

Curriculum and Course Contents
of
B.Tech.,
M.Sc. ,
And
Ph.D.

M.Sc. Physics

<i>Year/Sem</i>	<i>Course code</i>	<i>Title</i>	<i>Credits</i>
I Year I Sem	PH 401	Classical Mechanics	3-1-0-8
	PH 403	Quantum Mechanics I	3-1-0-8
	PH 407	Mathematical Physics I	3-1-0-8
	PH 405	Electronics	2-1-0-6
	PH 434	Programming Lab	1-0-3-5
	PH 443	Electronics Lab	0-0-3-3
	Total credits: 38		
I Year II Sem	PH 410	Statistical Physics	2-1-0-6
	PH 422	Quantum Mechanics II	2-1-0-6
	PH 408	Mathematical Physics II	3-1-0-8
	PH 418	Introduction to Condensed Matter Physics	2-1-0-6
	PH 424	Electromagnetic Theory I	2-1-0-6
	PH 441	General Physics Lab	0-0-3-3
	Total credits: 35		

<i>Year/Sem</i>	<i>Course code</i>	<i>Title</i>	<i>Credits</i>
II Year I Sem	PH 515	Introduction to Atomic and Molecular Physics	2-1-0-6
	PH 505	Introduction to Nuclear and Particle Physics	2-1-0-6
	PH 527	Physics Lab (Solid State and Nuclear Physics)	0-0-6-6
	PH 595	M.Sc. Project stage I or Departmental Elective X	2-1-0-6
		Departmental Elective I	2-1-0-6
		Departmental Elective I	2-1-0-6
	Total credits: 36		
II Year II Sem	PH 510	Electromagnetic Theory II	2-1-0-6
	PH 530	Light Matter Interaction	2-1-0-6
	PH 512	Physics Lab (Optics and Spectroscopy)	0-0-3-6
	PH 438	M.Sc. Project stage II or Departmental Elective XX	2-1-0-6
		Departmental Elective III	2-1-0-6
		Departmental Elective IV	2-1-0-6
	Total credits: 36		

Total Credits: 145

No. of Dept. electives required: 6 (including Projects)

List of prescribed courses under Electives X, I, II (odd semester)

Number	Title	Number	Title
PH 523	Quantum Mechanics III	PH 565	Semiconductor Physics
PH 543	Advanced Statistical Mechanics	PH 567	Nonlinear Dynamics
PH 549	Physics of Biological Systems	PH 569	Applied Solid State Physics
PH 557	Theoretical Condensed Matter physics	PH 575	Nanoscience: Fundamentals to Fabrication
PH 561	Ultra fast Sciences	PH 817	Specialized topics in QFT and Beyond Standard Model Physics
PH 563	Group Theory Methods in Physics	PH 821	Gravitational Wave Physics and Astronomy

You have to choose electives from any 2 baskets (only) [suggested]

Basket 1

QM III
 Group theory
 Adv. Stat. mech.
 Nonlinear Dyn.
 Theort. Cond. Mat.

Basket 2

Appl. Solid State
 Semiconductor phys.
 Ultrafast sciences
 Nonlinear Dyn.
 Theo. Cond. Mat. Phys.

Basket 3

Phys. of Bio sys.
 Theort. Cond. Mat.
 Adv. Stat. mech.
 The. Con. Mat. Phys
 Appl. Solid State

List of prescribed courses under Elective XX, III, IV (even semester)

PH 500	Thin film Physics and Technology	PH 562	Continuum Mechanics
PH 534	Quantum Information and Computing	PH 564	Methods in Experimental Nuclear and Particle Physics
PH 540	Elementary Particle Physics	PH 566	Advanced Simulation Techniques in Physics
PH 544	General Theory of Relativity	PH 572	Special Topics in Elementary Particle Physics
PH 546	Quantum Optics	PH 576	Nanoscale Quantum Transport
PH 550	Soft Matter Physics	PH 578	Nanodevices and Applications
PH 554	Computational Many Body Physics	PH 580	Magnetism and Superconductivity
PH 556	Astrophysics		

You have to choose electives from any 2 baskets (only) [suggested]

Basket 1

Ele. Part. Phys.
 Quan. Compt
 Gen. The. Rel.
 Astro Phys.
 Methods Nul. Pat. Phys.
 Special Topics in Ele. Part.

Basket 2

Quan. Compt.
 Magn. and Supercod.
 Compu. Many body phys.
 Nano Quan. Trans

Basket 3

Soft Matter Phys.
 Quan. Compt.
 Quantum Optics
 Continuum Mech.
 Nano & Appl.

B. Tech. (Engineering Physics)

<i>Year/ Sem</i>	<i>Course code</i>	<i>Course Title</i>	<i>Credits</i>
I Year I Sem	CH 105	Organic + Inorganic Chemistry	3-1-0-4
	CH 107	Physical Chemistry	3-1-0-4
	CS 101 or BB 101	Computer Programming & Utilization or Biology	2-0-2-6
	MA 109	Calculus-1 (first half semester course)	3-1-0-4
	MA 111	Calculus-2 (second half semester course)	3-1-0-4
	ME 119 or ME 113	Engineering Graphics & Drawing or Workshop	0-1-3-5 or 0-0-4-4
	PH 107	Quantum Physics and applications	2-1-0-6
	PH 117 or CH 117	Physics or Chemistry Lab	0-0-3-3
		NCC/NSS/NSO	P/NP
	Total credits: 35/36		
I Year II Sem	CS 101 or BB 101	Computer Programming & Utilization or Biology	2-0-2-6
	EE 112	Introduction to Electronics- DIC	2-1-0-6
	MA 106	Linear Algebra (first half semester course)	2-1-0-4
	MA 108	Ordinary Differential Equations I (second half semester course)	2-1-0-4
	ME 119 or ME 113	Engineering Graphics & Drawing or Workshop	0-1-3-5 or 0-0-4-4
	PH 108	Basics of Electricity and Magnetism	2-1-0-6
	PH 117 or CH 117	Physics or Chemistry Lab	0-0-3-3
		NCC/NSS/NSO	P/NP
	Total credits: 34/33		

<i>Year/ Sem</i>	<i>Course code</i>	<i>Course Title</i>	<i>Credits</i>
II Year I Sem	PH 207	Introduction to Special Theory of Relativity	2-1-0-3
	PH 215	Thermal Physics	2-1-0-3
	PH 217	Classical Mechanics	2-1-0-6
	HS 101	Economics	3-0-0-6
	PH 219	Data Analysis and Interpretation	2-1-0-6
	MA 205	Complex Analysis (first half semester course)	3-1-0-4
	MA 207	Ordinary Differential Equation II (second half semester course)	3-1-0-4
	PH 231	Electronics Lab I (Basic circuits)	0-0-3-3
	PH 233	Electronics Lab II (Op-amp circuits)	0-0-3-3
	Total credits: 38		
II Year II Sem	PH 202	Waves, Oscillations and Optics	2-1-0-6
	PH 204	Quantum Mechanics I	3-1-0-8
	MA 214	Introduction to Numerical Analysis	3-1-0-8
	PH 230	Electronics Lab III (Digital Electronics)	1-0-3-5
	PH 232	General Physics Lab	0-0-3-3
	EE 224	Digital Systems	2-1-0-6
	Total credits: 36		

<i>Year/Sem</i>	<i>Course code</i>	<i>Title</i>	<i>Credits</i>
III Year I Sem	PH 421	Photonics	2-1-0-6
	PH 423	Quantum Mechanics II	2-1-0-6
		Department Elective I	2-1-0-6
	HS 30X	HSS core course	2-1-0-6
	PH 435	Electronics Lab IV (Microprocessors)	1-0-3-5
	Total credits: 29		
III Year II Sem		Department Elective II	2-1-0-6
		Institute elective I	2-1-0-6
	PH 436	Introduction to Condensed Matter Physics	2-1-0-6
	PH 438	Statistical Physics	2-1-0-6
	PH 444	Electromagnetic Theory	2-1-0-6
	PH 446	Physics Lab (Solid State and Nuclear Physics)	0-0-3-3
	Total credits: 33		

<i>Year/Sem</i>	<i>Course code</i>	<i>Title</i>	<i>Credits</i>
		Institute elective II	2-1-0-6
IV Year I Sem	PH 587	BTP-1 or Department Elective III	2-1-0-6
	PH 515	Introduction to Atomic and Molecular Physics	2-1-0-6
	PH 505	Introduction to Nuclear and Particle Physics	2-1-0-6
	PH 517	Methods in Analytical Techniques	2-0-2-6
	PH 447	Physics Lab (Optics and spectroscopy)	0-0-3-3
	Total credits: 33		
IV Year II Sem	PH 588	BTP-II or Department Elective IV	2-1-0-6
		Department Elective V	2-1-0-6
	PH 574	Physics of Semiconductor Devices	2-1-0-6
	ES 200	Environmental Studies: Science and Engineering	3-0-0-3
	HS 200	Environmental Studies	3-0-0-3
		Institute Elective III	2-1-0-6
	Total credits: 30		

Total credits (minimum) = 268

No. of Institute electives = 3

No. of Department electives = 5 (including SLP & BTPs)

List of prescribed courses under Electives I, III (odd semester)

Number	Title	Number	Title
PH 523	Quantum Mechanics III	PH 565	Semiconductor Physics
PH 543	Advanced Statistical Mechanics	PH 567	Nonlinear Dynamics
PH 549	Physics of Biological Systems	PH 569	Applied Solid State Physics
PH 557	Theoretical Condensed Matter physics	PH 575	Nanoscience: Fundamentals to Fabrication
PH 561	Ultra fast Sciences	PH 817	Specialized topics in QFT and Beyond Standard Model Physics
PH 563	Group Theory Methods in Physics	PH 821	Gravitational Wave Physics and Astronomy

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Basket 2

Appl. Solid State
 Semiconductor phys.
 Ultrafast sciences
 Nonlinear Dyn.
 Theo. Cond. Mat. Phys.

Basket 3

Phys. of Bio sys.
 Theort. Cond. Mat.
 Adv. Stat. mech.
 The. Con. Mat. Phys
 Appl. Solid State

List of prescribed courses under Elective II, IV, V (even semester)

PH 500	Thin film Physics and Technology	PH 556	Astrophysics
PH 530	Light Matter Interaction - (core for M.Sc)	PH 562	Continuum Mechanics
PH 534	Quantum Information and Computing	PH 564	Methods in Experimental Nuclear and Particle Physics
PH 540	Elementary Particle Physics	PH 566	Advanced Simulation Techniques in Physics
PH 544	General Theory of Relativity	PH 572	Special Topics in Elementary Particle Physics
PH 546	Quantum Optics	PH 576	Nanoscale Quantum Transport
PH 550	Soft Matter Physics	PH 578	Nanodevices and Applications
PH 554	Computational Many Body Physics	PH 580	Magnetism and Superconductivity

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 Special Topics in Ele. Part.

Basket 2

Quan. Compt.
 Magn. and Supercod.
 Compu. Many body phys.
 Nano Quan. Trans
 Light Matter Int.

Basket 3

Soft Matter Phys.
 Quan. Compt.
 Quantum Optics
 Continuum Mech.
 Nano & Appl.

B.Tech.- M.Tech. Dual Degree Program

In addition to the 4 year B.Tech. credits, Dual Degree students have to do 8 additional electives of which the following 3 theory electives and PH 570 lab are compulsory. They must also do the SLP and the two projects. The extra credits for DD is 126. (8x6+6+30+42=126). Total credits =268+126= 394. The extra courses are given below:

Course Code	Title	Credits
PH 500	Thin Film Physics and Technology	2-1-0-6
PH 575	Nanoscience: Fundamentals to Fabrication	2-1-0-6
PH 576	Nanoscale Quantum Transport	2-1-0-6
PH 570	Advanced Lab Techniques in Nanoscience	0-0-6-6
PH 303	Supervised Learning	2-1-0-6
PH 591	Dual Degree Project – I	30
PH 592	Dual Degree Project – II	42
	Department Elective - I	2-1-0-6
	Department Elective - II	2-1-0-6
	Department Elective - III	2-1-0-6
	Department Elective - IV	2-1-0-6
Total Credits: 126		

Ph.D. courses (Jan 2019 onwards)

Group A	Group B
ODD SEMESTER (July)	ODD SEMESTER (July)
Semiconductor Physics-PH 565	Methods in Analytical Techniques – PH 517
Mathematical Physics-I – PH 407 (8 credits)	Advanced Statistical Mechanics – PH 543
Quantum Mechanics III -PH 523	Applied Solid State Physics – PH 569
Non-linear Dynamics – PH 567	Ultrafast Sciences - PH 561
Photonics - PH 421	Group Theoretical Methods in Physics- PH 563
Introduction to Nuclear and Particle Physics- PH 505	Physics of Biological Systems - PH 549
Theoretical Condensed Matter Physics- PH 557	Data analysis and Interpretation- PH 219
Introduction to Atomic and Molecular Physics - PH 515	
Nanoscience: Fundamentals to Fabrication - PH 575*	
EVEN SEMESTER (January)	EVEN SEMESTER (January)
Introduction to Condensed Matter Physics – PH 418	Physics of Quantum Devices – PH 536
Quantum Mechanics II – PH 422	Elementary Particle Physics – PH 540
Electromagnetic Theory II - PH 510	Quantum Information and Computing – PH 534
Advanced Simulation Techniques in Physics- PH 566** (8 credits)	Methods in Experimental Nuclear and Particle Physics- PH 564
Laboratory Techniques- PH 804 (8 credits)	Thin film Physics and Technology – PH 500
Astrophysics – PH 556	Nanoscale Quantum Transport - PH 576
Programming Lab- PH 434 (5 credits)**	Special topics in Elementary Particle Physics -PH 572
Light Matter Interaction – PH 530	Computational Many Body Physics- PH 554
Nanodevices & Applications- PH 578*	Soft Matter Physics – 550
Continuum Mechanics -PH 562	General Theory of Relativity- PH 544
Statistical Physics - PH 410	Quantum Optics – PH 546
Mathematical Physics II - PH 408 (8 credits)	Magnetism and Superconductivity- PH 580

*you can take either Nanodevices & Applications - PH 578 **OR** Nanoscience: Fundamentals to Fabrication - PH 575. Both will not be allowed to credit.

** You can take either one of these.

PhD students with M.Sc. have to complete 34 credits. This includes 4 credits of a seminar course (PHS 801/802). Regarding the theory courses, you have to take at least 2 from each of the two groups. One course can be taken from outside the dept. In addition, all Ph.D. students should pass PH 899 in their first year. Those with M.Tech./M.E need to do only 16 credits, while those with B.Tech./B.E./B.S. need to do 44 credits. The credits requirements for PMRFs are the same as those of other students.