DHC	**18/20**		**18/20**		**18/20**		**18/20**	
	Grand Total			**208-213**		**156-199**		**172-177**	

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
5 Years BSMS (Physics)

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	21	44
2	22/23	19/20	41/43
3	23/24	20	43/44
4	20	14	34
5	16	12	28
Grand Total			190/193
Total with Minor Specialization Courses	with additional 18-20 credits (mentioned in the parentheses)		208/213

	Components	Maximum	Minimum	Comments
	Discipline (DIS)	20	10	To be evaluated by DoSW
Non-Credit Elements (NCE)	NCC/NSS/NSO	8	4	To be evaluated by DoSW
	Internship (INT)	32	10	1 week internship= 1 unit (To be coordinated by departments/centres/school)
	Participation in professional development programs by Industry experts/ field experts (PPD -1, PPD-2 & PPD-3)	12	6	To be coordinated by departments/centres/school (2^{nd}, 3^{rd} and 4^{th} Years)
Minimum non-credit to be earned: 30				

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
4 Years BSMS (Physics) Exit

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**

Teaching Scheme

Year	Credits in Autumn Semester	Credits in Spring Semester	Credits (Year-wise)
1	23	21	44
2	22/23	19/20	41/43
3	23/24	20	43/44
4	20	6	26
Grand Total			**154-157**
Total with Minor Specialization Courses	**with additional 18-20 credits (mentioned in the parentheses)**		**172-177**

Non-Credit Elements (NCE)	Components	Maximum Units	Minimum Units	Comments
	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^{nd}& 3^{rd} Years)
Minimum non-credit units to be earned: 24				

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **I**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Autumn Semester														
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	-	20-35	-	20-30	40-50	-
3.	PHI-101	Physics - I	BSC	4	3	1	2/2	3	-	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.	ECE-101	Fundamentals of Electronics	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
		TOTAL		**23**										
Spring Semester														
1.	IKS-102	Indian Knowledge System	HSSC	2	2	0	0	2	-	20-35	-	20-30	40-50	-
2.	MAI-102	Mathematics - II	BSC	4	3	1	0	3	-	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.	CSE-101	Data Structure and Algorithm	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-102	Mechanics and Relativity	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-112	Atomic and Nuclear Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
7.	PHC-114	Physics Lab – I	PCC	2	0	0	4	-	4	-	50	-	-	50
		TOTAL		**21**										

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

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **II**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Autumn Semester														
1.	HSSEC-I	HSS Elective Course-I	HSSEC	3										
2.	OEC-I	Open Elective Course-I	OEC	3/4										
3.	MSI-101	Fundamentals of Management	MC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
4.	ECE-103	Digital Electronics	ESC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	MAB-104	Mathematical Methods	BSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-203	Thermal & Statistical Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
7.	PHC-207	Physics Lab – II	PCC	2	0	0	4	-	4	-	50	-	-	50
		TOTAL		**22/23**										
Spring Semester														
1.	DAI-101	Data Science	DSC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
2.	OEC-II	Open Elective Course-II	OEC	3/4										
3.	PHC-204	Quantum Mechanics - I	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4.	PHC-214	Optics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-202	Mathematical Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-212	Physics Lab – III	PCC	2	0	0	4	-	4	-	50	-	-	50
		TOTAL		**19/20**										

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **III**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Autumn Semester														
1.	HSSEC-II	HSS Elective Course	HSSEC	3										
2.	OEC-III	Open Elective Course-III	OEC	3/4										
3.	PHC-351	Fundamentals of AI/ML	PCC	2	2	0	0	2	0	20-35	-	20-30	40-50	-
4.	PHC-311	Classical Electrodynamics	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-313	Classical Mechanics	PCC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	PHC-315	Physics Lab –IV	PCC	2	0	0	4	-	4	-	50	-	-	50
7.	PHC-399	Community Outreach	CORE	2						100				
8.	PHL-I	Program Elective Course-I	PEC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
		Total		**23/24**										
Spring Semester														
1.	PHC-302	Condensed Matter Physics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
2.	PHC-391	Technical Communication	PCC	2	0	0	4	0	-	-	50	-	-	50
3.	PHC-314	Statistical Mechanics	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
4.	PHC-316	Quantum Mechanics – II	PCC	3	3	0	0	3	-	20-35	-	20-30	40-50	-
5.	PHC-318	Physics Lab – V	PCC	3	0	0	6	-	3	-	50	-	-	50
6.	PHL-II	Program Elective Course-II	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
7.	PHT-I	Talent Enhancement-I	TEB	2	0	1	3	-	-	100				
8.	MSC/DHC-I	Minor Specialization Course-I/Departmental Honours Course-I	MSC/DHC	3/4										
		Total		**20/ 23-24**										
Note: Students willing to exit with BS Degree in Physics must inform to Dean (Academic Affairs) after completion of 6th semester														

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Autumn Semester														
1.	PHC-400	Engg. Analysis and Design/Lab Based Project/Practical Problems	PCC	4	-	-	-	0	0	20-35	-	20-40	60-80	0
2.	PHT-II	Talent Enhancement-II	TEB	4	1	1	3	-	-	100				
3.	PHL-III	Program Elective Course-III	PEC	4	3	0	0	3	-	20-35	-	20-30	40-50	-
4.	PHL-IV	Program Elective Course-IV	PEC	4	3	0	0	3	-	20-35	-	20-30	40-50	-
5.	PHL-V	Program Elective Course-V	PEC	4	3	0	0	3	-	20-35	-	20-30	40-50	-
6.	MSC/DHC -II	Minor Specialization Course-II/Departmental Honours Course-II	MSC/ DHC	3/4										
		Total		**20/23-24**										
Spring Semester														
1.	PHL-VI	Program Elective Course-VI	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
2.	PHL-VII	Program Elective Course-VII Project*	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
3.	PHC-402	Advanced Mathematical Physics	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
4.	PHC-404	Semiconductor Devices	PCC	4	3	1	0	3	0	20-35	-	20-30	40-50	-
5.	MSC/DHC -III	Minor Specialization Course-III/Departmental Honours Course-III	MSC/ DHC	3/4										
		Total		**14/17-18**										

*Project only for 8 and above CGPA.

DEPARTMENT OF PHYSICS

Program Code : **324 -BS-MS (Physics)**
Department : **PH – Physics**
Year : **V**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Autumn Semester														
1.	PHL-VIII	Program Elective Course-VIII	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
2.	PHL-IX	Program Elective Course-IX	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
3.	PHL-X	Program Elective Course-X	PEC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
4.	PHP-501	Thesis stage - I	PCC	4	-	-	-	-	-	-	-	30	70	0
5.	MSC/DHC-IV	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
		Total		**16/19-20**										
Spring Semester														
1.	PHP-502	Thesis stage - II	PCC	12	-	-	-	-	-	-	-	30	70	0
2.	MSC/DHC-V	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
		Total		**12/15-16**										

DEPARTMENT OF PHYSICS
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Program Code : **324 -BS-MS (Physics) with Exit Policy**
Department : **PH – Physics**
Year : **IV**

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Autumn Semester														
1.	PHC-400	Engg. Analysis and Design/Lab Based Project/Practical Problems	PCC	4	-	-	-	0	0	20-35	-	20-40	60-80	0
2.	PHT-II	Talent Enhancement-II	TEB	4	1	1	3	-	-	100				
3.	PHL-III	Program Elective Course-III	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
4.	PHL-IV	Program Elective Course-IV	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
5.	PHL-V	Program Elective Course-V	PEC	4	3	1	0	3	-	20-35	-	20-30	40-50	-
6.	MSC/DHC-II	Minor Specialization Course-II/Departmental Honours Course-II	MSC/DHC	3/4										
7.	MSC/DHC-III	Minor Specialization Course-III/Departmental Honours Course-III	MSC/DHC	3/4										
		Total		**20/26-28**										
Spring Semester														
1.	PHP-400/PHL	Project/Internship Based Project/Entrepreneurship/PEC*	PCC /PEC*	6						100				
2.	MSC/DHC-IV	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
3.	MSC/DHC-V	Minor Specialization Course-IV/Departmental Honours Course-IV	MSC/DHC	3/4										
		Total		**6/12-14**										

*Project only for 8 and above CGPA.

List of Program Elective Courses

PECs (Programme Elective Courses) in 3rd year:

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	**Subject Code**	**Course Title**	**Subject Area**	**Credits**	**L**	**T**	**P**	**Theory**	**Practical**	**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
Autumn Semester														
1.	PHC-301	Atomic and Molecular Spectroscopy	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
2.	PHC-303	Signals and systems	PEC	3	3	0	-	3	-	20-35	-	20-30	40-50	-
3.	PHC-304	Nuclear Physics & Applications	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
4.	PHC-306	Microprocessor and microcontroller	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
5.	PHC-308	Quantum Electronics and Devices	PEC	3	3	0	0	3	0	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	4	3	1	-	3	-	20-35	-	20-30	40-50	-
8.	PHC-308	Computer Architecture for AI	PEC	3	3	0	0	3	0	20-35	-	20-30	40-50	-
9.	PHL-309	Machine Learning	PEC	3	3	1	0	3	0	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	4	3	1	-	3	-	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 4th and 5th years:

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs.)		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
Autumn Semester														
1	PHL-501	Nuclear Astrophysics	PCC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
2	PHL-502	Physics of Nanosystems	PCC	4	3	1	-	3	0	20-35	-	20-30	40-50	-
3	PHL-503	Superfluidity 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					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	**Course Code**	**Course Title**	**Area**	**Cr.**	**L**	**T**	**P**	**Th.**	**Pr.**	**C W S**	**PRS**	**MTE**	**E T E**	**P R E**
(TEB-I)														
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				
(TEB-II)														
1	PHT-103	Experimental Techniques in Laser Physics	TEB	2	0	1	3	-	-	100				
2	PHT-104	Ad. Experimental Techniques in Photonics	TEB	4	1	1	3	-	-	100				
(TEB-III)														
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				
(TEB-IV)														
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				
(TEB-V)														

1	PHT-109	Principles of Electroceramic Processing & Fabrication	TEB	2	0	1	3	-	-	100
2	PHT-110	Advanced Techniques of Electroceramic Characterization	TEB	4	1	1	3	-	-	100
(TEB-VI)										
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