AC – 20/05/2025
Item No. – 6.19 (N) (4ab)

As Per NEP 2020

University of Mumbai

Syllabus for Physics Minor Scheme II Vertical 2		
Faculty of Science		
Board of Studies in Physics		
First Year Programme in Minor (Physics)		
Semester	**I & II**	
Title of Paper	**SEM.**	**Total Credits (4)**
I) Basics of Analog and Digital Electronics	**I**	**2**
II) Physics Minor Practical Course – USPHMNP1		**2**
Title of Paper		**Total Credits (6)**
III) Applied Optics	**II**	**2**
IV) Electrical Instruments		**2**
V) Physics Minor Practical Course – USPHMNP2		**2**
From the Academic Year		**2025-26**

SEM. - I

Vertical – 2
Physics Minor

Syllabus of Scheme II
F. Y. B. Sc. Physics Minor

Name of the Course: Physics Minor Course 1
USPHMN1: Basics of Analog and Digital Electronics (2 Credits)

Sr. No.	Heading	Particulars
1.	**Description the course: (Including but not limited to)**	Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.
2.	**Vertical:**	Major / **Minor** / Open Elective / Skill Enhancement / Ability Enhancement / Indian Knowledge System
3.	**Type:**	Theory
4.	**Credit**:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5.	**Hours Allotted:**	**30 Hours**
6.	**Marks Allotted**:	**50 Marks**
7.	**Course Objectives**: The students are expected to:	
	CO 1	to impart knowledge of basic concepts in Electronics.
	CO 2	to provide the skills and methods required to construct electronic circuits
	CO 3	to provide exposure of linear and digital electronics circuits.
8.	**Course Outcomes**: On successful completion of this course students will be able to:	
	OC 1	understand basic concept of electronic devices resistors, capacitors, inductors, transformers and p-n junction diode.
	OC 2	understand the basic concept of ac generator, basic terms, phasor diagram, ac circuit using resistance, capacitance and inductance.
	OC 3	apply knowledge to develop circuits using electronic devices.
9.	**Modules / Units**: - There will be One module / Unit Per Credit	
	Module / Unit - I: Basic Circuit Components (15 Hours)	
	i) **Resistors:** Introduction of resistor, units, Resistor value using Color Code, Resistive circuits: Series circuit, characteristics of series circuit, series voltage divider, open and short in series circuit, Parallel circuit, laws of parallel circuit, open and short in parallel circuit. ii) **Capacitors:** Principles of capacitance, units, color code, capacitors in series and parallel. iii) **Inductors:** Introduction, units, inductor color code, self and mutual inductance, Inductance in series and parallel iv) **Transformers:** Introduction, Step-up and Step-down Transformers, Turn-Ratio, Voltage and Current Ratio. v) **P-N Junction Diode:** construction, formation of depletion layer, forward and reverse biasing, and I-V characteristics.	
	Module / Unit-II: Number System and Logic Gates 15 Hours)	

<table>
<tr><td></td><td colspan="3">1. Number system and codes: Binary, octal, hexadecimal and decimal Number systems and their inter conversion, BCD numbers (8421-2421), Binary addition and subtraction, signed and unsigned binary numbers, 1's and 2's complement representation and Binary subtraction.
2. Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, Ex NOR and their truth tables), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem.</td></tr>
<tr><td>10.</td><td colspan="3">Reference Books:
1. Electronics Principles by Malvino and Leach, Mc. Graw Hill, Third edition. 2000
2. Modern Digital Electronics by R P Jain, Tata McGraw-Hill Education, 2003.
3. Fundamental of Digital Circuits by A. Anandkumar
4. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
5. Electrical Circuits, M. Nahvi, J. Edminister, Schaum's Outline Series, Tata McGraw-Hill
6. Electrical Circuits, K. A. Smith and R. E. Alley (2014) Cambridge University Press
7. Network, Lines and Fields, J. D. Ryder, Prentice Hall of India.
8. Digital Fundamentals by T. L. Floyd, Pearson International Publications, Ninth Edition, 2000</td></tr>
<tr><td>11.</td><td colspan="3">Individual Passing in Internal and External Examination</td></tr>
<tr><td>12.</td><td>Internal Continuous Assessment (40%)
(20 Marks)</td><td colspan="2">External Assessment, (60%)
(30 Marks)</td></tr>
<tr><td></td><td>Continuous Evaluation through:
Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)</td><td colspan="2">Evaluation: through Exam at the End of the Semester / Term.</td></tr>
<tr><td>13.</td><td colspan="3">Format of Question Paper for Physics Minor Term End Examination for 30 Marks:
Duration of the Term End Examination: One Hour</td></tr>
<tr><td></td><td>Unit - I (15 Marks)</td><td colspan="2">Q.1 A) Attempt any Two 10 Marks
i) Theory
ii) Theory
iii) Theory
iv) Theory
B) Attempt any One 05 Marks
i) Problem / Theory
ii) Problem</td></tr>
<tr><td></td><td>Unit – II (15 Marks)</td><td colspan="2">Q.2 A) Attempt any Two 10 Marks
i) Theory
ii) Theory
iii) Theory
iv) Theory
B) Attempt any One 05 Marks
i) Problem / Theory
ii) Problem</td></tr>
</table>

Name of the course: Physics Minor Practical Course – I
USPHMNP1 – Physics Minor Practical

Sr. No.	Heading	Particulars
1.	**Description the course: (Including but not limited to)**	Introduction, Relevance, Usefulness, Application, Interest, Connection with other courses, Demand in the Industry, Job Prospects etc.
2.	**Vertical:**	Major / **Minor** / Open Elective / Skill Enhancement / Ability Enhancement / Indian Knowledge System
3.	**Type:**	**Practical**
4.	**Credits:**	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a Semester)
5.	**Hours**	60 Hours
6.	**Marks Allotted:**	50 Marks
7.	**Course Objectives (CO):** The students are expected to:	
	CO 1	learn the skills while performing experiments.
	CO 2	know how to use the apparatus without fear & hesitation.
	CO 3	learn the concepts of physics theory concepts and their practical application.
	CO 4	learn the errors and their estimation**.**
8.	**Course outcomes (OC):** After successful completion of this course, the students will be able to:	
	OC 1	understand & practice the skills while performing experiments.
	OC 2	understand the use of apparatus and their use without fear & hesitation.
	OC 3	correlate the physics theory concepts to practical application.
	OC 4	understand the concept of errors and their estimation**.**
9.	**List of Experiments** 1. Bar Pendulum: Determination of acceleration due to gravity **g**. 2. Moment of Inertia of a fly wheel 3. Young's Modulus of a wire material by method of vibrations 4. Torsional Oscillations: To determine modulus of rigidity **η** of a material of wire by Torsional oscillations 5. Surface Tension of water by capillary rise method 6. Spectrometer: Determination of the angle of Prism 7. Frequency of AC Mains: To determine frequency of AC mains 8. To study the thermistor characteristics: Resistance Vs Temperature 9. To study the Zener Diode as a regulator 10. To study NAND and NOR gates as Universal Building Blocks 11. Study of Logic gates & verification of De Morgan's First Theorem 12. Study of Logic gates & verification of De Morgan's Second Theorem 13. To study EX-OR Gate and verify its truth table (4 input Parity Checker) 14. To study the logic gates and half adder. 15. To study the OR, AND & NOT logic gates and full adder. **Skill experiments:** 1. Use of Vernier Callipers, and Screw Gauge. 2. Graph Plotting: Experimental, Straight Line with intercept, Resonance Curve etc	

3. Use of Digital Multimeter (DMM)
4. Spectrometer: Schuster's Method
5. To determine the Resistance & Capacitance using Color code/Number & verify using Multimeter (Analog/Digital).
6. Absolute and relative error calculation

Note: Teacher should follow the above guidelines to conduct skill experiment

Reference Books:

1. Advanced course in Practical Physics D. Chattopadhya, P. C. Rakshit & B Saha. (6th Edition)Book and Allied Pvt. Ltd.
2. B. Sc. PRACTICAL Physics – Harnam Singh S. Chand & Co. Ld. 2001
3. B.Sc. Practical Physics – C. L Arora (1st Edition) -2001 S. Chand and Co Ltd.

Additional Reference Books:

1. A test book of advanced practical PHYSICS _ SAMIR Kumar Ghosh, New Central BookAgency (3rd edition)
2. Practical Physics CL Squires (3rd Edition) Cambridge University
3. University Practical Physics – DC Tayal. Himalaya Publication
4. Advanced Practical Physics – Worsnop & Flint.

- Minimum **8 experiments** from the list of experiments and minimum **04 skill experiments** must be completed and reported in the journal, in the **First Semester**. Certified Journal is a must, to be eligible to appear for the semester end practical examination.
- All the measurements and readings should be written with proper units in SI system only.
- After completing the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination to be eligible to appear in the Semester End Practical Examination.

General Instructions:

- For practical examinations, the learner will be examined in **One** experiment from the list of experiments.
- Evaluation in viva voce will be based on regular experiments and skill experiments.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department / Institute to the effect that the candidate has completed the practical course of that semester of F. Y. B. Sc. Physics as per the minimum requirement.

Note:

- The questions on slips for the same should be framed in such a way that candidate will be able to complete the task within the specified time.
- While evaluating practical, weightage should be given to circuit / ray diagram, observations, tabular representation, experimental skills, procedure, graph, calculation and result.

<table>
<tr><td></td><td colspan="3">• The skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.</td></tr>
<tr><td>10.</td><td colspan="3">Passing standards for Practical:
• Individual Passing in Internal and External Examination</td></tr>
<tr><td>11.</td><td colspan="3">Scheme of Examination:</td></tr>
<tr><td></td><td colspan="3">Semester End Practical Examination:
• The duration of Each Experiment in Semester End External Practical Examination will be of Two hours.
• The Semester End External Practical Examination will be for 30 marks as per the marking scheme given below:</td></tr>
<tr><td></td><td>Sr. No.</td><td>Activity</td><td>Total 30 Marks</td></tr>
<tr><td></td><td>1</td><td>One Experiment</td><td>20 Marks</td></tr>
<tr><td></td><td>2</td><td>Certified Journal</td><td>05 Marks</td></tr>
<tr><td></td><td>3</td><td>Viva</td><td>05 Marks</td></tr>
<tr><td></td><td colspan="3"><u>Internal Practical Examination:</u>
• The duration of Internal Practical Examination per experiment will be of Two hours.
• The Internal Practical Examination Pattern for 20 marks (During the Semester), will be as per the marking scheme given below:</td></tr>
<tr><td></td><td>Sr. No.</td><td>Activity</td><td>Total 20 Marks</td></tr>
<tr><td></td><td>1</td><td>Skill testing related any one Experiment</td><td>10 Marks</td></tr>
<tr><td></td><td>2</td><td>Overall performance</td><td>05 Marks</td></tr>
<tr><td></td><td>3</td><td>Viva-Voce</td><td>05 Marks</td></tr>
</table>

SEM. – II

Vertical – 2
Physics Minor

Syllabus of Scheme II
F. Y. B. Sc. Physics Minor

Name of the Course: Physics Minor Course II
USPHMN2: Applied Optics (2 Credits)

Sr. No.	Heading		Particulars
1.	**Description the course: (Including but not limited to)**		Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.
2.	**Vertical:**		Major / **Minor** / Open Elective / Skill Enhancement / Ability Enhancement / Indian Knowledge System
3.	**Type:**		Theory
4.	**Credit**:		2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5.	**Hours Allotted:**		**30 Hours**
6.	**Marks Allotted**:		**50 Marks**
7.	**Course Objectives:** The students are expected to:		
	CO 1	understand the principles of thin and thick lenses, including the lens maker's equation, newton's lens equation, and magnification (both lateral and longitudinal).	
	CO 2	analyze the behavior of lenses in co-axial systems, considering equivalent focal lengths and cardinal points.	
	CO 3	explore the properties of thick lenses, including their cardinal points, with a focus on practical examples.	
	CO 4	investigate aberrations such as spherical aberration and chromatic aberration, emphasizing conditions for achromatic aberration.	
	CO 5	apply knowledge of optical systems to real-world scenarios, including oil immersion objectives in high-power microscopes, telescope objectives, and camera lenses.	
8.	**Course Outcomes**: After successful completion of the course, the students will be able to:		
	OC 1	solve problems related to lens behaviour, cardinal points, and focal lengths.	
	OC 2	identify and correct aberrations in optical systems.	
	OC 3	analyze and interpret interference phenomena, including thin film interference, fringes in wedge-shaped films, and newton's rings.	
	OC 4	operate a Michelson's interferometer and apply it for wavelength measurement and other practical purposes.	
	OC 5	demonstrate understanding of Fabry-Perot interferometers and etalons, particularly in qualitative contexts.	
9.	**Modules / Units**: - There will be One module / Unit Per Credit		
	Module / Unit I: Lens and Aberration **(15 Hours)**		

	1. Thin & thick Lens, Lens Maker's Equation (Review), Newton's lens equation, magnification-lateral, Longitudinal and angular. Equivalent focal length of two thin lenses, cardinal points of co-axial system of two thin lenses, thick lens, cardinal points of thick lens, Ramsden and Huygens eyepiece. 2. **Aberration:** Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration and condition for achromatic aberration, oil immersion objective of high-power microscope, achromatism of telescope objective and camera lens. (Emphasis must be placed on explaining examples from day-to-day life and solving more Problems)	
	Module / Unit II: Interference **(15 Hours)**	
	1. Interference, Interference in thin films, Fringes in Wedge shaped films, Newton's Rings (Reflective) 2. Michelson's Interferometer: Principle & Working, Applications: Measurement of Wavelength, Determination of difference in the wavelength of two waves, Thickness of Thin transparent film, Determination of RI of gases, Standardisation of Metre scale. Fabry Perot Interferometer and etalon (qualitative) (Emphasis must be placed on understanding applications based on interference and solving more Problems)	
10.	**Reference Books:** 1. N. Subramanyam, Brijlal, and M N Avadhanulu, A Textbook of Optics, 25th revised ed. (2012) S. Chand (Main Reference) 2. Ashok Kumar, D R Gulati, H R Gulati, Fundamentals of Optics, 2018, R Chand & Co. (Further Reading) 3. Devraj Singh, Fundamentals of Optics, 2nd edition (2015), PHI (Further Reading)	
11.	**Individual Passing in Internal and External Examination**	
12.	**Internal Continuous Assessment: 40% (20 Marks)**	**External, Semester End Examination:60% (30 Marks)**
	Continuous Evaluation through: Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)	**Evaluation:** through Exam at the End of the Semester / Term.
13.	**Format of Question Paper for Physics Minor Term End Examination for 30 Marks:** **Duration of the Term End Examination: One Hour**	
	Unit - I (15 Marks)	Q.1 A) Attempt any Two 10 Marks i) Theory ii) Theory iii) Theory iv) Theory B) Attempt any One 05 Marks i) Problem / Theory ii) Problem

	Unit – II (15 Marks)	Q.2 A) Attempt any Two i) Theory ii) Theory iii) Theory iv) Theory B) Attempt any One i) Problem / Theory ii) Problem	10 Marks 05 Marks

Name of the Course: Physics Minor Course III
USPHMN3: Electrical Instruments (2 Credits)

Sr. No.	Heading	Particulars
1.	**Description the course: (Including but not limited to)**	Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.
2.	**Vertical:**	Major / **Minor** / Open Elective / Skill Enhancement / Ability Enhancement / Indian Knowledge System
3.	**Type:**	Theory
4.	**Credit**:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5.	**Hours Allotted:**	**30 Hours**
6.	**Marks Allotted**:	**50 Marks**
7.	**Course Objectives:** The students are expected to:	
	CO 1	gain knowledge of measuring instruments used in Physics laboratory.
	CO 2	explore principle of Cathode Ray Oscilloscope and its applications.
	CO 3	investigate tuning circuit behaviour, Q-value and bandwidth.
	CO 4	learn about direct and indirect coupled circuits and filters.
	CO 5	understand the general features of time base signals, different types of time base circuits.
	CO 6	study specific sweep circuits, including exponential sweep, transistor-based sweeps, and current time base generators.
	CO 7	understand general use of Transducers, LVDT, Photodiode, LDR, Thermistor and Microphone.
8.	**Course Outcomes**: After successful completion of the course, the students will be able to:	
	OC 1	explore the working of a Cathode Ray Oscilloscope (CRO), including the cathode ray tube (CRT) and beam deflection.
	OC 2	design and analyze resonance in series and parallel LCR circuits.
	OC 3	calculate the Q-value and bandwidth of tuning circuits.
	OC 4	recognize the general features of time base signals, types of time base circuits.
	OC 5	learn methods for generating time base waveforms.
	OC 6	explore sweep circuits, including exponential, transistor-based, and constant current sweeps.
9.	**Modules / Units**: - There will be One module / Unit Per Credit	
	Module / Unit I: Measuring Instruments (15 Hours)	

	1. **Measuring Instruments:** PMMC Multimeter – Digital Multimeter– Cathode Ray Oscilloscope (CRO): Principle – Cathode Ray Tube – Deflection of the Beam – Blanking or Flyback or Retrace-Deflection Sensitivity- Single Trace Oscilloscope – Recurrent Sweep. 2. **Tuning Circuits and Filters:** Resonance in series and parallel LCR circuits – Operating characteristic of a tuning circuit – Q value – Bandwidth – Tuning circuit in radio receivers – Double tuned transformers – direct and indirect coupled circuits – coefficient of coupling – filters: low pass filter-high pass filter– band pass filter-band stop filter.	
	Module / Unit II: Galvanometers, Potentiometers and Bridges (15 Hours)	
	1. **Galvanometers**: General principle and performance equations of D'Arsonval Galvanometers, Moving coil Galvanometer. 2. **Potentiometers**: DC/AC Potentiometer, Crompton potentiometer, construction, standardization, application. 3. **Bridges**: DC/AC Bridges, General equations for bridge balance, measurement of self-inductance by Maxwell's bridge (with variable inductance & variable capacitance), measurement of capacitance by Schearing bridge, errors, Wagner's earthing device	
10.	**Reference Books:** 1. Electronic Instruments and Systems, R.G. Gupta – TMH (2001) 2. Basic Electronics – Solid State, B.L. Theraja-S Chand (2005) 3. A text Book of Applied Electronics, R.S. Sedha – S. Chand (2005) 4. Electronic Instrumentation (2 Ed.) H.S. Kalsi, TMH (2006). 5. Sawhney A K. A Course in Elec. & Electronics Measurements & Instrumentation. Dhanpatrai & Co, 1978. 6. Helfrick A D, Cooper W D. Modern Electronic Instrumentation and Measurement Techniques. PHI, 2016. 7. Kulshreshtha DC. Basic Electrical Engineering. Mc Graw Hill Publications, 2019. 4. David G Alciatore and Michel B Histand, Introduction to Mechatronics and 8. Measurement Systems. Tata McGraw Hill Education Private Limited, 3rd Edition, 2015. 9. Vincent Del Toro. Electrical Engineering Fundamentals. Prentice Hall India, 2009.	
11.	**Individual Passing in Internal and External Examination**	
12.	**Internal Continuous Assessment: 40% (20 Marks)**	**External, Semester End Examination:60% (30 Marks)**
	Continuous Evaluation through: Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc. (at least 3)	**Evaluation:** through Exam at the End of the Semester / Term.
13.	**Format of Question Paper for Physics Minor Term End Examination for 30 Marks: Duration of the Term End Examination: One Hour**	

	Unit - I (15 Marks)	Q.1 A) Attempt any Two 10 Marks i) Theory ii) Theory iii) Theory iv) Theory B) Attempt any One 05 Marks i) Problem / Theory ii) Problem
	Unit – II (15 Marks)	Q.2 A) Attempt any Two 10 Marks i) Theory ii) Theory iii) Theory iv) Theory B) Attempt any One 05 Marks i) Problem / Theory ii) Problem

Name of the course: Physics Minor Practical Course – II
USPHMNP2 – Physics Minor Practical

Sr. No.	Heading	Particulars
1.	**Description the course: (Including but not limited to)**	Introduction, Relevance, Usefulness, Application, Interest, Connection with other courses, Demand in the Industry, Job Prospects etc.
2.	**Vertical:**	Major / **Minor** / Open Elective / Skill Enhancement / Ability Enhancement / Indian Knowledge System
3.	**Type:**	**Practical**
4.	**Credits:**	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a Semester)
5.	**Hours**	60 Hours
6.	**Marks Allotted:**	50 Marks
7.	**Course Objectives (CO):** The students are expected to:	
	CO 1	study the skills while performing experiments.
	CO 2	know how to use the apparatus without fear & hesitation.
	CO 3	learn the concepts of physics theory concepts and their practical application.
	CO 4	learn the errors and their estimation**.**
8.	**Course outcomes (OC):** After successful completion of this course, the students will be able to:	
	OC 1	understand & practice the skills while performing experiments.
	OC 2	understand the use of apparatus and their use without fear & hesitation.
	OC 3	correlate the physics theory concepts to practical application.
	OC 4	understand the concept of errors and their estimation**.**
9.	**List of Experiments:** 1. Combination of Lenses To determine equivalent focal length of a lens system by magnification method. 2. Spectrometer: To determine refractive index μ of the material of prism 3. Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings. 4. Determination of diameter of thin wire using Wedge Shaped Film 5. To study the divergence of a LASER beam. 6. LDR Characteristics: To study the dependence of LDR resistance on intensity of light 7. Bifilar Pendulum: Determination of moment of inertia of rectangular and cylindrical bar about an axis passing through its centre of gravity 8. To study load regulation of a Bridge Rectifier 9. Measurement of AC Voltage, DC Voltage and frequency by using CRO / DSO. 10. Transistor characteristics (CE Mode) – Input Characteristics 11. Transistor characteristics (CE Mode) – Output Characteristics 12. To determine Inductance in AC circuit using L and R Combination 13. To determine capacitance in AC circuit using R and C Combination 14. To study the leakage current of a capacitor 15. To verify maximum power transfer theorem **Demo Experiments:**	

1. Radius of ball bearings (single pan balance)
2. Use of Oscilloscope: Wave forms at output of half wave, bridge rectifiers with and without Capacitor filter, Ripple
3. I-V Characteristics of LED
4. Testing of components (Resistors, Diode, Transistor, capacitor)
5. Charging and discharging of a capacitor

Note: Teacher should follow the above guidelines to conduct skill experiment

Reference Books:

1. Advanced course in Practical Physics D. Chattopadhya, P. C. Rakshit & B. Saha (6th Edition) Bookand Allied Pvt. Ltd.
2. B. Sc. Practical Physics–Harnam Singh S. Chand & Co. Ltd. 2001
3. A test book of advanced practical Physics - SAMIR Kumar Ghosh, New Central Book Agency (3rd edition)
4. B. Sc. Practical Physics –C. L. Arora (1st Edition) – 2001 S. Chand and Co. Ltd.
5. Practical Physics C. L. Squires (3rd Edition) Cambridge University
6. University Practical Physics – D. C. Tayal. Himalaya Publication
7. Advanced Practical Physics–Worsnop& Flint.

- Minimum **8 experiments** from the list of experiments and **04 demo experiments** must be completed and reported in the journal, in the **Second Semester**. Certified Journal is a must, to be eligible to appear for the semester end practical examination.
- All the measurements and readings should be written with proper units in SI system only.
- After completing the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination to be eligible to appear in the Semester End Practical Examination.

General Instructions:

- For practical examinations, the learner will be examined in **One** experiment from the list of experiments.
- Evaluation in viva voce will be based on Regular experiments and skill experiments.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department / Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B. Sc. Physics as per the minimum requirement.

Note:

- The questions on slips for the same should be framed in such a way that candidate will be able to complete the task within the specified time.
- While evaluating practical, weightage should be given to circuit / ray diagram, observations, tabular representation, experimental skills, procedure, graph, calculation and result.
- The skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

<table>
<tr><td>10.</td><td colspan="3">Passing standards for Practical:
• Individual Passing in Internal and External Examination</td></tr>
<tr><td rowspan="8">11.</td><td colspan="3">Scheme of Examination:</td></tr>
<tr><td colspan="3">Semester End Practical Examination:
• The duration of the Experiment in Semester End External Practical Examination will be of Two hours.
• The Semester End External Practical Examination will be for 30 marks as per the marking scheme given below:</td></tr>
<tr><td>Sr. No.</td><td>Activity</td><td>Total 30 Marks</td></tr>
<tr><td>1</td><td>One Experiment</td><td>20 Marks</td></tr>
<tr><td>2</td><td>Certified Journal</td><td>05 Marks</td></tr>
<tr><td>3</td><td>Viva</td><td>05 Marks</td></tr>
<tr><td colspan="3"><u>Internal Practical Examination:</u>
• The duration of Internal Practical Examination per experiment will be of Two hours.
• The Internal Practical Examination Pattern for 20 marks (During the Semester), will be as per the marking scheme given below:</td></tr>
<tr><td>Sr. No.</td><td>Activity</td><td>Total 20 Marks</td></tr>
<tr><td>1</td><td>Skill testing related to One Experiment</td><td>10 Marks</td></tr>
<tr><td>2</td><td>Overall performance</td><td>05 Marks</td></tr>
<tr><td>3</td><td>Viva-Voce</td><td>05 Marks</td></tr>
</table>

Letter Grades and Grade Points:

Semester GPA/ Programme CGPA Semester/ Programme	% of Marks	Alpha-Sign/ Letter Grade Result	Grading Point
9.00 - 10.00	90.0 - 100	**O** (Outstanding)	10
8.00 < 9.00	80.0 < 90.0	**A+** (Excellent)	9
7.00 < 8.00	70.0 < 80.0	**A** (Very Good)	8
6.00 < 7.00	60.0 < 70.0	**B+** (Good)	7
5.50 < 6.00	55.0 < 60.0	**B** (Above Average)	6
5.00 < 5.50	50.0 < 55.0	**C** (Average)	5
4.00 < 5.00	40.0 < 50.0	**P** (Pass)	4
Below 4.00	Below 40.0	**F** (Fail)	0
Ab (Absent)	-	**Ab** (Absent)	0

Sd/-

Sign of the BOS Chairman
Dr. T.N. Ghorude
Board of Studies in Physics

Sd/-

Sign of the
Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science & Technology

Sd/-

Sign of the
Offg. Dean
Prof. Shivram S. Garje
Faculty of Science & Technology