Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Ref.No.SU/BOS/Science/451 **Date: 25/07/2025**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0)

Ref: No.SU/BOS/Science/270 & 271 Date: 03/05/2025 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc. Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	Physics	3.	Astrophysics and Space Science
2.	Pollution	4.	Sugar Technology (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours Faithfully,

Dy Registrar
Dr. S. M. Kubal

Encl: As above

for Information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

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दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्याससमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

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B.Sc.Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	Botany	8.	Geology
2.	Physics	9.	Zoology
3.	Statistics	10.	Chemistry
4.	Mathematics	11.	Electronics
5.	Microbiology	12.	Drug Chemistry
6.	Plant Protection	13.	Industrial Microbiology
7.	Astrophysics and Space Science	14.	Sugar Technology (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

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Shivaji University, Kolhapur

Accredited by NAAC with A⁺⁺ Grade

Syllabus for Bachelor of Science Part II
Physics (NEP 2.0)

To be implemented from June, 2025 onwards

SHIVAJIUNIVERSITY,KOLHAPUR

NEP-2020 (2.0): Credit Framework for UG(B. Sc.) Programme under Faculty of Science and Technology

SEM (Level)	COURSES			OE	VSC/SEC	AEC/VEC/IKS	OJT/FP/CEP /CC/RP	Total Credits	Degree/Cum. Cr. MEME
	Course-1	Course-2	Course-3						
SEMI (4.5)	DSC-I(2) DSC-II (2) DSC P-I(2)	DSC-I(2) DSC-II (2) DSC P-I(2)	DSC-I(2) DSC-II (2) DSC P-I(2)	OE-1(2) (T/P)		IKS-I(2)		22	UG Certificate 44
SEMII (4.5)	DSC-III(2) DSC-IV (2) DSC P-II(2)	DSC-III(2) DSC-IV (2) DSC P-II(2)	DSC-III(2) DSC-IV (2) DSC P-II(2)	OE-2(2) (T/P)		VEC-I(2) (Democracy, Election and Constitution)		22	
Credits	8(T)+4(P)=12	8(T)+4(P)=12	8(T)+4(P)=12	2+2=4 (T/P)	--	2+2=4	--	44	Exit Option:4 credits NSQF/Internship/Skill courses
	MAJOR		MINOR						
SEMIII (5.0)	Major V(2) Major VI (2) Major P III (2)	--	Minor V(2) Minor VI (2) Minor P III(2)	OE-3(2) (T/P)	VSC I (2) (P) (Major specific) SEC I(2) (T/P)	AEC I(2) (English)	CC-I (2)	22	UG Diploma 88
SEMIV (5.0)	Major VII(2) Major VIII (2) Major P IV (2)	--	Minor VII(2) Minor VIII (2) Minor P IV (2)	OE-4(2) (T/P)	SEC-II(2) (T/P)	AEC-II(2) (English) VEC-II(2) (Environmental studies)	CEP-I(2)	22	
Credits	8(T)+4(P)=12		8(T)+4(P)=12	2+2=4(T/P)	4(T/P)+2(P)=6	2+4=6	2+2=4	44	Exit Option:4 credits NSQF/Internship/Skill courses
SEMV (5.5)	Major IX(2) Major X (2) Major P V (4)	Major I (ELEC)(2) Major P-I (ELEC) (2)	-	OE-5(2) (T/P)	VSC II (2) (Major specific)(P)	AEC III(2) (English)	OJT (04)	22	UG Degree 132
SEMVI (5.5)	Major XI(2) Major XII (2) Major P VI (4)	Major II (ELEC)(2) Major P-II(2) (ELEC)	-		VSC III (2) (Major specific) (P) SEC III(2) (T/P)	AEC IV(2) (English) IKS 2 (Major specific) (2)	FP-(02)	22	
Credits	8(T)+8(P)=16	4(T)+4(P)=8	-	2(T/P)	2(T/P)+4(P)=6	4+2=6	4+2=6	44	
Total Credits	40+20=60		24	10	12	16	10	132	Exit Option

SEMVII (6.0)	Major -XIII(4) Major -XIV(4) Major(P).-VII(4) Major (P) .-VIII(2)	MAJOR III (4) (ELEC)	RM-I(4)	-	-	-		22	UG Honours Degree 176
SEMVIII (6.0)	Major -XV(4) Major -XVI(4) Major (P)- IX(4) Major (P). - X(2)	MAJOR IV (4) (ELEC)	-	-	-	-	OJT(04)	22	
Credits	16(T)+12(P)=28	8(T)	4	-	-	-	04	44	
									Exit Option
Total Credits	68+28=96		28	10	12	16	14	176	
SEMVII (6.0)	Major -XIII (4) Major -XIV (4) Major(P).-VII (2)	MAJOR (4) (ELEC)	RM-I (4)	-		-	RP-4	22	UG Honours with Research Degree 176
SEMVIII (6.0)	Major -XV (4) Major -XVI (4) Major (P)-VIII (2)	MAJOR (4) (ELEC)		-		-	RP-8	22	
Credits	16(T)+4(P)=20	8(T)	4	-	-	-	12	44	
Total Credits	60+28=88		28	10	12	16	22	176	

Note:

- University may decide to offer maximum of three subjects (Courses) in the first year. The student may select one subject out of combination of three subjects (Courses), (which a student has chosen in the first year) as a **MAJOR** subject (Course) and one subject (Course) as **MINOR** Subject in the second year. Thereby it is inferred that the remaining third subject (Course) shall stand discontinued.
- **DSC:** Discipline Specific Course
- **MAJOR:** Mandatory/Elective
- **MINOR:** Course may be from different disciplines of same faculty of DSC Major
- **OE(Open Elective):** Elective courses/**Open Elective to be chosen compulsorily from faculty other than that of the Major.**
- **VSC/SEC: Vocational Skill Courses (MAJOR related)/Skill Enhancement Courses**
- **AEC/ VEC / IKS:** Ability Enhancement Courses (English, Modern Indian Language)/Value Education Courses/ Indian Knowledge System (Generic & Specific))
- **OJT/FP/RP/CEP/CC:** On-Job Training (Internship/Apprenticeship) / Field Project (Major related)/ Research Projects (Major related) Community Engagement **(Major related)/ Co-Curricular courses(CC)** such as Health& Wellness, Yoga Education, Sport, and Fitness, Cultural activities, NSS/NCC and Fine /applied/visual/performing Arts / Vivek Vahini etc.

1. Year of Implementation : June 2025
2. Preamble: The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics.
3. Medium of Instruction: English
4. Eligibility for Admission: As per the rules & regulations of Shivaji University, Kolhapur.
5. Scheme of teaching & Examination Pattern: As per the rules & regulations of Shivaji University, Kolhapur.
6. Structure of the Programme:

Semester	**Code**	***Major***	**Code**	***Minor***
III	Physics Major V	*Thermal Physics*	Physics Minor V	*Thermodynamics*
	Physics Major VI	*Waves & Optics*	Physics Minor VI	*Applications of Physics*
	Physics Major Practical III	*Thermal Physics and Waves & Optics*	Physics Minor Practical III	*Thermodynamics and Applications of Physics*
	OE III Practical	*Units & Measurements*	VSC I (Major Specific) Practical	*Skills in Physics*
	SEC Practical I	*Physics Laboratory Techniques I*	CC I	
IV	Physics Major VII	*Modern Physics*	Physics Minor VII	*Semiconductor Physics*
	Physics major VIII	*Analog & Digital Electronics*	Physics Minor VIII	*Astronomy & Astrophysics*
	Physics Major Practical IV	*Modern Physics and Analog & Digital Electronics*	Physics Minor Practical IV	*Semiconductor Physics and Astronomy & Astrophysics*
	OE IV Practical	*Physics of Everyday Life*	CEP I	
	SEC Practical II	*Physics Laboratory Techniques II*		

Program Outcomes (POs)

After completing the B.Sc. (Physics) program, students will be able to:

PO1: Demonstrate a fundamental and conceptual understanding of core areas in Physics such as mechanics, thermodynamics, modern physics, electronics, and optics.

PO2: Apply physical principles and experimental techniques to analyze scientific problems and interpret data meaningfully.

PO3: Use critical thinking and problem-solving skills in theoretical and laboratory-based physics contexts.

PO4: Operate scientific equipment, conduct experiments, and analyze the results using appropriate computational tools.

PO5: Develop communication skills to present scientific information effectively through oral, written, and digital formats.

PO6: Exhibit ethical practices, social responsibility, and environmental awareness through field-based, community, and laboratory engagements.

PO7: Demonstrate continuous learning and research aptitude required for higher education and employability in scientific and technological sectors.

Program Educational Objectives (PEOs)

The B.Sc. (Physics) graduates are expected to:

PEO1: Gain a solid foundation in physics and related fields enabling them to pursue advanced degrees in Physics, Engineering, or interdisciplinary sciences.

PEO2: Acquire skills for employment in education, research, industry, communication, and service sectors.

PEO3: Demonstrate analytical skills, a scientific mindset, and problem-solving abilities relevant to both academic and societal challenges.

PEO4: Engage in lifelong learning with a commitment to ethical and sustainable scientific practices.

PEO5: Contribute to community and national development through scientific awareness, innovation, and entrepreneurship.

Program Specific Outcomes (PSOs)

B.Sc. II (Physics Major and Minor)

Shivaji University, Kolhapur (Effective from June 2025)

After successfully completing the B.Sc. II Physics program, the students will be able to:

PSO1: Conceptual Understanding of Thermal and Optical Physics

Apply fundamental concepts of thermodynamics, heat transfer, wave optics, and laser physics to interpret and analyze natural phenomena and practical devices such as heat engines, diffraction gratings, optical fibers, and polarimeter.

PSO2: Proficiency in Experimental and Laboratory Techniques

Develop experimental skills by conducting practical's related to thermal conductivity, interference and diffraction of light, spectrometry, and laser-based measurements, thereby gaining hands-on experience with modern physics instruments.

PSO3: Application of Physics in Modern Technologies

Understand and apply the principles of semiconductor devices, transistor amplifiers, digital electronics, and Python programming, enabling them to solve real-world electronics problems and perform basic coding operations in scientific computing.

PSO4: Exploration of Advanced and Applied Physics Domains

Demonstrate knowledge of modern physics, atomic models, astronomy, and astrophysics, and relate them to practical applications such as X-ray generation, photoelectric effect, solar observation, and galactic structures.

PSO5: Community and Career Readiness

Utilize physics knowledge and vocational training in physics laboratory techniques, skill development, energy auditing, environmental monitoring, and digital literacy to contribute meaningfully to society and prepare for careers in education, research, or industry.

Shivaji University, Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III PHYSICS Paper-V
Major V: Thermal Physics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Laws of Thermodynamics I (08)

Thermodynamic Systems, Thermodynamic variables, Thermodynamic equilibrium, Zeroth Law of Thermodynamics, Equation of State, Internal Energy, First Law of Thermodynamics and its differential form, Thermodynamic processes: Isothermal process, Adiabatic process, Work done during an Isothermal process and Adiabatic process, Reversible and Irreversible Processes & their Examples.

2. Laws of Thermodynamics II (07)

Concept of Heat and Work, Carnot's Heat Engine and Carnot's Cycle, Second Law of Thermodynamics: Kelvin Planck &Clausius Statements, Concept of Entropy, Physical significance of Entropy, Entropy changes in reversible and irreversible process with examples, T-S diagram, Third law of thermodynamics: Unattainability of absolute zero.

3. Thermo dynamical Relations (09)

Extensive and Intensive variables, Thermodynamic potentials: Internal energy, Enthalpy, Helmholtz free energy, Gibbs free energy, Maxwells relations, Applications of Maxwells relations: Joule Thomsons effect, ClausiusClapeyron equation, Specific heat equation $C_P - C_V$ and C_P / C_V equation (for ideal gas only), TdS equations.

4. Transport Phenomenon (06)

Mean free path, Sphere of Influence and Collision cross-section, Expression for mean free path, Transport phenomenon: Transport of momentum (viscosity), Transport of thermal energy (Conductivity), Transport of mass (Diffusion).

Reference books:

1. Heat and Thermodynamics, M.W. Zemansky and R. Dittman, (8thEdn) McGraw Hill.
2. Thermal Physics – S Garg,R.Bansal and Ghosh, @nd editition,1993, Tata McGraw Hill.
3. Text Book of Heat- J.B. Rajam, S.Chand and Company Ltd.

4. A Treatise on Heat- MeghnadSaha and B.N. Srivastava, Indian Press.
5. Heat and Thermodynamics- Brijlal and N. Subramanyam, S.Chand and Company Ltd.
6. Heat Thermodynamics and Statistical Physics- J.P. Agrawal, Satya Prakash, Pragati Publication
7. Fundamentals of Heat - D.S.Mathur, S.Chand and sons.

Course Outcomes (CO'S):

After successfully completing this course, the student will be able to do the following:

1.Student understands basic laws of thermodynamics. Student is able to describe the laws of thermodynamics from both microscopic and macroscopic point of view. Student can also apply these laws to understand real physical systems.

2. Students know the concept of heat engine and refrigerator. Students are able to compute efficiency of Carnot heat engine and coefficient of performance of refrigerator.

3. Students understand theory of transport phenomena. Students are able to derive expressions related to transport of momentum, transport of thermal energy and transport of mass.

4. Students understand the concept of fourth thermodynamic variable that is entropy. Students learn use of entropy to define third law of thermodynamics.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III PHYSICS Paper-VI
Major VI: Waves and Optics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Wave properties of light (11)

Diffraction: Introduction, Plane diffraction grating, Theory of plane diffraction grating, its application to determine wavelength of monochromatic light.

Polarization: Introduction, Brewster's law, Relation between polarizing angle and angle of reflection in denser medium, Polarimeter: Determination of specific rotation of sugar solution.

Interference: Principle of superposition of waves, Division of amplitude, Division of wavefront, Interference in Wedge shaped film, Newton's rings, Biprism.

2. Resolving Power of Optical Instruments (05)

Resolution, resolving power (RP) of optical instruments, Rayleigh's criterion for the limit of resolution, Modified Rayleigh's criterion, comparison between magnification and resolution, RP of a prism.

3. LASER and its applications (07)

Introduction, Absorption, stimulated and spontaneous emission, Einstein's Coefficients, Population Inversion, Optical pumping techniques, Lasing Action, Properties of LASER, Types of LASERS, Construction and working of Ruby Laser and He-Ne Laser, Applications of LASER in various fields, Idea of holography

4. Fiber-Optic Communication Systems (07)

Introduction, Principle of optical fiber, Construction of optical fiber, Classification of fibers: Single and multimode fibers, Transmission of signal in step index fiber and graded index fiber, Acceptance angle, Numerical aperture (Definition and expression), Optical fiber communication system, Advantages of fiber optic communication, Applications of optical fibers.

REFERENCE BOOKS:

1. Optics – AjoyGhatak, 2021, McGraw Hill.
2. A Textbook of Optics-N. Subrahnmanyam,BrijLal, M.N. Avadhanulu, S.Chand.
3. A Textbook of Light- D.N. Vasudeva, Atma ram and Sons.
4. Fundamentals of Optics – Devraj Singh PHI Learning.
5. Principles of Laser by O. Svelto, Springer
6. Lasers:Principles, Types and Applications by K.R. Nambiar

7. "Fiber Optic Communication," J. C. Palais, Pearson Prentice Hall, 2013.

8. "Optoelectronics and Photonics: Principles and Practices," S. O. Kasap, Pearson Prentice Hall, 2011.

9. "An Introduction to Fiber Optic Systems," J. Powers, TMH 2010.

10. "Optical Fiber Communication," G. Keiser, McGraw Hill 2013.

11. "Fiber-Optic Communication Systems," G. P. Agrawal,John Wiley & Sons, 2011.

12. "Optical Fiber Communications: Principles and Practice", J. M. Senior, Pearson 2011.

13. "Fundamentals of Fibre Optics in Telecommunication and Sensor Systems," B. P. Pal, New Age International Publishers 2006.

Course Outcomes (CO'S):

After successfully completing this course, the student will be able to:

1. Understand the Fundamentals of Diffraction, Interference & Polarization & to apply the Principles of Polarization and analyze Interference Patterns.
2. Correlate Resolving Power with Wave Optics.
3. Recognize Advanced Applications and Future Trends in LASERS.
4. Recognize the Role of Fiber Optics in Emerging Technologies.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
PHYSICS Practical –III(Major): Thermal Physics and Waves & Optics
Marks-50 (Credits: 02)

Group: I - Thermal Physics

1. To determine the coefficient of thermal conductivity by using Searl's apparatus.
2. To determine specific heat of graphite.
3. To determine the temperature coefficient of resistance using platinum resistance thermometer.
4. To determine temperature coefficient of resistance by using P.O. box.
5. To determine joule constant J by electrical method.
6. To determine mechanical equivalent of heat J by Callender and Barne's constant flow method.
7. Searls Viscometer

Group: II - Waves & Optics

1. Calibration of spectrometer.
2. To determine the resolving Power of Grating.
3. To determine wavelength of sodium light using Newton's Rings.
4. To determine the thickness of thin film.
5. To determine wavelength of sodium light using bi-prism.
6. To study angle of specific rotation of sugar using polarimeter.
7. To determination of wavelength of LASER using plane diffraction grating.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
OE Practical –III: Units & Measurements
Marks-50 (Credits: 02)

Group I

1. Identification of various measuring tools, to find least count and range.
2. To measure thickness by using Vernier Caliper.
3. To measure diameter of wire by using Micrometer Screw Gauge.
4. To determine radius of curvature by using spherometer.
5. To calculate inner diameter of capillary tube by using mercury thread.
6. Study of elasticity of given rubber.
7. Period of simple pendulum.

Group II

1. Measurement of rate of flow of water using stopwatch and measuring flask.
2. To determine coefficient of static friction.
3. To determine volume of solid by using Archimedes principle.
4. Study Refraction of light using glass slab.
5. Measurement of focal length of convex lens.
6. Number of images using two mirrors.
7. To study Audio Frequency Generator.

In Marathi:

Group I

1. मोजमाप करणाऱ्या साधनांची ओळख, लघुत्तम माप आणि श्रेणी (रेंज) मोजणे.
2. व्हर्नियर कॅलिपर वापरून जाडी मोजणे.
3. मायक्रोमीटर स्क्रू गेज वापरून वायरचा व्यास मोजणे.
4. स्फेरोमीटर वापरून वक्रतेची त्रिज्या मोजणे.
5. पाऱ्याचा धागा वापरून केशिका नळीच्या (कॅपिलरी) आतील व्यासमोजणे.
6. रबराच्या लवचिकतेचा (इलॅस्टिसिटी) अभ्यास.
7. साध्या लंबकाचा (पेंडुलम) कालावधी मोजणे.

Group II

1. घड्याळआणि मापनपात्र वापरून पाण्याचा प्रवाह दर मोजणे.
2. स्थिर घर्षण गुणांक काढणे.
3. आर्कीमेडीज चे तत्व वापरून घनफळ काढणे.
4. काचेच्या स्लॅबचा वापर करून प्रकाशाच्या अपवर्तनाचा अभ्यास करणे.
5. बहिर्वक्र भिंगाच्या नाभीय अंतराचे मापनकरणे.
6. दोन आरसे वापरून प्रतिमांची संख्या मोजणे.
7. Audio Frequency Generator चा अभ्यास करणे

References:

1. Practical Physics- P.R. Sai Kumar, PHI 2011

2.www.tntextbooks.in

Course Outcomes (CO'S):

After successfully completing this course, the student will be able to :

1. Measure distance using given instruments.
2. Do the calculation to find out value of physical quantities.
3. Know the optical phenomena.
4. Understand physical units.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
SEC Practical –I: Physics Laboratory Techniques I
Marks-50 (Credits: 02)

Group I (Skills in General Physics)

1. To determine radius of curvature of convex and concave surfaces using spherometer.
2. To measure the radius of the capillary tube using travelling microscope.
3. To measure unknown resistance using P. O. Box.
4. To find unknown resistance using meter bridge.
5. To determine volume of solid by using Archimedes principle.
6. To study the relation between the square of time period of a simple pendulum and its length.
7. To establish graphically the relation between tension and length of the string of the sonometer.

Group II (Skills in Optics)

1. Verification of Snell's law.
2. To study the normal shift using glass slab.
3. Optical levelling of spectrometer and Schuster's method (Angle of prism).
4. Polar graph using photocell/photovoltaic cell.
5. To verify inverse square law of radiation using photoelectric cell.
6. To measure divergence of LASER.
7. Study of light propagation in an optical fiber.

References

1. Practical electronics : Ralph, Morrison

2. An advance course in practical Physics : D. Chattopadhyay

3. B. Sc. Practical Physics : C. L. Arora

4. B. Sc. Practical Physics : Harnam Singh

5. Practical Physics : K. K. Dey, B. N. Dutta

6. Advance practical Physics : Worshnop Flint

Course Outcomes

After successfully completing this course, the student will be able to:

1. Handle and operate various instruments in Physics laboratory.
2. Perform experiments in General Physics and Optics.
3. Develop practical skill, instruments handling skills, observational skills and problem solving skills
4. Record experimental observations scientifically.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
PHYSICS Minor V: Thermodynamics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Ideal and Real gas: (07)

Interpretation of temperature, Andrew's curve, critical constants, Relation between critical constants and Vander Waal's constants, reduced equation of state. Degrees of freedom

2. Thermometry: (08)

Concept of heat and temperature, Principle of thermometry, types of thermometers, Scales of temperature (Celsius, Kelvin, Fahrenheit and Rankine) and relation between them, Mercury thermometer (Principle, construction, working, errors and corrections), Seeback effect, Principle, construction, and working of Thermoelectric thermometer and Platinum resistance thermometer.

3. Laws of thermodynamics-I (07)

Thermodynamic system, thermodynamic variables, thermodynamic equilibrium, Zeroth Law of thermodynamics, Internal energy, First law of thermodynamics, Specific heats (C_P and C_V), Isothermal, Adiabatic, Isochoric, and Isobaric process, Adiabatic relations, work done during isothermal and adiabatic processes,

4. Laws of thermodynamics-II (08)

Reversible and irreversible processes, Second law of thermodynamics (different statements), Heat engine, Carnot's ideal heat engine, Carnot's cycle (Working, efficiency), Carnot's theorem, Entropy (concept & significance), Third law of thermodynamics-Nernst's heat theorem.

References:

1.Heat and Thermodynamics- Brijlal and N.Subramanyam, S.Chand and Company Ltd.

2. Text book of heat- J.B. Rajam, S.Chand and company Ltd

3.A treatise on Heat- MeghnadSaha and B.N. Srivastava, Indian Press

4. Heat and Thermodynamics (8th Ed), M.W. Zemansky and R. Dittman, McGraw Hill

5.Heat Thermodynamics and Statistical physics- J.P. Agrawal and Satya Prakash, Pragati Prakashan

6. Fundamentals of heat - D.S.Mathur, S.Chand and Sons publisher

Course Outcomes (COs):

After successfully completing this course, the student will be able to:

1. Understand Real gases and validity of the laws of thermodynamics.
2. Visualize Merits and demerits of thermometers.
3. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process.
4. Understand concept of entropy.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
PHYSICS Minor VI: Applications of Physics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Optical Devices (07hrs)

Optical instruments: Construction, Principle and Working with ray diagram of different optical devices like Spectacle lenses, Microscope, Telescope, Camera and Binoculars.

2. Applications of LASER (08hrs)

Types of LASER, Construction and working of Ruby Laser and He-Ne Laser,Properties and applications of Laser in medical field, data storage, precision cutting.

3. Modern Physics (08hrs)

Production of X-rays, application of X-rays in health care, Radioactive decay, use of Gamma rays in cancer treatment, Production of Ultrasonic Waves by Piezo-electric Oscillator & its medical applications.

4. Meteorology (07hrs)

Introduction, scales in meteorology, branches and applications, causes for climate changes and it's impact on Earth's atmosphere, global radiation balance, solar energy spectrum.

References:

1.Application of LightOptics by Eugene Hecht

2.Fundamentals of Photonics by Bahaa E. A. Saleh and Malvin Carl Teich

3.Principles of Optics by Max Born and Emil Wolf

4.Introduction to Electrodynamics by David J. Griffiths

5.Electricity and Magnetism by Edward M. Purcell and David J. Morin

6.Electromagnetic Waves and Radiating Systems by Edward C. Jordan and Keith G. Balmain

7.Concepts of Modern Physics by Arthur Beiser

8.Introduction to Health Physics by Herman Cember

9.Medical Imaging Physics by William R. Hendee and E. Russell Ritenour

10. Meteorology Today by C. Donald Ahrens

11. Atmospheric Science: An Introductory Survey by John M. Wallace and Peter V. Hobbs

12. The Physics of Atmospheres by John Houghton

Course Outcomes (COs):

After successfully completing this course, the student will be able to:

1. Understand concepts of geometrical optics.
2. Understand the production of Laser Light and its diverse significant applications.
3. Know X-rays as diagnostic tools and nuclear phenomena in cure of dreadful disease.
4. Know how to address or overcome the challenges of climate change.

Shivaji University Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
PHYSICS Minor Practical III: Thermodynamics & Applications of Physics
Marks-50 **(Credits: 02)**

Group: I –Thermodynamics

1. To record and analyse the cooling temperature of hot object as a function of time using a thermocouple.
2. To determine the temperature coefficient of resistance using platinum resistance Thermometer.
3. To determine the temperature coefficient of resistance using post office box.
4. To determine Joules constant by electrical method.
5. To studythermistor as a temperature transducer.
6. To determine Latent heat of fusion of ice.
7. To determine thermal coefficient of linear expansion of a metal rod.

Group: II –Applications of Physics

1. To determine the equivalent focal length of a thick lens using Newton's formula.
2. To determine the wavelength of laser using plane diffraction grating.
3. To determine focal length and the power of a single convex lens by displacement method.
4. To determine the refractive index of a liquid lens by auto collimation method.
5. To study Divergence of a laser beam.
6. To Study the Indian meteorological charts (IMD) Isobaric patterns (drawing and identification) sign and symbols on IMD charts, interpretation of IMD charts
7. To study Representation of Meteorological data Graphs – line, Bar, Climograph, Hypsography.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
Vocational Skill Course –I (Practical): Skills in Physics
Marks-50 (Credits: 02)

Group: I

1. Electrical wiring of bulb, switch and plug.
2. Design & develop a simple electronic circuit using resistors, capacitors etc.
3. To verify Ohm's law.
4. To study IV characteristics of a diode.
5. To analyze a data set using Excel and visualize the results using charts & graphs.
6. Graphical representation of motion of simple pendulum using python program.
7. To calibrate Resistance Temperature Device (RTD)

Group: II

1. To determinethe focal length of convex lenses using auto collimation method.
2. To verify Brewster's law.
3. Mounting of grating with its plane vertical and set it for normal incidence.
4. Obtaining bi-prism fringes without lateral shift.
5. To determine bench error using glass rod.
6. To determine radius of capillary bore using mercury thread.
7. Sky observation by Stellarium astronomy software.

Course Outcomes

After successfully completing this course, the student will be able to:

1. Handle and operate various instruments in Physics laboratory.
2. Develop practical skill, instruments handling skills, observational skills.

Shivaji University Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV PHYSICS Paper-VII
Major VII: Modern Physics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Relativity [07]

Inertial and non-inertial frame of reference, Galilean transformation, ether hypothesis. Michelson- Morley experiment, postulates of the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence relation.

2. Particle Properties of the Wave [08]

Introduction: Ultraviolet Catastrophe, Photoelectric effect,X-rays: Production of X-rays, Continuous X- ray spectrum, Mosley's law, Duane-Hunt law, Characteristic X -rayspectrum, Compton Effect, Expression for Compton wavelength, Experimental verification of Compton Effect.

3. Wave properties of Matter [08]

De-Broglie hypothesis and derivation of wavelength of matter wave, explanation of wave packet, group velocity, phase velocity, relations between them, Davisson and Germer experiment, Bohr's quantum condition on the basis of matter waves, Heisenberg's uncertainty principle (explanation with example of non- existence of electron in the nucleus)

4. **Vector Atom Model: [07]**

Review of Bohr's Atomic Model, Principal quantum number, Energy levels and emission and absorption spectra (with H_2 example), Somerfield correction (qualitative), azimuthal quantum number.

Vector atom model: Space quantization and electron spin hypothesis, quantum numbers, Pauli's exclusion principle,

Reference Books:

1. Introduction of special Relativity by Robert Resnik.
2. Perspectives of modern Physics- Arthur Beiser.

3. Atomic and nuclear Physics by Gupta and Gosh, 2nd Edition.

4. Quantum Mechanics by Sing, Bagade, Kamal Sing, Chand &Comp.

5. Introduction to Atomic and Nuclear Physics by H. Semat and Albright.

6. Atomic Physics by J.B. Rajam.

7. "Modern Physics" by Kenneth S. Krane

8. Concepts of modern Physics by S.L. Gupta and S.Gupta, Dhanpatrai and Sons

Course Outcomes (CO'S):

After successfully completing this course, the student will be able to:

1. Understand the basic ideas of special theory of relativity like space and time are relative depending on the observer's motion. Fundamentally changing our perception of space and time depending on the reference frame.
2. Develop critical understanding of dual nature of radiation by comprehending the significant phenomena that turned to be the milestones in the development of modern physics.
3. Explain the significance of matter waves that led to the invention of electron microscopy and also to quantify the uncertainty in the probabilistic measurements.
4. Understand the refinements in conventional atomic models that led to the modern vector atomic model. In future to develop an insight into atomic spectra exhibited by different elements.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV PHYSICS Paper-VIII
Major VIII: Analog & Digital Electronics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Cathode Ray Oscilloscope (05)

Principle, Construction and working of Cathode Ray Tube, Block diagram of Cathode Ray Oscilloscope, uses of Cathode Ray Oscilloscope (AC voltage measurement, DC voltage measurement, Time period measurement, frequency measurement, phase measurement, Lissajous figures)

2. TransistorAmplifier and Oscillators (10)

TransistorAmplifier: Single stage transistor CE Amplifier, DC and AC equivalent circuits, load line analysis and Q – point. Frequency Response curve of an amplifier, Positive and negative feedback.

Oscillators: Types of Waveforms, Oscillations from tank circuit, theory of feedback oscillator, Barkhausen's criterion for sustained oscillations, Phase shift oscillator, Colpitts oscillator and Crystal oscillators (Qualitative treatment only).

3. Digital Electronics (07)

Review of basic logic gates, Derived logic Gates (NOR, NAND, XOR and XNOR gates), De Morgan's theorems, NAND and NOR as universal gates, R-S flip-Flop, J-K Flip- flop, half Adder, full adder and parallel binary adder.

4. Python Programming Language (08)

Brief History, Key features, Famous applications built using python.
Identifier, comments, Indentation
Data types: Integer, Float, List, Tuple, String, Boolean.
Input-Output: print [ ], input []
Python Operators: Arithmetic, Comparison, Logical Operator, Assignment, Membership and Identity Operator.
Expression, Statement
Conditional Statement: If else, if-elif-else statement
Loop: for, while

References:

1. Digital Principles & Applications, A.P. Malvino, D.P. Leach &Saha, 7th Ed. 2011, Tata McGraw Hill.

2. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6thEdn., Oxford University Press.

3. Modern Electronic Instrumentation & Measurement Tech., Helfrick&Cooper, 1990, PHI Learning.

4. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.

5. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.

6. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.

7.Let Us Python, 5th Edition, YashavantKanetkar, AdityaKanetkar

8.Website Reference:

https://www.geeksforgeeks.org/python-programming-language-tutorial/

Course Outcomes (Cos)

After successfully completing this course, the student will be able to do the following:

1. Student will be able to discuss the construction and working of CRO and various applications of CRO and illustrate it with suitable examples.
2. Student will be able to discuss single stage common emitter amplifier with ac and dc load line.
3. Student will be able to design different types of oscillator circuits of desired frequency.
4. Student will be able to list basic logic gates and derived logic gate.
5. Student will be able to understand basics of Python programming language.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV PHYSICS Practical –IV (Major)
Modern Physics and Analog & Digital Electronics
Marks-50 (Credits: 02)

Group: I- Modern Physics

1. Determination of Boltzmann constant using semiconductor diode.
2. Determination of Plank's constant using photodiode or LED.
3. To verify Stefan's fourth power law.
4. To determine Stefan's constant by using black body radiation.
5. To determine Rydberg's constant using hydrogen source and plane diffraction grating
6. To study photoelectric current with intensity of light using photoelectric cell/ To determine stopping potential by using photoelectric cell.
7. Simulation of Lorenz Transformation.

Group: II- Analog & Digital Electronics

1. To determine A. C. and D. C. sensitivity of the C. R. O. and to measure unknown frequency.
2. To design a single stage CE amplifier of a given gain using voltage divider bias.
3. To study phase shift oscillator using BJT.
4. To study Colpitt's oscillator using BJT.
5. To verify De- morgan's theorems by using IC - 74 series.
6. Python program to find the maximum of two numbers by using if – else statement.
7. Python program to find factorial of number using for loop.

Course Outcomes (Cos)

After successfully completing this course, the student will be able to do the following:

1. Able to perform experiments in Modern Physics and Electronics.

2. Develop practical skill, instruments handling skills, observational skills and problem solving skills.

3. Able to solve problems in Python programming language.

Shivaji University Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV
OE Practical –IV: Physics of Everyday Life
Marks-50 (Credits: 02)

Group: I

1. To measure speed and understand the concept of average speed.
2. Free Fall and Acceleration Due to Gravity, Speed of a rolling object.
3. Simple pendulum
4. Centre of mass
5. Energy transfer
6. Exploring Fluid Flow and Speed Using Water Streams
7. Exploring Static Electricity

Group: II

1. Exploring Basic Electrical Circuits
2. Exploring magnets
3. Exploring Light and Colour with Soap Film Interference
4. Observing Refraction and Optical Distortion in Water
5. Exploring Image Formation with Two Plane Mirrors
6. Exploring Image Formation with Convex Mirror
7. Investigating the Shape of Water Drops and the Effect of Surface Tension

Course Outcomes (Cos)

After successfully completing this course, the student will be able to do the following:

1. **Understand and Apply Basic Physical Concepts:** Students will be able to understand and apply fundamental physics concepts.
2. **Conduct Simple Experiments:** Students will be able to conduct basic experiments to measure physical quantities, observe phenomena, and collect data.
3. **Appreciate the Relevance of Physics:**Students will be able to appreciate the relevance of physics in their daily lives and its applications in various fields.
4. **Develop Critical Thinking Skills:** Students will be able to critically analyze and evaluate information related to physics and its applications.
5. **Foster Interest in Science:** Students will be able to develop an interest in science and its applications in the real world.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV
SECPractical –II: Physics Laboratory Techniques II
Marks-50 (Credits: 02)

Group III (Skills in Electronics)

1. Building a D. C. power supply using bridge rectifier
2. Zener diode as a voltage regulator
3. Use of multimeter : Electronic component testing
4. Electronic component testing using C. R. O.
5. To measure unknown frequency using C. R. O.
6. Maximum power transfer theorem
7. Transistor characteristics in C. E. mode

Group IV (Computational Skill)

1. Estimation of errors
2. Plotting graphs: Plotting straight line graph and calculate i) Standard Deviation
3. ii) Standard error iii) Probable error
4. Python program to add two numbers
5. Python program to find area of a triangle
6. Python program to find sort of a number
7. Determination of lattice constant using given XRD powder pattern

References

1. Practical electronics: Ralph, Morrison
2. An advance course in practical Physics: D. Chattopadhyay
3. B. Sc. Practical Physics: C. L. Arora
4. B. Sc. Practical Physics: Harnam Singh
5. Practical Physics: K. K. Dey, B. N. Dutta
6. Advance practical Physics: Worshnop Flint

Course Outcomes (COs)

After successfully completing this course, the student will be able to:

8. Handle and operate various instruments in Physics laboratory.
9. Perform experiments in Electronics.

3. Record experimental observations scientifically.
4. Solve problems in Python programming language.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV
PHYSICS Minor VII: Semiconductor Physics
Theory: 30 Hours Marks-50 (Credits: 02)

1. SEMICONDUCTORS (06)

Semiconductors, Types of semiconductors-intrinsic and extrinsic, majority and minority carriers, p-n junction, properties of p-n junction, forward bias and reverse bias of p-n junction, V-I characteristics of p-n junction.

2. SEMICONDUCTOR DIODE (09)

p-n junction diode, diode as a rectifier- half wave, full wave, bridge; ripple factor, filter circuits, types of filter circuits, Zener diode, Zener diode as a voltage stabilizer.

3. TRANSISTOR (09)

Types of transistors, symbol, working of npn and pnp transistors, common emitter, common base, common collector configurations, transistor characteristics in CE and CB mode.

4. TRANSISTOR AMPLIFIER: (06)

Single Stage CE transistor amplifier, D.C. and A.C. equivalent circuit, load line analysis.

References

1. Electronic Devices and Circuits: Allen Mottershead, Prentice-Hall of India Pvt.Ltd.
2. Electricity and electronics: G. K. Mithal, Khanna Publishers
3. Principles of electronics: V. K. Mehta, S Chand & Company, New Delhi (11th Edition)
4. Electronic Principles: Elbert Malvino, David Bates, Patrick Hoppe (9th edition)

Course Outcomes (COs)

After successfully completing this course, the student will be able to:

1. Explain the fundamental properties of semiconductors, distinguish between intrinsic and extrinsic semiconductors, and describe the behaviour of majority and minority carriers in a p-n junction.

2. Analyse the properties of a p-n junction under forward and reverse bias and interpret the V-I characteristics of the junction.
3. Demonstrate the ability to design and analyse rectifier circuits (half-wave, full-wave, and bridge), calculate ripple factors, and understand the role of filter circuits in reducing ripples. They will also evaluate the operation of a Zener diode as a voltage stabilizer.
4. Students will understand the working principles of NPN and PNP transistors, explain the transistor configurations (CE, CB) and evaluate the characteristics of transistors in these configurations.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV
PHYSICS Minor VIII: Astronomy & Astrophysics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Origin of Modern Astronomy (07)

Introduction, Geocentric theory, heliocentric theory, Tectonic system, Kepler's laws of planetary motion, Galileo's astronomical contribution, Newton's laws of motion, Newton's law of gravitation.

2. Stellar Evolution (08)

Formation of the Stars (protostar), Sources of Stellar Energy, H-R Diagram (only diagram), Main Sequence stars, Evolution from the Main Sequence to Red Giants, Chandrasekhar Limit and White Dwarfs, Neutron Stars (only concept), Black Holes (only concept).

3. The Sun (07)

Internal structure of Sun, Photosphere, Chromospheres and Corona, Sunspots, Solar cycle, Solar Flares, Coronal Mass Ejections, Solar wind, solar radio bursts, Space Weather (only concept).

4. The Milky Way Galaxy (08)

Origin of the Milky Way galaxy, Spiral Structure of the galaxy, Galactic Coordinates, The Mass of the Galaxy, Self-Sustaining Star Formation, The galactic centre, Stellar Populations in the Galaxy.

References:

1. Foundations of Astronomy, Eleventh Edition, Michael A. Seeds, Dana E. Backman, 2011, Brooks/Cole, Cengage Learning.
2. Astronomy: Fundamentals and Frontiers – Jastrow& Thomson, third edition, John Wiley & Sons, 1979
3. Astronomy: A Physical Perspective - Marc L. Kutner, Cambridge University Press, 2003
4. Source book on space science by S. Glasstone, Van Nostrand Company Incorporated, 1965

5. Structure and Evolution of the Stars by Martin Schwarzschild, Princeton University Press, 2016.
6. Structure of the Universe by J.V. Narlikar, Oxford University Press, 1977
7. Astrophysics of the Sun, by H. Zirin, Cambridge University Press, 1989

Classroom Activities:

1. Hands-On: Telescope operation and celestial observations.
2. Interactive Sessions: Exploring constellations using star charts.
3. Debates: The role of space exploration in societal progress.

Recommended Resources:

Simulations and Apps:

1. Stellarium (Planetarium Software)
2. SkySafari (Astronomy App)

Course Outcomes (COs):

After successfully completing this course, the student will be able to:

1. Understand the fundamentals laws and theories of Astronomy.
2. Discuss the star evolution and related basic concepts.
3. Compare the characteristics of the Galaxy
4. Explain various activities of the Sun.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester VI
PHYSICS Minor Practical II: Semiconductor Physics and Astronomy & Astrophysics
Marks-50 **(Credits: 02)**

Group: I – Semiconductor Physics

1. To study of I-V Characteristics of a p-n Junction Diode (Forward and Reverse Bias).
2. To study the half-wave rectifier.
3. To study the full-wave rectifier.
4. To study the output of the bridge rectifier with and without a filter circuit.
5. Study of Zener Diode as a Voltage Regulator.
6. To study the output characteristics of a Transistor in CE Configuration.
7. Single-Stage CE Transistor Amplifier.

Group: II –Astronomy & Astrophysics

1.Verification of inverse square law of intensityusing solar cell.

2. Study of Solar Spectrum.

3. Sunspot activity analysis.

4.Constellation map drawings – a) Orion b) Ursa Major (Big Dipper) c) Auriga d) Taurus.

5. To use idea of parallax to determine large distance.

6. Spherical Aberration (Caustic Curve)

7. Study of polar graph.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV
Community Engagement Programme –I: Physics
Marks-50 (Credits: 02)

The students study various changes in society related to Physics. Students must visit different places and maintain a journal/field dairy. Field Visit is a part of the Community Engagement Programme. Some of the field based activities are as follows,

1. Energy Audit
2. Digital Literacy
3. Awareness regarding water conservation.
4. E waste management.
5. Demonstrations of Physics experiments at school level.
6. Creating videos, pod costs or interactive simulations to help students learn physics.
7. Entrepreneurship Development.
8. Work with community groups to develop and implement physics-based projects that address community needs.
9. Environmental monitoring projects.
10. Awareness in community regarding scientific attitude.

The list is not limited to the above given topics. The students should choose a topic that is related to Physics.

The Assessment pattern is internal and external:

Internal	External	Total
30 Marks	20 Marks	50 Marks

Internal continuous assessment:

Concern field visit	Project report & Journal Submission	Presentation of field project findings
40 %	40 %	20 %

Marks Distribution for B. Sc. II Semester III

10. For Major and Minor Practical (Lab)

Group	Group I	Group II	Journal	Total
Marks	20	20	10	50

11. For VSC I Practical (Lab)

Group	Group I	Group II	Journal	Total
Marks	20	20	10	50

12. For SEC I Practical (Lab)

Group	Group I	Group II	Journal	Total
Marks	20	20	10	50

13. For OE III Practical (Lab)

Group	Group I	Group II	Journal	Total
Marks	20	20	10	50

Marks Distribution for B. Sc. II Semester IV

14. For Major and Minor Practical (Lab)

Group	Group I	Group II	Journal	Total
Marks	20	20	10	50

*Field visit/ Study tour is compulsory. Report should be submitted during practical examination.

15. For SEC II Practical (Lab)

Group	Group I	Group II	Journal	Total
Marks	20	20	10	50

16. For OE IV Practical (Lab)

Group	Group I	Group II	Journal	Total
Marks	20	20	10	50

Shivaji University Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
Major and Minor PHYSICS Theory Papers
Nature of Question Paper
Total Marks-40

Q. 1 Choose the correct alternatives. **8 marks**

a)

b)

c)

d)

e)

f)

g)

h)

Q. 2 Attempt any TWO of the following. (Out of Three) **16 marks**

a)

b)

c)

Q. 3 Attempt any FOUR of the following. (Out of Six) **16 marks**

a)

b)

c)

d)

e)

f)