Since 1989

Devoted to Serve

Royal College of Arts Science and Commerce (Autonomous)

Affiliated to University of Mumbai

Program: BSc

Course: Physics

Syllabus for Semester: I and II

Syllabus for Undergraduate Programme as per

National Education Policy (NEP-2020) with effect from the academic year 2025-2026

Chairperson BOS Physics

ROYAL COLLEGE OF ARTS SCI & COM DIST. THANE

Principal
ROYAL COLLEGE OF ARTS SCIENCE & COMMERCE
PENKAR PADA, MIRA ROAD,
DIST : THANE. PIN : 401107.

NEP Credit Structure for Science

Level	Sem	Major		Minor	OE	VSC	SEC	AEC	IKS	VEC	OJT/FP /RP/CC /CEP	Cumulative Credits	
		DSC	DSE										
4.5	I	6		6	2	2		2	2	2		22	**UG Certificate Cumulative Credit:44**
	II	6		6	2		2	2		2	2	22	
Exit Option: Award of UG Certificate in Major with 40 -44 Credits and an Additional 4 Credits Core NSQF Course / Internship OR Continue with Major and Minor													
5	III	8		4	2+2		2	2			2	22	**UG Diploma Cumulative Credit:88**
	IV	8		4	2+2		2	2			2	22	
Exit Option: Award of UG Diploma in Major and Minor with 80-88 Credits and an Additional 4 Credits Core NSQF Course / Internship OR Continue with Major and Minor													
5.5	V	10	4			4					4	22	**UG Degree Cumulative Credit:132**
	VI	10	4			4					4	22	
	Total	**48**	**8**	**20**	**12**	**10**	**6**	**8**	**2**	**4**	**14**	**132**	

Proposed List of All Courses offered from Semesters I – VI in Physics

Level	Sem	Major subject Course titles	Minor subject Course titles	Electives Course titles	OE Course titles	VSC Course title/s	SEC Course title/s
4.5 **100-199**	**I**	Mechanics and Thermodynamics Modern Physics and Nuclear Physics				Measuring Instruments	
	II	Optics Electricity and Electronics					Digital Electronics
5 **200-299**	**III**	Mathematical Physics Electricity and Magnetism Thermodynamics	Crystal Physics, Semiconductor Theory		Physics in Daily Life		Computational Physics using Python
	IV	Quantum Mechanics Mechanics and Optics Electronics	Quantum Mechanics and Spectroscopy.		Photography		Arduino Programming
5.5 **300-399**	**V**	Solid State Physics Thermal and statistical Physics Atomic and Molecular Physics Electrodynamics		SQL and Data Science I		1. Electronics Instrumentation Java Programming	
	VI	Classical Mechanics Major Subject IKS Nuclear Physics Relativity		Java Programming and Data Science II		1. Advanced Electronics Machine Learning	

Programme Outcomes (POs) for B. Sc.

Sr. No.	On completing B.Sc. the student will be able to :
PO1	Acquired the basic knowledge related to the subject offered.
PO2	Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevance in day-to-day life.
PO3	Acquired the skills in handling scientific instruments.
PO4	Acquired the skills of planning and performing laboratory experiments, recording observations and drawing logical inferences from the scientific experiments.
PO5	Developed scientific outlook not only with respect to science subjects but also in all aspects related to life.

Programme Specific Outcomes (PSOs) for B.Sc. Physics

Sr. No.	On completing B.Sc. Physics, the student will be able to :
PSO1	Understand basic concepts of physics.
PSO2	Acquire a systematic understanding of the core areas of physics, including mechanics, thermodynamics, Quantum Mechanics, Atomic And Nuclear Physics, Mathematical Physics and Electronics at a level compatible with graduate programs.
PSO3	Be able to analyze and interpret quantitative results, both in the core areas of physics and interdisciplinary areas.
PSO4	Be able to use contemporary experimental apparatus and analysis tools to acquire, analyze and interpret Scientific data.
PSO5	Be able to apply the principles of physics to solve new and unfamiliar problems.
PSO6	Be able to effectively communicate scientific results.
PSO7	Demonstrate professional behavior such as (i) being objective, unbiased and truthful in all aspects of work and avoiding unethical, irrational behavior such as fabricating, falsifying or misrepresenting data or committing plagiarism; (ii)the ability to identify the potential ethical issues in work-related situations; (iii) appreciation of intellectual property and environmental issues.

Course/ Paper Title	**Mechanics and Thermodynamics**
Course offered as	**Major**
Course Code	**RUSPHMJ101**
Semester	**I**
No. of Credits	**2**
No. of lecture Hours/week	**2**

Sr. No.	Course Learning Objectives
1	To make students understand Newton's laws and its applications in daily life.
2	To introduce students to the basic concepts of elasticity and fluid mechanics which has important applications in science and engineering.
3	To familiarize students with the application of elasticity and fluid mechanics in science and engineering.
4	To make students understand the basic concepts of thermodynamics.
5	To enable students to apply the laws of thermodynamics in real life problems.
6	To enable students to solve problems for work done in various thermodynamics process.
7	To enable students to apply knowledge of thermodynamic properties in other related coursework.

Course Learning Outcome:

	On completing the course, the student will be able to :
CO1	Define Newton's three laws of motion and key terms such as pseudo forces.
CO2	Explain the concepts of stress and strain.
CO3	Define Young's Modulus, Modulus of Rigidity (Shear Modulus), and Bulk Modulus and apply the formulas for Young's Modulus, Modulus of Rigidity, and Bulk Modulus to solve problems involving material deformation under different types of loads. Analyze the behavior of cantilever beams subjected to loads at the free end.
CO4	Apply continuity equation to solve problems involving the flow rate in pipes or ducts of varying cross-sections and apply Bernoulli's equation to solve problems related to fluid flow.
CO5	Explain the fundamental concepts such as energy, temperature, and the laws of thermodynamics.
CO6	Apply the zeroth and first laws of thermodynamics to analyze and solve problems related to energy transfer, work and heat.

CO-PO mapping (RUSPHMJ101)

	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓			✓
CO2	✓	✓		✓	✓
CO3	✓	✓		✓	✓
CO4					
CO5	✓	✓			✓
CO6	✓	✓	✓	✓	✓

CO-PSO mapping (RUSPHMJ101)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	✓	✓	✓		✓	✓	
CO2	✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓	
CO4	✓	✓					
CO5	✓	✓	✓		✓		
CO6	✓	✓	✓	✓	✓	✓	

Detailed Syllabus :

Module	Title with content	No. of lectures	CO Mapping
I	**Application of Newton's law:** Newton's first, second and third laws of motion, interpretation and applications, pseudo forces, inertial and non-Inertial frames of reference **HCV: 5.1-5.5** **Work and Energy: Kinetic Energy, Work and Work-energy theorem, Potential Energy, Conservative and Non-Conservative Forces, Different forms of Energy: Mass Energy, Equivalence Worked out Examples. (HCV: 8.1, 8.2, 8.5, 8.6, 8.11)**	**15**	**CO1**
	Elasticity Stress, Strain, Hooke's Law for Elastic Solids, Young's Modulus, Modulus of rigidity and Bulk Modulus, **HCV:14.2,14.3, 14.4,14.5** Applications of Elasticity in Engineering: cantilever load at free end. **DSM: Page 310, article number 130 i**		**CO2, CO3**
	Fluid Mechanics: Conservation of mass: continuity equation, Bernoulli's equation and its applications. **Applications of Fluid Mechanics** Aerodynamics: lift and drag forces on airfoils **HP: 15.2B, 15.3B, 15.5B**		**CO4**
II	**Thermodynamics:** Thermodynamic systems, Thermodynamic variables and quantities, equation of state, zeroth law of thermodynamics and its significance and applications, Thermodynamic equilibrium, heat, thermodynamic energy, concept of work and internal energy, first law of thermodynamics its significance and applications. Work done under various thermodynamic process. Relation between different thermodynamic variables under adiabatic conditions. Real Gas, Van der waal equation of state **BH :4.1-4.10, 4.12, 4.13**	**15**	**CO5, CO6**

References :

1. DSM: Element of Properties of Matter, D S Mathur, S Chand & Co.
2. HCV: Concepts of Physics – Part I, by H. C. Verma, (Second Reprint of 2020) Bharati Bhavan Publishers and Distributers.
3. HP: Mechanics – Hans and Puri, 2nd Ed. Tata McGraw Hill.
4. BH: Heat Thermodynamics and Statistical Physics, by Brijlal, Subramanyam and Hemne, S Chand, Revised, Multi-coloured, 2007 Ed.

Additional Reference :

1. Mechanics: Properties of Matter by Brijlal and Subramanyam, S Chand & Co.

Course/ Paper Title	**Modern Physics and Nuclear Physics**
Course offered as	**Major**
Course Code	**RUSPHMJ102**
Semester	**I**
No. of Credits	**2**
No. of lecture Hours/week	**2**

Sr. No.	Course Learning Objectives
1	Introducing students to the fundamental concepts and principles that govern modern physics.
2	Providing an introduction to the principles of quantum mechanics, including wave-particle duality.
3	To develop a comprehensive understanding of the production of X-rays, including the generation of X-rays through X-ray tubes and their properties such as intensity, wavelength, and energy.
4	To provide students a mathematical description of radioactive decay.

Course Learning Outcome:

	On completing the course, the student will be able to :
CO1	Explain and apply quantum mechanical concepts by analyzing and solving problems related to wave-particle duality, quantum states, and uncertainty principles.
CO2	Apply quantitative problem-solving skills in quantum mechanics to solve simple quantum mechanics problems.
CO3	Explain the fundamental principles of X-rays and radioactivity, including their production and properties. Apply this knowledge to analyze the behavior of X-rays and radioactive materials, evaluate their applications in various fields.
CO4	State and apply the application of X-Rays.
CO5	Explain the fundamental concepts of radioactivity, including the types of radioactive decay, decay processes, and nuclear stability. Apply these concepts to analyze decay patterns and evaluate the factors influencing nuclear stability.

CO-PO mapping (RUSPHMJ102)

	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓	✓		✓
CO2		✓		✓	✓
CO3	✓	✓		✓	
CO4	✓	✓		✓	✓
CO5	✓	✓	✓		✓

CO-PSO mapping (RUSPHMJ102)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	✓	✓	✓		✓	✓	✓
CO2		✓	✓		✓		
CO3	✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓		✓	✓
CO5	✓	✓	✓		✓	✓	

Detailed Syllabus:

Module	Title with content	No. of lectures	CO Mapping
I	**Origin of Quantum theory**: Origin of Quantum theory, Black body (definition), Black Body spectrum, Wien's displacement law. Matter waves: De Broglie waves, Concept of wave packet, phase velocity, group velocity and relation between them, wave particle duality, Davisson-Germer experiment, Heisenberg's Uncertainty Principle, Compton Effect, Pair production, Gravitational Red Shift, Black holes. **AB: 3.1,3.2,3.3,3.4,3.5,3.7,3.8,3.9,2.7,2.8,2.9**	**15**	**CO1** **CO2**
II	**X-Rays:** Production and properties of X-rays, X-Ray spectra, X-Ray Diffraction, Moseley Law, Application of X-Rays. **AB: 2.5,2.6,7.9**	**15**	**CO3,** **CO4**
	Radioactivity: The law of radioactive decay, half-life and mean life, unit of activity. Alpha decay, beta decay, gamma decay. Successive radioactive disintegration A to B to C. Radioactive series, determination of the age of the earth and universe **SBP: 2.1,2.3,2.6,2.9,2.12,2.13**		**CO5**

References :

1. AB: Concepts of Modern Physics: Arthur Beiser, 6th Edition
2. SBP: Nuclear Physics: An introduction by S. B. Patel.

Additional Refrences :

1. Introduction to nuclear Physics : Kenneth Krane
2. Modern Physics : Kenneth Krane

Theory Examination Pattern for

(Major)

I	Internal Assessment	
a	One class test (Short answers/Objectives/ Multiple Choice)	**10**
b	Assignment/ Project/ Presentation/Book or research paper Review	**10**
	Total	**20 Marks**
II	Semester End Examination	**30 Marks**

Question Paper Pattern (Major)

Total Marks: 30

Duration: 1 hour

Module I **(15 Marks)**	**Q1 A Attempt any one (7 marks)** i Theory a. (7 M) b. (7 M) **Q1 B Attempt any one (3 marks)** ii Problem a. (3 M) b. (3 M) **Q1 C Multiple choice (3 marks)** i ii iii **Q1 D Fill in the blanks (2 marks)** i ii
Module II **(15 Marks)**	**Q2 A Attempt any one (7 marks)** i Theory c. (7 M) d. (7 M) **Q2 B Attempt any one (3 marks)** ii Problem c. (3 M) d. (3 M) **Q2 C Multiple choice (3 marks)** i ii iii **Q2 D Fill in the blanks (2 marks)** i ii

Course/ Paper Title	**Physics Practical**
Course offered as	**Major Practical**
Course Code	**RUSPHMJP1**
Semester	**I**
No. of Credits	**2**
No. of lecture Hours/week	**4**

Course Learning Outcome:

	On completing the course, the student will be able to :
CO1	Use experimental apparatus and techniques for conducting measurements and observations related to mechanics and thermodynamics.
CO2	Correlate the connection between theoretical concepts with experiments.
CO3	Apply the theories they've learned to solve real-time problems.

CO-PO mapping (RUSPHMJP1)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	
CO3					✓

CO-PSO mapping (RUSPHMJP1)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1				✓		✓	✓
CO2				✓		✓	✓
CO3				✓		✓	✓

Regular experiments:

Sr. No.	Skills Experiments
1	Error Calculations.
2	Graph Plotting
3	Soldering
4	Use of Breadboard
	Group A Experiments
1	J by Electrical method
2	CVAT
3	Y by cantilever
4	Determination of viscosity using Siphon Method.
5	Bifilar Pendulum
6	Determination of Planck's constant using LED
7	Determination of specific heat of graphite
8	η by Torsional Oscillations
9	Moment of Inertia of a Flywheel

Rules of Practical:

- All skill experiments must be reported in the journal
- A Minimum of 8 experiments must be reported in journal.

Practical examination:

	External Assessment for Practical	50 Marks
	Experiment I	**30**
	Viva	**10**
	Journal	**10**

- A learner will be allowed to appear for the semester end practical examination only after the learner submits a certified journal of Physics.
- The duration of the practical exam will be of three hours.

Course/ Paper Title	**Measuring Instruments Practical**
Course offered as	**Vocational Skill Course**
Course Code	**RUSPHVSC101**
Semester	**I**
No. of Credits	**2**
No. of lecture Hours/week	**4**

Course Outcome :

	On completing the course, the student will be able to :
CO1	Use measurement techniques, including accuracy, precision, and least count.
CO2	Take readings with proper significant digits.
CO3	Use the right instrument to measure physical quantity.
CO4	Estimate and analyze uncertainties and errors in measurements, and apply techniques like significant figures to report results with appropriate accuracy.

CO-PO mapping (RUSPHVSC101)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1			✓	✓	
CO2			✓	✓	
CO3			✓	✓	
CO4			✓	✓	

CO-PSO mapping (RUSPHVSC101)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1			✓	✓		✓	
CO2			✓	✓		✓	
CO3			✓	✓		✓	
CO4			✓	✓		✓	

Regular experiments:

Sr. No.	Experiments
1	Practical exercises on uncertainty calculation
2	To measure diameter of a small sphere using Vernier Calipers and calculate its volume.
3	To measure diameter and length of a test tube using Vernier Calipers, hence calculate its volume.
4	To determine the volume of an irregular but uniform thickness lamina using micrometer screw gauge and graph paper.
5	To find the radius of a wire using micrometer screw gauge.
6	To determine the radius of a capillary tube using travelling microscope.
7	To determine the gauge element of a wire gauge using travelling microscope.
8	Study of thermal characteristics of a thermistor.
9	To prove inverse square law using LDR and photodiode.

Rules of Practicals:
Minimum 7 Experiment must be written in the journal.

Practical examination:

	External Assessment for Practical	**50 Marks**
	Experiment –I	15
	Experiment –II	15
	Viva	10
	Journal	10

- A learner will be allowed to appear for the semester end practical examination only after the learner submits a certified journal of Physics.
- The practical exam will be of two hours duration.

SEMESTER II

Course/ Paper Title	**Optics**
Course offered as	**Major**
Course Code	**RUSPHMJ201**
Semester	**II**
No. of Credits	**2**
No. of lecture Hours/week	**2**

Sr. No.	Course Learning Objectives
1	To develop a thorough understanding of different types of lenses, including convex, concave, and combination lenses, and understand their respective properties such as focal length, magnification, and aberrations. Aid students to explore how these lenses function individually and in combination, and how their characteristics influence image formation and optical performance.
2	Students will explore application of lens systems in various optical instruments such as microscopes and telescopes.
3	To introduce students to the basic principles of interference, including the wave nature of light
4	Explore various interference phenomena such as thin film interference, Newton's rings,

Course Learning Outcome:

	On completing the course, the student will be able to :
CO1	Classify different types of lenses (convex, concave, and combination lenses) and describe their properties such as focal length and magnification.
CO2	Explain the fundamental concepts of lens systems, including their types, configurations, and optical properties. They will apply this knowledge to analyze the behavior of light through different lens arrangements and evaluate their effectiveness in image formation
CO3	Define Cardinal points of a lens system. Explain lens combinations and analyze how it affects image formation in telescopes and microscopes.
CO4	Explain and classify aberration in lens.
CO5	Explain the underlying principles governing the interference of light in thin films. They will analyze the behavior of wedge-shaped films and evaluate the interference patterns observed in Newton's rings.
CO6	Apply their knowledge of the interference of light in thin films to identify and solve problems related to thin film interference and its practical applications

CO-PO mapping (RUSPHMJ201)

	PO1	PO2	PO3	PO4	PO5
CO1	✓	✓			✓
CO2	✓	✓		✓	✓
CO3	✓	✓	✓	✓	✓
CO4	✓	✓			
CO5	✓	✓	✓		
CO6	✓	✓		✓	✓

CO-PSO mapping (RUSPHMJ201)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	✓	✓			✓	✓	
CO2	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓				
CO5	✓	✓	✓	✓		✓	
CO6	✓	✓		✓	✓	✓	

Detailed Syllabus :

Module	Title with content	No. of lectures	CO Mapping
I	**Lens and Lens System**: **Review:** Thin lens equation and lens maker's formula, Formation of images by lenses. SBA: 4.1, 4.2, 4.3, 4.5, 4.7, 4.8, 4.9, 4.10 **Magnification**: Lateral, Longitudinal and Angular Magnification, Magnification of microscope and telescope, **SBA:4.12, 4.12.1, 4.12.2, 4.12.3, 10.14, 10.15**	15	**CO1, CO2**
	Principles of lens combinations, Cardinal points of a lens system, telephoto lens and telescope lens. **SBA:4.17, 4.17.1, 6.8.1, 6.8.2, 5.2**		**CO3**
	Optical aberrations: spherical aberration, chromatic aberration. **SBA:9.2, 9.5, 9.10**		**CO4**
II	**Interference in Thin Films**: Interference due to reflected and transmitted light in plane thin films, Conditions for Maxima and Minima, Wedge shaped film, Interference pattern in Newton's rings, Application of Thin film, problems. **SBA: 15.1, 15.2, 15.2.1, 15.2.2, 15.3, 15.5, 15.6, 15.6.1-15.6.3, 15.6.7**	15	**CO5, CO6**

(Two units for a two credit course and four units for a four credit course.
1 credit = 1 lecture hour/week
1 credit = 2 practical hours/week)

References :

1. SBA: A Textbook of Optics by Dr. N. Subrahmanyam, Brijlal, and Dr. M. N. Avadhanulu, 25th Revised Edition 2012(Reprint 2016), S. Chand and Company Pvt. Ltd.

Additional References :

1. Optics by Eugene Hecht, 5th Edition, Pearsons.
2. Optics by Ajoy Ghatak, and K. Thyagarajan, Tata McGraw-Hill Education, 2009.

Course/ Paper Title	**Electricity and Electronics**
Course offered as	**Major**
Course Code	**RUSPHMJ202**
Semester	**II**
No. of Credits	**2**
No. of lecture Hours/week	**2**

Sr. No.	Course Learning Objectives
1	To make students comprehend the behaviour of current and voltage in various AC circuits and analyze ac waveforms parameters.
2	To introduce to the students the relationships of power and frequency in AC circuits
3	To help students use this knowledge to practical AC circuits
4	Students will explore the properties of semiconductor materials and working of diode and transistor.
5	Students will comprehend the working of transistor as amplifier
6	To aid students utilize the knowledge of transistors to address and solve real-life problems effectively.

Course Outcome :

	On completing the course, the student will be able to :
CO1	Explain the concepts in alternating current (AC) circuits, like impedance, reactance, and phasor representation.
CO2	Analyze series RLC, AC circuits, to determine impedance, current, voltage, and power.
CO3	Explain semiconductor physics, including the behavior of electrons and holes in semiconductors, doping, and the operation of p-n junctions.
CO4	Analyze and design various transistor configuration and understand the working of transistor as a switch.

CO-PO mapping (RUSPHMJ202)

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	✓	✓			✓	✓
CO2	✓	✓		✓	✓	✓
CO3	✓	✓			✓	✓
CO4	✓	✓	✓	✓	✓	✓

CO-PSO mapping (RUSPHMJ202)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	✓	✓	✓			✓	
CO2	✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓			✓	
CO4	✓	✓	✓	✓	✓	✓	

Detailed Syllabus :

Module	Title with content	No. of lectures	CO
I	**Electricity (Series AC Circuits):** Review of passive components. AC through LR Circuit, power factor, Symbolic notation and phasor diagram, Active, reactive and apparent power, Q-factor of coil, AC through CR Circuit, dielectric loss and power factor of capacitor **BA : 13.1, 13.2, 13.4, 13.5, 13.7, 13.8**	**15**	**CO1**
	LCR circuit in series, Resonance in series LCR circuit, graphical representation of resonance, resonance curve, half power bandwidth of resonance circuit, determination of upper and lower half-power frequencies, Q-factor of resonant series circuit. **BA : 13.9-13.15, 13.17**		**CO2**
II	**Transistor Fundamentals:** Basics of semiconductor, intrinsic and extrinsic semiconductor, P-type and N-type semiconductor, PN junction, properties of PN junction, PN diode as rectifier. **VR : 5.1, 5.8, 5.9, 5.10, 5.11, 5.14, 5.15, 6.8**	**15**	**CO3**
	Physical structure of transistor, transistor action, transistor symbols, transistor configurations (CB, CC, CE), current amplification factors and their relationships, characteristics of CE configuration, leakage current and its measurement, transistor as CE amplifier, transistor DC load line analysis, operating point. Transistor as a switch. **VR : 8.1-8.5, 8.8, 8.10-8.13, 8.16-8.18, 8.22**		**CO4**

References :

1. BA : A text book of electrical technology, vol 1, B. L. Theraja, A. K. Theraja and S. G. Tarnekar.
2. VR : Principles of Electronics, V. K. Mehta and R. Mehta

Theory Examination Pattern for

(Major)

I	Internal Assessment	
a	One class test (Short answers/Objectives/ Multiple Choice)	**10**
b	Assignment/ Project/ Presentation/Book or research paper Review/	**10**
	Total	**20 Marks**
II	Semester End Examination	**30 Marks**

Question Paper Pattern (Major)
Total Marks: 30
Duration: 1 hour

Module I (15 marks)	**Q1 A Attempt any one (7 marks)** i Theory a. (7 M) b. (7 M) **Q1 B Attempt any one (3 marks)** ii Problem a. (3 M) b. (3 M) **Q1 C Multiple choice (3 marks)** i ii iii **Q1 D Fill in the blanks (2 marks)** i ii
Module II (15 marks)	**Q2 A Attempt any one (7 marks)** i Theory a. (7 M) b. (7 M) **Q2 B Attempt any one (3 marks)** ii Problem a. (3 M) b. (3 M) **Q2 C Multiple choice (3 marks)** i ii iii **Q2 D Fill in the blanks (2 marks)** i ii

Course/ Paper Title	**Physics Practical**
Course offered as	**Major Practical**
Course Code	**RUSPHMJP2**
Semester	**II**
No. of Credits	**2**
No. of lecture Hours/week	**4**

Course Learning Outcome:

	On completing the course, the student will be able to :
CO1	Use spectrometer to perform various optics experiments
CO2	Use signal generators and multimeter and CRO
CO3	Correlate theory concepts with practicals.

CO-PO mapping (RUSPHMJP2)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1			✓	✓	✓
CO2			✓	✓	✓
CO3			✓	✓	✓

CO-PSO mapping (RUSPHMJP2)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1			✓	✓	✓	✓	
CO2			✓	✓	✓	✓	
CO3			✓	✓	✓	✓	

Regular experiments:

Sr. No.	Experiments
	Skill Experiment
1	Use of DMM
2	To determine the value of resistor using colour code and digital multimeter
3	To determine the value of capacitance using number code and digital multimeter
4	Use of digital storage oscilloscope
	Regular Experiment
1	Lens combination
2	Newton's rings
3	LR circuit
4	CR circuit
5	LCR series resonance
6	Use of spectrometer to determine the angle of prism.
7	Use of spectrometer to determine the refractive index of prism.
8	Study of transistor characteristics
9	Study visit.

Rules of Practical :

- All skill experiments must be reported in the journal.
- A Minimum of 7 experiments must be reported in journal.
- A report of study tour must be reported in the journal.

Practical examination :

	External Assessment for Practical	**50 Marks**
	Experiment	**30**
	Viva	**10**
	Journal	**10**

- A learner will be allowed to appear for the semester end practical examination only after the learner submits a certified journal of Physics.
- The duration of the practical exam will be of three hours.

Course/ Paper Title	**Digital Electronics**
Course offered as	**Skill Enhancement Course Practical**
Course Code	**RUSPHSEC201**
Semester	**II**
No. of Credits	**2**
No. of lecture Hours/week	**4**

Course Outcome :

	On completing the course, the student will be able to :
CO1	Perform basic arithmetic operation on binary numbers.
CO2	Demonstrate a comprehensive understanding of digital logic principles, including logic gates, Boolean algebra, and basic digital logic operations.
CO3	Apply theorems of Boolean algebra to simply logic equations.

CO-PO mapping (RUSPHSEC201)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓

CO-PSO mapping (RUSPHSEC201)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1	✓			✓		✓	
CO2	✓			✓		✓	
CO3	✓			✓		✓	

Regular experiments: (Theory will be explained before the practical)

Sr. No.	**Experiments**
1	Binary addition
2	Verification of truth tables of basic logic gates
3	Logic gates using switch.
4	NAND NOR gate as a basic building block
5	Verification of De Morgan's theorems
6	Half Adder
7	Full Adder
8	RS Flip Flop
9	JK Flip Flop
10	Counters

Rules of Practicals:

Minimum 8 Experiment must be written in the journal.

Practical examination:

	External Assessment for Practical	**50 Marks**
	Experiment –I	**15**
	Experiment –II	**15**
	Viva	**10**
	Journal	**10**

- A learner will be allowed to appear for the semester end practical examination only after the learner submits a certified journal of Physics.
- The practical exam will be of two hours duration.

Dr. Nandini Kachhap
Chairperson,
BOS, Physics.

Prof. (Dr) Kalpana Patankar Jain,
Principal

Appendix B

Justification for B.Sc. (PHYSICS)

1.	Necessity for starting the course:	The necessity for starting the B.Sc. (Physics) course is to gain strong foundation in scientific principles, problem-solving skills, and preparing for diverse career paths in fields like technology, research, and finance. The degree equips students with a deep understanding of how the universe works and provides a strong base for further studies or a wide range of professional roles.
2.	Whether the UGC has recommended the course:	Yes
3.	Whether all the courses have commenced from the academic year 2023-24	The course has already commenced in the university and in the academic year 24-25, it is restructured under NEP 2020.
4.	The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available:	This course is aided.
5.	To give details regarding the duration of the Course and is it possible to compress the course?	The duration of the program is three years (6 semesters). It is not possible to compress the course.
6.	The intake capacity of each course and no. of admissions given in the current academic year:	The intake capacity is 120 at the entry level.
7.	Opportunities of Employability / Employment available after undertaking these courses:	A BSc in Physics graduate can adapt their skill to diverse career paths beyond traditional research and academia, including roles in technology, engineering, and healthcare. The degree equips students with strong problem-solving, analytical, and quantitative skills, making them valuable in a wide range of industries.

Dr. Nandini Kachhap
Chairperson,
BOS, Physics.

Prof. Kalpana Patankar Jain,
Principal

Board of studies in Physics

	Category	Name and Designation	Affiliation	Signature
1	Chairperson (Head of Department)	Dr. Nandini Kachhap, Associate Professor	Royal College of Arts, Science and Commerce.	
2	Internal BOS Members	Dr. Vinod Panchal Assistant Professor	Royal College of Arts, Science and Commerce.	
		Mr. Abdul Kayum Chaudhary Assistant Professor	Royal College of Arts, Science and Commerce.	
3	External Subject Expert	Dr. Shirish Pathare, Scientific Officer – E	Homi Bhabha Centre for Science Education	
		Dr. Mohan Narayan, Professor, Department of Physics	Institute of Chemical Technology	
4	Vice-Chancellor Nominee	Ms. Vidya Hiren Patil, Associate Professor & HOD, Department of Physics	Ruparel College of Arts, Science & Commerce,	
5	Industry Representative	Krishan Kumar Pandey, Scientific Officer G	High Pressure & Synchrotron Radiation Physics Division, BARC, Mumbai	
6	Postgraduate meritorious alumnus	Shailendra Singh, Assistant Professor	Department of Physics, Thakur College	
7	Nomination by Management	Dr. Anil Raghav, Assistant Professor	Department of Physics, University of Mumbai	