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

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, अभ्याससमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Ref.No.SU/BOS/Science/270 **Date: 03/05/2025**

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)

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.	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)

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,

By 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

Shivaji University, Kolhapur

Accredited by NAAC with A^{++} Grade

Syllabus for Bachelor of Science Part II
Astrophysics & Space Science (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	*Major V*	*Celestial Mechanics*	*Minor V*	*Mechanics*
	Major VI	*Introductory Quantum Mechanics*	*Minor VI*	*Foundations of Quantum Mechanics*
	Major Practical III	*Celestial Mechanics & Quantum Mechanics*	*Minor Practical III*	*Mechanics & Foundations of Quantum Mechanics*
	OE III Practical	*Units & Measurements*		
	SEC Practical I	*Physics Laboratory Techniques I*		
	VSC I (Major Specific)	*AEC I (English)*	CC - I	
IV	*Major VII*	*Cosmic Electro Dynamics*	*Minor VII*	*Solar and Cosmic Plasma Dynamics*
	Major VIII	*Thermal Physics*	*Minor VIII*	*Fundamental Thermodynamics*
	Major Practical IV	*Cosmic Electro Dynamics & Thermal Physics*	*Minor Practical IV*	*Solar and Cosmic Plasma Dynamics & Fundamental Thermodynamics*
	OE IV Practical	*Physics of Everyday Life*		
	SEC Practical II	*Physics Laboratory Techniques II*		
		AEC II (English)	CEP - I	VEC II (Envi. Science)

Shivaji University, Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III Astrophysics & Space Science Paper-V
Major V: Celestial Mechanics
Theory: 30 Hours Marks-50 (Credits: 02)

Unit I: Fundamentals of Dynamics: (7hrs)

Reference frames: Inertial and non Inertial frames, Review of Newton's Laws of Motion. Galilean transformations. Galilean invariance, Non-Isolated Systems, Motion in a One-Dimensional Potential, Simple Harmonic Motion ,Two-Body Problem .

Unit II Newtonian Gravity: (8hrs)

Introduction , Revision of Newton's Law of Gravitation, Gravitational Field, The Gravitational Fields Around Various Bodies;-a point mass, on the axis of ring, Plane discs, Rods ,Solid Cylinder, uniform solid sphere, Gauss's Theorem.

Gravitational potential and potential energy, Gravitational potential near various bodies-;-a point mass, on the axis of ring, Plane discs, Rods ,Solid Cylinder, uniform solid sphere

Unit III: Orbits in Central Force-Fields: (7 hrs)

Introduction, Motion in a General Central Force-Field, Motion in a Nearly Circular Orbit, Precession, Precession of Mercury

Unit IV: Rigid Body Rotation: (8 hrs)

Introduction, Fundamental Equations, Moment of Inertia Tensor , Rotational Kinetic Energy, Principal Axes of Rotation , Euler's Equations.

References:

1. Feynman Lectures, Vol.I, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
2. Mechanics, D.S. Mathur, S.Chand and Company Limited, 2000
3. University Physics. F.W Sears, M.W Zemansky, H.D Young 13/e, 1986, Addison Wesley
4. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. 2007, Tata McGraw-Hill.
5. Classical Mechanics By Goldstein
6. An Introduction to Celestial Mechanics, Richard Fitzpatrick, Cambridge University, Press 2012

Shivaji University, Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III Astrophysics & Space Science Paper-VI
Major VI: Introductory Quantum Mechanics
Theory: 30 Hours Marks-50 (Credits: 02)

Unit I: Origin of Quantum Mechanics: (7 hrs)

Limitations of Classical Physics; Landmark discoveries leading to origin of Quantum Physics: Explanation of Black body radiation Spectrum, Photoelectric effect, Compton Effect and Pair Production (Qualitative discussions only).

Unit II: Matter Waves: (8 hrs)

De-Broglie hypothesis and derivation of wavelength of matter wave, explanation of wave packet, group velocity, phase velocity, relations between them, Davission and Germer experiment, Bohr's quantum condition on the basis of matter waves, Heisenberg's uncertainty principle (statement and explanation).

Unit III Schrodinger's Equation: (8 hrs)

Physical interpretation of wave function, time dependent and time independent Schrodinger's wave equations (one and three dimensional), probability current density, eigen values and eigen functions, expectation values.

Unit IV The Quantum Harmonic Oscillator: (7 hrs)

Quantum Harmonic Oscillator in 1D (Solution to the Schrodinger equation); Energy quantization and its implications for astrophysical systems; Relation to astrophysical phenomena e.g. molecular vibrational states in interstellar space.

References:

1 Quantum Mechanics (Kindle edition) by G. Aruldas, PHI Learning Private Limited, Delhi- 1100092, 2009.
2. Quantum Mechanics: An Accessible Introduction by Rober Scherrer, Pearson Publisher.
3. Concepts of Modern Physics: Beiser, Mahajan and Choudhary, Published by Tata Mc Graw Hill Education, Pvt Ltd. New Delhi.
4. Quantum Mechanics by sing, Bagade, Kamal Sing, Chand & Comp.
5. Concepts of modern Physics by S.L. Gupta and S. Gupta, Dhanpatrai and Sons.
6. Quantum Astrophysics by S. M. Moser and F. K. Lam
7. Principle of Quantum Mechanics (Text Book) by R. Shankar
8. Quantum Mechanics: Concepts and Applications (Text Book) by Nouredine Zettili

Course Outcomes

1. To understand the basic principles of quantum mechanics.
2. To build a foundation for more advanced topics in quantum astrophysics.

Learning Outcomes:
By the end of this course, students should be able to:
Understand and apply the basic principles of quantum mechanics.
Relate quantum phenomena to astrophysical objects and processes.
Analyze quantum systems in the context of stellar evolution, black holes, and high-energy astrophysics.

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

Group A:

1. To study the random error in observations

2.To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.

3. To determine the value of g using Kater's Pendulum.

4. Study of Amplitude decay using Simple Pendulum

5. To calculate g using Bifilar Pendulum

6. Modulus of rigidity of a wire by Dynamical method

7. To determine moment of Inertia of Disc

8.To determine time of descent for spherical and cylindrical body rolling down an inclined plane.

Group B:

1.Determination of Cauchy's constants

2.Compare dispersive powers of crown and flint glass prisms using composite light

3. Determination of Wave length of light using Fresnel's Biprism

4.Verify Brestwer's Law of Polarization

5.Comparison of Positive and Negative crystals using polarid

6.Cardinal points using Searle's Goniometer

7.Study of normal shift using material of different refractive indices

8.Newton's Rings

Shivaji University, Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III Astrophysics & Space Science Paper-V
Minor V: Mechanics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Review on Dynamics: (9 Hours)

(a) Frames of reference. Newton's laws of motion. Dynamics of a system of particles. Conservation of momentum. Centre of mass.

(b) Work-energy theorem (statement only) Conservative forces. Concept of potential energy. Conservation of energy.

2. Gravitation: (6 Hours)

Newton's Law of Gravitation, Motion of a particle in a central force field: motion in a plane, angular momentum is conserved, areal velocity is constant.

3. Orbits and Launching Methods: (7 Hours)

Introduction, Kepler's First Law, Kepler's Second Law, Kepler's Third Law, Definitions of Terms for Earth-Orbiting Satellites and Orbital Elements. Satellite in circular orbit and applications.

4. Precessional Motion: (8 Hours)

Precession, torque necessary for precession, gyroscope, gyrostatic pendulum, motion of rolling disc and hoop, gyroscopic applications- riding on a bicycle.

References:

1. Feynman Lectures, Vol. I, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
2. Mechanics, D.S. Mathur, S.Chand and Company Limited, 2000
3. University Physics. F.W Sears, M.W Zemansky, H.D Young 13/e, 1986, Addison Wesley
4. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. 2007, Tata McGraw-Hill.
5. Classical Mechanics by Goldstein
6. Satellite Technology, Principles and Applications, by Anil K. Maini, Varsha Agarwal (Second Edition), Wiley

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III Astrophysics & Space Science Paper-VI
Minor VI: Foundations of Quantum Mechanics
Theory: 30 Hours Marks-50 (Credits: 02)

1: Conceptual Origins of Quantum Mechanics (8 hours)

- Breakdown of classical physics: blackbody radiation, photoelectric effect, atomic spectra
- Introduction to Planck's quantum hypothesis
- Einstein's photon concept and the photoelectric effect
- Bohr's model of the hydrogen atom
- Wave-particle duality: de Broglie hypothesis
- Heisenberg's uncertainty principle (qualitative discussion)
- Philosophical shift from classical determinism to quantum indeterminacy

2: Mathematical Foundations and Postulates of Quantum Mechanics (7 hours)

- Complex numbers, vectors, and basic linear algebra (as needed)
- Introduction to the concept of state vectors and Hilbert space (elementary)
- Operators and observables: definition and interpretation
- Basic postulates of quantum mechanics:
  1. State vector and wave function
  2. Observables as operators
  3. Measurement postulate
  4. Time evolution via Schrödinger equation (qualitative)
- Superposition and orthogonally
- Probabilistic interpretation and expectation value

3: Wave Mechanics and Quantum Phenomena (08 hours)

- Schrödinger equation in one dimension (time-independent, qualitative form)
- Particle in a box: physical picture and quantization of energy
- Tunneling and potential barrier: qualitative understanding
- Double-slit experiment with electrons
- Spin and Stern–Gerlach experiment: introduction to quantum spin
- Quantum entanglement (conceptual)

4: Interpretations of Quantum Mechanics (07 hours)

- Copenhagen interpretation: measurement and collapse of wavefunction
- Einstein-Podolsky-Rosen (EPR) paradox
- Bell's theorem and the idea of locality

- Other interpretations: Many Worlds (basic idea), Bohmian mechanics (brief mention)
- Quantum information perspective (qubit concept, no math)

References:

1) The Theoretical Minimum, Volume 3 (Quantum Mechanics), Leonard Susskind
2) Quantum Physics: A Beginner's Guide – Alastair I.M. Rae
3) The Quantum World – Kenneth W. Ford
4) Sneaking a Look at God's Cards – Giancarlo Ghirardi
5) Introduction to Quantum Mechanics – David J. Griffiths (Selected simplified sections)
6) Online lectures & resources: MIT OpenCourseWare (Introductory level)
1 Feynman Lectures on Physics, Volume 3, Richard Feynman

Course Objectives:

- To introduce the conceptual framework of quantum mechanics.
- To explore its philosophical implications and historical development.
- To familiarize students with basic formalism including wave functions and the postulates of quantum mechanics.
- To provide simple illustrative applications without requiring advanced mathematics.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
Practical –III (Minor): Mechanics & Foundations of Quantum Mechanics

Marks-50 (Credits: 02)

Group I

1. To study the random error in observations
2. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
3. To determine the value of g using Kater's Pendulum.
4. Study of Amplitude decay using Simple Pendulum
5. To calculate g using Bifilar Pendulum
6. Modulus of rigidity of a wire by Dynamical method
7. To determine moment of Inertia of Disc

Group II

1. Determination of Cauchy's constants
2. Compare dispersive powers of crown and flint glass prisms using composite light
3. Determination of Wave length of light using Fresnel's Biprism
4. Verify Brestwer's Law of Polarization
5. Comparison of Positive and Negative crystals using polarid
6. Cardinal points using Searle's Goniometer
7. Study of normal shift using material of different refractive indices

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. To find unknown mass using law of moment.
8. 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 and liquid
4. To study Light Dependent Resistor (LDR).
5. Study Refraction of light using glass slab.
6. Measurement of focal length of convex lens.
7. Number of images using two mirrors.
8. Measurement of frequencies by using audio frequency 'Phyphox' app.

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 व्यास मोजणे.
6. रबराच्या लवचिकतेचा (इलॅस्टिसिटी) अभ्यास.
7. लॉ ऑफ मोमेन्ट वापरून दिलेल्या वस्तूचे वस्तुमान शोधणे.
8. साध्या लंबकाचा (पेंडुलम) कालावधी मोजणे.

Group II

1. घड्याळ आणि मापनपात्र वापरून पाण्याचा प्रवाह दर मोजणे.
2. स्थिर घर्षण गुणांक काढणे.
3. घन आणि द्रवांचे घनफळ काढणे.
4. प्रकाश अवलंबी रोध (LDR) अभ्यासणे.
5. काचेच्या स्लॅबचा वापर करून प्रकाशाच्या अपवर्तनाचा अभ्यास करणे.
6. बहिर्वक्र भिंगाच्या नाभीय अंतराचे मापन करणे.
7. दोन आरसे वापरून प्रतिमांची संख्या मोजणे.
8. 'फायफॉक्स' (PhyPhox) अँप वापरून वारंवारिता (फ्रिक्वेन्सी) मोजणे.

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 do the following:

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.
5. Measure distance using given instruments.
6. Do the calculation to find out value of physical quantities.
7. Know the optical phenomena.
8. 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. Use of telescope and stop watch.
6. To measure the radius of capillary using mercury thread.
7. To find the time period of simple pendulum for small amplitudes and draw the graph of length of pendulum against square of time period
8. To establish graphically relation between tension and length of the string of the sonometer resonating with given tuning fork

Group II (Skills in Optics)

1. Polar graph using photocell/photovoltaic cell
2. Schuster method and optical levelling of spectrometer
3. To find angle of prism using spectrometer
4. Mounting of grating with its plane vertical and set it for normal Incidence
5. Obtaining Biprism fringes without lateral shift
6. To verify inverse square law of radiation using photoelectric cell
7. To measure divergence of LASER source
8. To show that the distance between the object and screen must be four times the focal length to obtain real magnified and diminished images of an object using convex lens

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 do the following:

1. Able to handle and operate various instruments in Physics laboratory.
2. Able to perform experiments in General Physics and Optics.
3. Develop practical skill, instruments handling skills, observational skills and problem solving skills
4. Able to 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
Vocational Skill Course –I (Practical): Skills in Physics
Marks-50 (Credits: 02)

Group: I

1. Design & develop a simple electronic circuit using resisters, capacitors, microcontrollers etc.
2. Verify Ohm's Law using a variable resister, battery and multimeter.
3. Measure a resistivity of wires of different lengths by plotting a graph of potential difference verses current.
4. To study of IV characteristics of Diode.
5. Electrical wiring of bulb, switch and plug.
6. Handling of CRO.
7. To study the different types of thermometers. (eg. Mercury, alcohol, PTR, RTD etc.)
8. To study solar rooftop system.

Group: II

1. Measurement of focal length for lenses.
2. Study the refraction phenomena using prism, a glass slab and light source.
3. Radius of Capillary bore using mercury thread.
4. To Identify and describe various light sources (eg. Mercury, sodium, tungsten filament etc.).
5. 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. Constellations spotting by using sky map.
8. Sky observation by Stellarium Astronomy Software.

Course Outcomes

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

1. Able to handle and operate various instruments in Physics laboratory.

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

Shivaji University, Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV Astrophysics & Space Science Paper-VII
Major VII: Cosmic Electro Dynamics
Theory: 30 Hours Marks-50 (Credits: 02)

1. Electrodynamics (8 hrs)

Scalar electric potential (φ), Vector magnetic potential, Poisson's and Laplace's equation, Maxwell's equation in vacuum, electromagnetic waves in vacuum, wave equation and wave velocity. Scattering of light, scattering cross section, Thomson's and Rayleigh scattering**.**

2. Hydrodynamics (7 hrs)

Equation of continuity and conservation of mass, ideal fluid and Euler's equation of motion, Navier stroke's equation for viscous fluid.

3. Plasma Physics and Magneto hydrodynamics (8 hrs)

Definition of Plasma, Debye Shielding, The Plasma Parameter, Applications of Plasma Physics – (Space Physics, Modern Astrophysics, Particle Accelerators, Atmospheric Plasmas.) Idealized hydrodynamic equation, diffusion and frozen - in a magnetic field, MHD equation (magnetic pressure and magnetic tension).

4. Sun and solar activity (7 hrs)

Sun's interior, the photosphere, the solar atmosphere (chromospheres and corona), sunspots, Sun's rotation and Solar field, Explanation for observed features of sunspots. Solar Winds, Fluid Theory of Solar Wind Formation.

Reference Books:

1. Fundamentals and Frontiers of Astronomy – Jastrow & Thomson.
2. Souece Book on Space Science – Samuel Glastone.
3. Cosmic Electrodynamics – Fleishman & Toptygin
4. Introduction to Plasma Physics and Controlled Fusion - Francis F. Chen
5. Introduction to Space Physics – Kivelson & Ressell.
6. Introductory Astronomy and Astrophysics – Zeilik and Greogary.
7. Astrophysics (Stars & Galaxies) – K. D. Abhyankar.

8. Classical Electrodynamics – Jackson.
9. Cosmic Electrodynamics – J. H. Pidington.

Course Outcomes (COs):

After the completion of this course, students will be able to,

1. Understand and apply the fundamental concepts of electrodynamics.
2. Analyze physical scenarios involving light scattering mechanisms and compute scattering cross-sections such as Thomson and Rayleigh scattering.
3. Derive and interpret hydrodynamic equations.
4. Understand the fundamental concepts of plasma physics and its applications in astrophysics.
5. Interpret magnetohydrodynamic (MHD) principles and explain the structure and dynamics of the Sun solar wind.

Program Outcomes (POs):

After the completion of this Program, students will be able to,

PO1: Build a strong foundation in science and mathematics to understand and solve real-world physics problems.

PO2: Think critically and creatively to identify, understand, and tackle various challenges in physics using core scientific principles.

PO3: Develop practical and theoretical solutions for complex physical systems, and design experiments to explore and validate those ideas.

PO4: Appreciate how physics connects to society and the universe, and understand its role in addressing broader scientific and technological issues.

PO5: Stay curious and committed to continuous learning, keeping up with new discoveries and developments in science.

Shivaji University, Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV Astrophysics & Space Science Paper-VIII
Major VIII: Thermal Physics
Theory: 30 Hours Marks-50 (Credits: 02)

1. 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 and their Examples.

2. Thermodynamics II (07)

Concept of heat and work, Carnot's theorem, Carnot's Heat Engine and Carnot's Cycle, Second Law of Thermodynamics, Kelvin Planck and 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. Radiation and Thermodynamic Potentials (09)

Stefan's Law, Boltzmann law, Black body radiation, Rayleigh, Jean's law, Planck's law, Stefan's fourth power law, Pyrometry, Solar constant. Enthalpy, Maxwell's relations, Specific heat equation, CP – CV and CP / CV 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, Mark W. Zemansky and Richard H. Dittman, McGraw-Hill
2. Thermodynamics, Kinetic Theory, and Statistical Thermodynamics Francis W. Sears and Gerhard L. Salinger, Narosa Publishing House
3. Transport Phenomena R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, Wiley
4. Thermal Physics, Charles Kittel and Herbert Kroemer, W. H. Freeman

5. Fundamentals of Statistical and Thermal Physics, Frederick Reif, McGraw-Hill
6. Concepts in Thermal Physics, Stephen J. Blundell and Katherine M. Blundell, Oxford University Press
7. Introduction to Modern Thermodynamics, Dilip Kondepudi, Wiley
8. Heat Transfer, J.P. Holman, McGraw-Hill
9. Blackbody Radiation, S. Chandrasekhar, Dover Publications
10. Heat and Thermodynamics, M.W. Zemansky and R. Dittman, (8thEdn) McGraw Hill.
11. Thermal Physics – S Garg,R.Bansal and Ghosh, @nd editition,1993, Tata McGraw Hill.
12. Text Book of Heat- J.B. Rajam, S.Chand and Company Ltd.
13. A Treatise on Heat- Meghnad Saha and B.N. Srivastava, Indian Press.
14. Heat and Thermodynamics- Brijlal and N. Subramanyam, S.Chand and Company Ltd.
15. Heat Thermodynamics and Statistical Physics- J.P. Agrawal, Satya Prakash, Pragati publication
16. Fundamentals of Heat - D.S.Mathur, S.Chand and sons.

Course Outcomes (COs):

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

1. Understand the basic laws of thermodynamics, describe them from both microscopic and macroscopic perspectives, and apply these laws to real physical systems.
2. Understand the concepts of heat engines and refrigerators, and compute the efficiency of a Carnot heat engine and the coefficient of performance of a refrigerator.
3. Understand the concept of thermal equilibrium and describe systems in thermal equilibrium using thermodynamics and the kinetic theory of gases.
4. Understand the theory of transport phenomena and derive expressions related to the transport of momentum, thermal energy, and mass.
5. Understand the concept of entropy as the fourth thermodynamic variable, and use entropy to define the third law of thermodynamics.
6. Understand the four thermodynamic potentials, derive Maxwell's thermodynamic relations, and apply them to derive relationships between specific heats.

Shivaji University Kolhapur
B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV Practical –IV (Major)
Cosmic Electro Dynamics & Thermal Physics
Marks-50 **(Credits: 02)**

Group A

1.To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.

2.To study the response curve of a parallel LCR circuit and determine its (a) Antiresonant frequency and (b) Quality factor Q.

3.Measurement of components of Earth's magnetic field using Earth Inductor

4.Measurement of angle of Dip and Declination using dip circle

5.To determine absolute capacitance of a capacitor using Ballastic Galvanometer

6.To convert a Galavanometer into Ammeter and Voltmeter

7.To verify Maximum power transfer theorem

8.To Verify tangent law in Magnetism

Group B

1.To verify Stefan's law

2.To determine Thermal conductivity by Lee's Method

3.To determine Mechanical equivalent of heat

4.To determine temperature cefficient of thermistor

5.To determine temperature coefficient of resistance of LED

6.To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.

7.To determine latent heat of water

8.To determine Heat of ionization/ Enthalpy of mixture

Note : Sky observation will remain mandatory for the course work

Shivaji University Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV Astrophysics & Space Science Paper-VII
Minor VII: Solar and Cosmic Plasma Dynamics
Theory: 30 Hours Marks-50 (Credits: 02)

1: Cosmic Plasma (8 hrs)

Terrestrial, Solar, and Astrophysical Plasmas, Microscopic Description of Plasma, Statistical Representation of Plasmas, Plasma in a Weak Magnetic Field, Plasma in a Strong Magnetic Field, Collision less Plasma, Solar and Stellar Winds, Applications of Plasma Physics – (Space Physics, Modern Astrophysics, Particle Accelerators, Atmospheric Plasmas.)

2: Magneto Hydrodynamics (7 hrs)

Equation of continuity and conservation of mass, ideal fluid and Euler's equation of motion, Navier stroke's equation for viscous fluid, Idealized hydrodynamic equation, diffusion and frozen - in a magnetic field, MHD equation (magnetic pressure and magnetic tension).

3: Solar Dynamics (7 hrs)

Sun's interior, the photosphere, the solar atmosphere (chromospheres and corona), sunspots, Sun's rotation and Solar field, Explanation for observed features of sunspots.

4: The Solar wind (8 hrs)

Properties of solar wind, Fluid theory of solar wind formation, termination of solar wind, magnetic structure of corona and solar wind, MHD equations in field-aligned coordinates, pressure exerted by solar wind on magnetopause, plasma interaction with moonlike bodies, plasma interaction with bodies with atmosphere

Reference Books:

10. Fundamentals and Frontiers of Astronomy – Jastrow & Thomson.
11. Souece Book on Space Science – Samuel Glastone.
12. Cosmic Electrodynamics – Fleishman & Toptygin
13. Introduction to Plasma Physics and Controlled Fusion - Francis F. Chen
14. Introduction to Space Physics – Kivelson & Ressell.
15. Introductory Astronomy and Astrophysics – Zeilik and Greogary.
16. Cosmic Electrodynamics – J. H. Pidington.

Course Outcomes (COs):

After the completion of this course, students will be able to,

6. Understand astrophysical plasmas and describe their physical properties at the microscopic and macroscopic levels.
7. Apply the principles of fluid dynamics and magnetohydrodynamics (MHD) to analyze the behavior of plasmas in weak and strong magnetic fields.
8. Describe the internal structure of the Sun, the nature of sunspots, and the Sun's magnetic field and rotational behavior.
9. Identify and explain real-world applications of plasma physics in space science, astrophysics, and advanced technologies.

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

1. Laws of Thermodynamics (08)

Thermodynamic- systems (definitions and types), states, processes (reversible/irreversible), and properties, Zeroth Law of Thermodynamics- thermal equilibrium and temperature, First Law of Thermodynamics- internal energy, heat, and work, Second Law of Thermodynamics- concept of entropy and spontaneous processes, Third law of Thermodynamics- behavior at absolute zero.

2. Entropy and Energy (07)

Concept of Entropy, Physical significance of Entropy, Entropy changes in reversible and irreversible process with examples, T-S diagram (construction and interpretation), Carnot's theorem, Carnot's Heat Engine and Carnot's Cycle, Energy conservation in closed and open systems

3. Thermodynamic Potentials and Radiations (09)

Enthalpy, Maxwell's relations, Specific heat equation, CP – CV and CP / CV equation (for ideal gas only), TdS equations,

Stefan's Law, Boltzmann law, Black body radiation, Rayleigh, Jean's law, Planck's law, Stefan's fourth power law, Solar constant and Pyrometry.

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. D.S. Mathur – Heat and Thermodynamics, S. Chand and Company Pvt. Ltd., 5th Edition (Revised), 2020 (reprints available till 2024), ISBN: 9789352533030
2. Mark W. Zemansky, Richard H. Dittman– Heat and Thermodynamics, McGraw-Hill Education, 7th Edition, 1997, ISBN: 9780070593118.

3. Y.V.C. Rao – An Introduction to Thermodynamics, University Press (India) Pvt. Ltd., 3rd Reprint (2017), First published in 1993, ISBN: 9788173714610.
4. Francis W. Sears, Mark W. Zemansky, Hugh D. Young – University Physics, Pearson Education / Addison-Wesley, 13th Global Edition (now updated as Young & Freedman's University Physics), 2012 (13th ed.), ISBN: 9780321696861
5. Cengel, Y.A., and Boles, M.A. Thermodynamics: An Engineering Approach. 8th Edition, McGraw-Hill Education, 2015, ISBN: 9780073398178
6. Fermi, E., Thermodynamics. Dover Publications, 1956 (Reprint). ISBN: 9780486603612
7. Callen, H.B., Thermodynamics and an Introduction to Thermostatistics. 2nd Edition, Wiley, 1985. ISBN: 9780471862567

Course Objectives

1. To develop foundational understanding of thermodynamic laws and energy transformations.
2. To interpret entropy as a measure of disorder and energy dispersion.
3. To explore thermodynamic potentials and their applications.
4. To understand radiation laws and transport phenomena in physical systems.

Shivaji University Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester IV Practical –IV (Minor)
Solar and Cosmic Plasma Dynamics & Fundamental Thermodynamics

Marks-50 **(Credits: 02)**

Group III

1. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
2. To study the response curve of a parallel LCR circuit and determine its (a) Antiresonant frequency and (b) Quality factor Q.
3. Measurement of components of Earth's magnetic field using Earth Inductor
4. To plot the frequency response of a microphone.
5. To convert a Galavanometer into Ammeter and Voltmeter
6. To verify Maximum power transfer theorem
7. To Verify tangent law in Magnetism

Group IV

1. To verify Stefan's law
2. To determine Thermal conductivity by Lee's Method
3. To determine Mechanical equivalent of heat
4. To determine Planck's constant
5. Calibrate semiconductor type temperature sensor (AD590, LM 35, LM 75)
6. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.
7. To verify Newton's law of cooling

Project report: Report on Sky observation will remain mandatory for the course work

Shivaji University Kolhapur

B.Sc. Part-2 (NEP 2020), Syllabus with effect from June, 2025
B.Sc. Part-II Semester III
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 Heat Transfer and Conductivity with Everyday Materials
8. Exploring Static Electricity

Group: II

1. Exploring Basic Electrical Circuits
2. Exploring magnets
3. Exploring Light and Colour with Soap Film Interference
4. Testing Magnetic Shielding
5. Observing Refraction and Optical Distortion in Water
6. Exploring Image Formation with Two Plane Mirrors
7. Exploring Image Formation with Convex Mirror
8. 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 III
SEC Practical –II: Physics Laboratory Techniques II
Marks-50 (Credits: 02)

Group III (Skills in Electronics)

1. Measuring battery voltages using multimeter
2. Building a D. C. power supply using bridge rectifier
3. Zener diode as a voltage regulator
4. Use of multimeter : Electronic component testing
5. Electronic component testing using C. R. O.
6. To measure unknown frequency using C. R. O.
7. Maximum power transfer theorem
8. 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 ii) Standard error iii) Probable error
3. Python program to add two numbers
4. Python program to find area of a triangle
5. Python program to find sort of a number
6. Determination of lattice constant using given XRD powder pattern
7. Conversion of T impedance network into a pi impedance network
8. Linearization of given functions using tangent line approximation

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 do the following:

1. Able to handle and operate various instruments in Physics laboratory.
2. Able to perform experiments in Electronics.
3. Develop practical skill, instruments handling skills, observational skills and problem solving skills.
4. Able to record experimental observations scientifically.
5. 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
Community Engagement Programme –I: Astrophysics & Space Science
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
40 Marks	10 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

1. **For Major and Minor Practical (Lab)**

Group	Group I	Group II	Journal	Seminar	Total
Marks	20	20	05	05	50

2. **For VSC I Practical (Lab)**

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

3. **For SEC I Practical (Lab)**

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

4. **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

1. **For Major and Minor Practical (Lab)**

Group	Group I	Group II	Journal	Field visit/ Study tour	Total
Marks	20	20	05	05	50

2. **For SEC II Practical (Lab)**

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

3. **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 Astrophysics & Space Science 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)