



## MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: **Department of Physics, Maharaja Ranjit Singh Punjab Technical University, Bathinda**

Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Electricity and Magnetism</u></b>	<b>Subject Code: <u>BPHYS1-101</u></b>	<b>Semester: <u>1<sup>st</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
<b>CO1</b>	Understanding the concepts of electric field, magnetic field, potentials, dielectric and magnetic properties of matter, electromagnetic induction and electric circuits.	3	2	1	2	2	2	2	3
<b>CO2</b>	Skill enhancement to solve numerical problems related with Electricity and Magnetism.	2	3	2	3	1	1	2	2
<b>CO3</b>	Apply knowledge of Electricity and Magnetism to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
<b>CO4</b>	To inculcate and develop the ability to think abstractly.	2	3		2	2	1	2	2

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%      2. Moderate (Medium) – above 30% and upto 70%      3. Substantial (High) – above 70%



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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Electricity and Magnetism Lab</u></b>	<b>Subject Code: <u>BPHYS1-104</u></b>	<b>Semester: <u>1<sup>st</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to verify the concepts/laws of Electricity and Magnetism.	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	1	3	2	2	1	2	2
CO3	Skill enhancement by solving experimental problems.	1	2	1	2	2	2	2	2
CO4	To inculcate the spirit of team work.	1	2	2	2	1	2	2	3

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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Mechanics</u></b>	<b>Subject Code: <u>BPHYS1-102</u></b>	<b>Semester: <u>1<sup>st</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understanding the concepts of fundamentals of dynamics, gravitation and central force motion, oscillations, and special theory of relativity.	3	2	1	2	2	2	2	3
CO2	To analyse and solve numerical problems in mechanics.	2	3	2	3	1	1	2	2
CO3	Apply knowledge of Mechanics to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
CO4	To inculcate and develop the ability to think abstractly.	2	3	1	2	2	1	2	2

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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Mechanics Lab</u></b>	<b>Subject Code: <u>BPHYS1-106</u></b>	<b>Semester: <u>1<sup>st</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P O <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to verify the concepts/laws of Mechanics.	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	1	3	2	2	1	2	2
CO3	Skill enhancement by solving experimental problems.	1	2	1	2	2	2	2	2
CO4	To inculcate the spirit of teamwork.	1	2	2	2	1	2	2	3

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### COs, POs, PSOs Mapping

<b>Subject: <u>Computational Physics Skills</u></b>	<b>Subject Code: <u>BPHYS1-108</u></b>	<b>Semester: <u>1<sup>st</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to understand the concept of computational Physics.	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude.	2	1	3	2	2	1	2	2
CO3	Skill enhancement by solving numerical problems.	1	2	1	3	2	2	2	2
CO4	To inculcate the spirit of teamwork.	1	2	2	2	1	2	2	3

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## COs, POs, PSOs Mapping

<b>Subject: <u>Organic Chemistry -I</u></b>	<b>Subject Code: <u>(BCHMS1-201)</u></b>	<b>Semester: <u>1st</u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	To provide knowledge of physics behind the working mechanisms of different organs in human body.	3			3		3	3	
CO2	Understanding the impact of radiation exposure to human body. Use of radiation dosimeters, radiation detectors/instrumentations for radiation monitoring.	2	2	1	3	1	3	3	2
CO3	Use of X-rays for medical diagnosis and application of radiations for therapeutic uses.	2	2		3	2	3	3	2
CO4	Acquiring the knowledge of medical imaging, physical principles of diagnostic radiology, image quality and quality assurance.	2	2	1	3	2	3	3	2

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### COs, POs, PSOs Mapping

<b>Subject: <u>Thermal Physics</u></b>	<b>Subject Code: <u>BPHYS1-201</u></b>	<b>Semester: <u>2<sup>nd</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	To understand the concepts related to Thermal Physics and their applications.	3	2	1	2	2	2	2	3
CO2	Skill enhancement to solve numerical problems related with the laws of thermodynamics, entropy, and Maxwell's thermodynamic relations.	2	3	2	3	1	1	2	2
CO3	Apply knowledge of Thermal Physics to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
CO4	To inculcate and develop the ability to think abstractly.	2	3	1	2	2	1	2	2

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### COs, POs, PSOs Mapping

<b>Subject: <u>Thermal Physics Lab</u></b>	<b>Subject Code: <u>BPHYS1-204</u></b>	<b>Semester: <u>2<sup>nd</sup></u></b>
<b>Credit:<u>2</u></b>	<b>L T P <u>0 0 2</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Practical knowledge of concepts of Thermodynamics.	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	1	3	2	2	1	2	2
CO3	Learn to draw conclusions from data and develop skills in experimental design.	1	2	1	2	2	2	2	2
CO4	To inculcate the spirit of teamwork	1	2	2	2	1	2	2	3

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### COs, POs, PSOs Mapping

<b>Subject: <u>Waves and Optics</u></b>	<b>Subject Code: <u>BPHYS1-202</u></b>	<b>Semester: <u>2<sup>nd</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understanding the concepts of harmonic oscillations, wave motion, wave optics, interference and diffraction.	3	2	1	2	2	2	2	3
CO2	Skill enhancement to solve numerical problems related with Waves and Optics.	2	3	2	3	1	1	2	2
CO3	Apply knowledge of Waves and Optics to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
CO4	To inculcate and develop the ability to think abstractly.	2	3	1	2	2	1	2	2

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### COs, POs, PSOs Mapping

<b>Subject</b> <u>Physical Chemistry -II</u>	<b>Subject Code:</b> <u>(BCHMS1-202)</u>	<b>Semester:</b> <u>2nd</u>
<b>Credit:</b> <u>4</u>	<b>L T P</b> <u>4 0 0</u>	<b>Duration:</b> <u>60 Hrs.</u>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Systematic knowledge of concepts of thermodynamics and able to identify and describe energy exchange processes.	1		1	3				
CO2	Concept of chemical equilibrium, and the factors affecting the state of equilibrium	1		1	3				
CO3	Variation of system properties with composition.	1		1	3				
CO4	Solutions and their properties.	1		1					

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### COs, POs, PSOs Mapping

<b>Subject: <u>Waves and Optics Lab</u></b>	<b>Subject Code: <u>BPHYS1-205</u></b>	<b>Semester: <u>2<sup>nd</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to verify the concepts/laws of Waves and Optics	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	1	3	2	2	1	2	2
CO3	Skill enhancement by solving experimental problems.	1	2	1	2	2	2	2	2
CO4	To inculcate the spirit of teamwork	1	2	2	2	1	2	2	3

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2. Moderate (Medium) – above 30% and upto 70%
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### COs, POs, PSOs Mapping

<b>Subject: <u>Analog System and Applications</u></b>	<b>Subject Code: <u>BPHYS1-301</u></b>	<b>Semester: <u>3<sup>rd</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
<b>CO1</b>	Understanding the constitution of semiconducting diode, its types like LED, Zener diode, photodiode solar cell etc. and use of diodes as rectifiers.	2	1	3	3	3	3	2	3
<b>CO2</b>	In depth understanding to use Bipolar Junction Transistor in various configurations and its respective characteristics.	3	1	3	3	1	3	1	2
<b>CO3</b>	Learning the use of Coupled Amplifier and its characteristics.	3	1	2	1	1	3	3	3
<b>CO4</b>	Applications of Operational Amplifier in Analog systems.	3	1	3	1	1	2	3	3

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### COs, POs, PSOs Mapping

<b>Subject: <u>Analog System and Applications Lab</u></b>	<b>Subject Code: <u>BPHYS1-305</u></b>	<b>Semester: <u>3<sup>rd</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 2</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Power Supply and the role of Capacitance and Inductance filters.	1	1	3	2	1	1	1	1
CO2	Hands on in finding the characteristics of various semiconductors like diode, transistor, JFET, MOSFET, Tunnel Diode etc.	3	2	2	3	1	1	3	3
CO3	Realization of characteristics of BJTs by performing experiments.	1	1	1	3	1	1	3	2
CO4	Learning use of OpAmp in Adder, Subtractor, Differentiator and Integrator.	3	2	2	2	3	3	2	2

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3. Substantial (High) – above 70%



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### COs, POs, PSOs Mapping

<b>Subject: <u>Elements of Modern Physics</u></b>	<b>Subject Code: <u>BPHYS1-302</u></b>	<b>Semester: <u>3<sup>rd</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understanding the basic concepts in the development of modern physics.	3	2	1	1	1	2	3	1
CO2	To establish the basic foundation of students to study the advance level course like quantum physics, particle physics and high energy physics.	3	2	1	3	1	1	2	1
CO3	Skill enhancement to solve numerical problems related with basic quantum, nuclear and particle physics.	1	3	1	2	1	1	2	1
CO4	To provide the knowledge of the state-of-the-art of modern days lasers and their applications in daily life.	3	2	2	2	2	3	3	2

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### COs, POs, PSOs Mapping

<b>Subject: <u>Elements of Modern Physics Lab</u></b>	<b>Subject Code: <u>BPHYS1-306</u></b>	<b>Semester: <u>3<sup>rd</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to verify the concepts/laws of basic quantum, nuclear and particle physics.	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	1	3	2	2	1	2	2
CO3	Skill enhancement by solving experimental problems.	1	2	1	2	2	2	2	2
CO4	To inculcate the spirit of teamwork.	1	2	2	2	1	2	2	3

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**COs, POs, PSOs Mapping**

<b>Subject: <u>Quantum Mechanics and Applications</u></b>	<b>Subject Code: <u>BPHYS1-303</u></b>	<b>Semester: <u>3<sup>rd</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understanding of Time independent and Time dependent Schrodinger equations and their applications.	3	2	1	2	2	2	2	3
CO2	Skill enhancement to solve numerical problems related with Quantum Mechanics.	2	3	2	3	1	1	2	2
CO3	Apply knowledge of Quantum Mechanics to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
CO4	To inculcate and develop the ability to think abstractly.	2	3	1	2	2	1	2	2

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### COs, POs, PSOs Mapping

<b>Subject: <u>Quantum Mechanics Lab</u></b>	<b>Subject Code: <u>BPHYS1-307</u></b>	<b>Semester: <u>3<sup>rd</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 2</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to understand computationally and experimentally the various concepts of Quantum mechanics.	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	1	3	2	2	1	2	2
CO3	Learn to draw conclusions from data and develop skills in experimental design.	1	2	1	2	2	2	2	2
CO4	To inculcate the spirit of teamwork.	1	2	2	2	1	2	2	3

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%

2. Moderate (Medium) – above 30% and upto 70%

3. Substantial (High) – above 70%



## MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: **Department of Physics, Maharaja Ranjit Singh Punjab Technical University, Bathinda**

Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Digital System and Applications</u></b>	<b>Subject Code: <u>BPHYS1-401</u></b>	<b>Semester: <u>4<sup>th</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Secure first-hand idea of different components including both active and passive components to gain an insight into circuits using discrete components and also to learn about integrated circuits.	3	1	3	1	2	2	3	3
CO2	About analog systems and digital systems and their differences, fundamental logic gates, combinational as well as sequential and number systems.	3	3	3	2	3	1	1	3
CO3	Synthesis of Boolean functions, simplification and construction of digital circuits by employing Boolean algebra.	2	3	1	1	1	3	2	3
CO4	Sequential systems by choosing FlipFlop as a building block- construct multivibrators, counters to provide a basic idea about memory including RAM,ROM and also about memory organization.	2	3	3	1	3	3	3	2

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Department: **Department of Physics, Maharaja Ranjit Singh Punjab Technical University, Bathinda**  
Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Digital System and Applications Lab</u></b>	<b>Subject Code: <u>BPHYS1-404</u></b>	<b>Semester: <u>4<sup>th</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Learning logic GATES and their realization using diodes and transistors.	2	2	1	2	1	3	3	3
CO2	FlipFlop as a building block about memory including RAM,ROM	2	3	1	2	2	1	3	1
CO3	Microprocessor and assembly language programming with special reference to Intel $\mu$ P 8085.	1	2	1	1	2	1	3	3
CO4	Learning Adders, Subtractors, Shift Registers, and multivibrators using 555 ICs.	1	1	3	2	2	1	1	3

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Department: **Department of Physics, Maharaja Ranjit Singh Punjab Technical University, Bathinda**

Program: **B.Sc. (Hons.) Physics**

**COs, POs, PSOs Mapping**

<b>Subject: <u>Solid State Physics</u></b>	<b>Subject Code: <u>BPHYS1-402</u></b>	<b>Semester: <u>4<sup>th</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

<b>COs</b>	<b>Statement</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
<b>CO1</b>	A brief idea about lattice, unit cell, miller indices, reciprocal lattice, concept of Brillouin zones and diffraction of X-rays by crystalline materials.	2	2	3	1	3	1	3	3
<b>CO2</b>	Knowledge of lattice vibrations, phonons and in depth of knowledge of Einstein and Debye theory of specific heat of solids.	2	2	3	1	2	1	1	1
<b>CO3</b>	Understanding above the band theory of solids and must be able to differentiate insulators, conductors, and semiconductors.	3	3	3	2	1	1	1	1
<b>CO4</b>	Secured an understanding about the magnetic, dielectric and superconducting phases of the materials.	3	2	3	2	2	3	3	3

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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Solid State Physics Lab</u></b>	<b>Subject Code: <u>BPHYS1-405</u></b>	<b>Semester: <u>4<sup>th</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 2</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Learning characteristics of LED, phot-diode, solar cell etc.	3	2	2	2	2	3	1	1
CO2	Characterization of material properties like: magneto-resistive, M(H), Ten Delta, Curie temperature etc.	3	2	1	1	3	3	3	3
CO3	Use of X-Ray diffraction tool for crystal structure analysis of the material.	3	1	1	2	3	1	1	2
CO4	Acquaintance with thin film preparation techniques.	3	2	1	2	1	2	2	2

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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Constitution of India</u></b>	<b>Subject Code: <u>BMNCC0-001</u></b>	<b>Semester: <u>1<sup>st</sup></u></b>
<b>Credit: <u>0</u></b>	<b>L T P <u>2 0 0</u></b>	<b>Duration: <u>30 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understanding the meaning, emergence, evolution and structure of Constitution of India.		1		1	2			2
CO2	Know their fundamental rights and duties and directive principles of state policy.	1	1	1	2	3	3	3	3
CO3	Will know the organs of governance with detailed study of Indian parliament, its composition and working. Also gain the knowledge of judiciary system, its powers and functions.	1	1	1	2	3	2	2	3
CO4	Acquire the understanding of aims and decentralization in India by explaining about the uses of Panchayath Raj system in India and its duties.	1	1	1	2	3	3	2	3

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3. Substantial (High) – above 70%



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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Mathematical Physics – I</u></b>	<b>Subject Code: <u>BPHYS1-501</u></b>	<b>Semester: <u>5<sup>th</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understand the concepts related with complex analysis, vector differentiation, vector integration and tensors.	3	2	1	2	2	2	2	3
CO2	Skill enhancement to solve numerical problems related with Mathematical Physics.	2	3	2	3	1	1	2	2
CO3	Apply knowledge of Mathematical Physics to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
CO4	To inculcate and develop the ability to think abstractly.	2	3		2	2	1	2	2

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3. Substantial (High) – above 70%



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Department: **Department of Physics, Maharaja Ranjit Singh Punjab Technical University, Bathinda**

Program: **B.Sc. (Hons.) Physics**

**COs, POs, PSOs Mapping**

<b>Subject: <u>Statistical Mechanics</u></b>	<b>Subject Code: <u>BPHYS1-101</u></b>	<b>Semester: <u>5<sup>th</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

<b>COs</b>	<b>Statement</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
<b>CO1</b>	Understand the concepts of microstate, macrostate, phase space, thermodynamic probability, partition function, properties and Laws associated with thermal radiations and kinetic theory of gases.	3	2	1	2	2	2	2	3
<b>CO2</b>	Skill enhancement to solve numerical problems related with Statistical Mechanics.	2	3	2	3	1	1	2	2
<b>CO3</b>	Apply knowledge of Statistical Mechanics to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
<b>CO4</b>	To inculcate and develop the ability to think abstractly.	2	3	1	2	2	1	2	2

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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Statistical Mechanics Lab</u></b>	<b>Subject Code: <u>BPHYS1-503</u></b>	<b>Semester: <u>5<sup>th</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to understand computationally and experimentally the various Statistical mechanics problems.	3	2	3	2	2	2	2	1
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	1	3	2	2	1	2	2
CO3	Learn to draw conclusions from data and develop skills in experimental design.	1	2	1	2	2	2	2	2
CO4	To inculcate the spirit of team work.	1	2	2	2	1	2	2	3

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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: Basic Instrumentation Skills</b>	<b>Subject Code: BPHYS1-504</b>	<b>Semester: 5<sup>th</sup></b>
<b>Credit: 2</b>	<b>L T P 0 0 4</b>	<b>Duration: 60 Hrs.</b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Basic knowledge of sensitivity and resolution of instrument with processing of error in measurement which is essential of instrument operation.	3	3	3	3	1	3	1	3
CO2	Operational knowledge of CRO with its applications towards measuring different type of ac and dc signals.	3	2	2	2	1	2	1	3
CO3	Knowledge of generating and testing different type of signals using signal generator and their analysis.	2	3	2	3	3	3	1	2
CO4	Conceptual knowledge of different type of LCR bridges and their balancing applications.	2	3	2	3	1	2	1	2

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Program: **B.Sc. (Hons.)Physics**

## COs, POs, PSOs Mapping

<b>Subject: <u>Nano Materials and Applications</u></b>	<b>Subject Code: <u>BPHYD1-513</u></b>	<b>Semester: <u>5<sup>th</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understanding the Nano systems and its implications in modifying the properties of materials at the nanoscale.	3	3	3	2	1	2	2	3
CO2	Concept of Quantum confinement, 3D,2D,1D and 0D nanostructure with examples.	3	3	3	1	3	1	1	3
CO3	Different synthesis techniques including top down and bottom-up approaches.	3	3	3	3	2	1	3	3
CO4	Applications of nanostructured materials in making devices namely MEMS, NEMS and other heterostructures for solar cell and LEDs.	3	1	2	2	1	2	3	1

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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

Subject: <u>Nano Materials and Applications Lab</u>	Subject Code: <u>BPHYD1-514</u>	Semester: <u>5<sup>th</sup></u>
Credit: <u>2</u>	L T P <u>0 0 4</u>	Duration: <u>60 Hrs.</u>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Student shall gain expertise in synthesis of nano-particles by chemical route.	3	1	1	1	2	1	3	3
CO2	Use of X-Ray diffraction tool for crystal structure analysis of the material.	2	2	1	1	1	1	1	2
CO3	Acquaintance with thin film preparation techniques.	2	3	3	2	1	3	3	2
CO4	Use of UV visible spectrometer for analysis of nano-particles.	1	1	3	1	3	1	2	3

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Program: B.Sc. (Hons.) Physics

### COs, POs, PSOs Mapping

Subject: <u>Mathematical Physics-II</u>	Subject Code: <u>BPHYS1-601</u>	Semester: <u>6<sup>th</sup></u>
Credit: <u>4</u>	L T P <u>4 0 0</u>	Duration: <u>60 Hrs.</u>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understand the concepts related with Frobenius method, theory of errors and special functions and integrals, and group theory.	3	2	1	2	2	2	2	3
CO2	Skill enhancement to solve numerical problems related with Mathematical Physics.	2	3	2	3	1	1	2	2
CO3	Apply knowledge of Mathematical Physics to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
CO4	To inculcate and develop the ability to think abstractly.	2	3	1	2	2	1	2	2

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%    2. Moderate (Medium) – above 30% and upto 70%    3. Substantial (High) – above 70%



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Program: **B.Sc. (Hons.) Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Electromagnetic Theory</u></b>	<b>Subject Code: <u>BPHYS1-602</u></b>	<b>Semester: <u>6<sup>th</sup></u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understand the concepts related with Maxwell's equations, propagation of EM waves, polarization, production and detection of EM waves, and optical fibres.	3	2	1	2	2	2	2	3
CO2	Skill enhancement to solve numerical problems related with Electromagnetic Theory	2	3	2	3	1	1	2	2
CO3	Apply knowledge of Electromagnetic Theory to go for higher studies in diverse fields.	2	2	1	2	2	1	3	2
CO4	To inculcate and develop the ability to think abstractly.	2	3	1	2	2	1	2	2

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2. Moderate (Medium) – above 30% and upto70%

3. Substantial (High) – above 70%



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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Electromagnetic Theory Lab</u></b>	<b>Subject Code: <u>BPHYS1-603</u></b>	<b>Semester: <u>6<sup>th</sup></u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to understand computationally and experimentally the various concept of electromagnetic theory.	3	1	1	1	2	1	3	3
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	2	2	1	1	1	1	1	2
CO3	Learn to draw conclusions from data and develop skills in experimental design.	2	3	3	2	1	3	3	2
CO4	To inculcate the spirit of team work.	1	1	3	1	3	1	2	3

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%

2. Moderate (Medium) – above 30% and upto70%

3. Substantial (High) – above 70%



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### COs, POs, PSOs Mapping

<b>Subject: <u>Nuclear and Particle Physics</u></b>	<b>Subject Code: <u>BPHYD1-521</u></b>	<b>Semester: <u>5th</u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
<b>CO1</b>	Understanding the concepts of nuclei like nuclear size, shape, mass, binding energy and nuclear stability etc through various nuclear models and potentials associated with them, nuclear reactions with emphasis on beta and gamma decays, elementary particle physics that would motivate the students for higher studies in the field of high energy physics.	3	2		2		3	2	1
<b>CO2</b>	Skill enhancement to solve numerical problems related with Nuclear and Particle Physics	3	2	2			2	3	
<b>CO3</b>	Apply knowledge of Nuclear and Particle Physics to go for higher studies in diverse fields.	3	2	1	2	1	2	2	1
<b>CO4</b>	To inculcate and develop the ability to think abstractly.	3			1	1	2	3	

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%

2. Moderate (Medium) – above 30% and upto 70%

3. Substantial (High) – above 70%



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Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Medical Physics</u></b>	<b>Subject Code: <u>BPHYD1-621</u></b>	<b>Semester: <u>6th</u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	To provide knowledge of physics behind the working mechanisms of different organs in human body.	3			3		3	3	
CO2	Understanding the impact of radiation exposure to human body. Use of radiation dosimeters, radiation detectors/instrumentations for radiation monitoring.	2	2	1	3	1	3	3	2
CO3	Use of X-rays for medical diagnosis and application of radiations for therapeutic uses.	2	2		3	2	3	3	2
CO4	Acquiring the knowledge of medical imaging, physical principles of diagnostic radiology, image quality and quality assurance.	2	2	1	3	2	3	3	2

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2. Moderate (Medium) – above 30% and upto 70%

3. Substantial (High) – above 70%



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Department: **Department of Physics, Maharaja Ranjit Singh Punjab Technical University, Bathinda**

Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Medical Physics Lab</u></b>	<b>Subject Code: <u>BPHYD1-622</u></b>	<b>Semester: <u>6th</u></b>
<b>Credit: <u>2</u></b>	<b>L T P <u>0 0 4</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Able to use and measure manual Hg blood pressure monitor and optical eye-testing machine.	2	3	3		3	3	3	2
CO2	To inculcate and develop scientific aptitude by performing the various experiments.	1	3	3	1	3	3	2	3
CO3	Learn to use combination of lenses on an optical bench and draw conclusions from data and develop skills in experimental design.		3	3		3	3	3	3
CO4	To inculcate the spirit of teamwork.	1	1		2		1		3

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%      2. Moderate (Medium) – above 30% and upto 70%      3. Substantial (High) – above 70%



## MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: **Department of Physics, Maharaja Ranjit Singh Punjab Technical University, Bathinda**

Program: **B.Sc. (Hons.)Physics**

### COs, POs, PSOs Mapping

<b>Subject: <u>Classical Dynamics</u></b>	<b>Subject Code: <u>BPHYD1-611</u></b>	<b>Semester: <u>6th</u></b>
<b>Credit: <u>4</u></b>	<b>L T P <u>4 0 0</u></b>	<b>Duration: <u>60 Hrs.</u></b>

COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Understand the fundamental Laws of motion and apply Lagrangian & Hamiltonian formulations to the motion of particles.	3	2	1			2	3	2
CO2	Gain the fundamental knowledge of rotational motion and solve the numerical problem in spherical and cylindrical coordinates for kinetic energy and moment of inertia of rotating bodies.	3	3	1	1		2	3	2
CO3	Learn the theory of small oscillations in detail along with basis of free vibrations.	3	2	1	1		2	3	2
CO4	Course will build a foundation of students for higher studies in diverse fields.	3					1		1

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30%

2. Moderate (Medium) – above 30% and upto 70%

3. Substantial (High) – above 70%