



Sir P. T. Sarvajani College of Science (Autonomous)
Athwalines, Surat-395001

SEM-II



B. Sc. (Physics) SEMESTER II
COURSE TITLE: MJ COURSE-III
COURSE CODE: PHYMJ-S2P3-3CR24 [CREDITS - 03]

| CC III | Course Code: PHYMJ-S2P3-3CR24 | |
|---|---|--------------|
| Course Learning Outcomes | | |
| <p>At the end of this course, learners will be able to</p> <ul style="list-style-type: none"> • apply the concepts of vector algebra and vector calculus • understand and apply Newton's laws of motion in three dimension and apply the concept of momentum conservation • interpret two-particle and many-particle systems • classify various elastic properties of solids. | | |
| Unit I | Electronics | [15L] |
| <p>Learning Objective: This unit is intended to</p> <ul style="list-style-type: none"> • familiarize the students with the concepts of scalar product, vector product, differentiation, gradient, divergence and curl. • infer the line, surface and volume integrals and associated theorems. | | |
| <p>Learning Outcomes: At the end of this unit, learners will be able to</p> <ul style="list-style-type: none"> • apply the concepts of scalar product, vector product, differentiation, gradient, divergence and curl • interpret the line, surface and volume integrals and apply them to understand various theorems in vector calculus. | | |
| 1.1 | Voltage Sources (1.3), Current Sources (1.4), Thevenin's Theorem (1.5), Norton's Theorem (1.6). Zener Diode (5-1), Loaded Zener Regulator (5-2), Light-Emitting Diodes (LEDs) (5-8), Seven-Segment Display, Photodiode (5.10). | [4L] |
| 1.2 | Unbiased Transistor (6.1), Biased Transistor (6.2), Transistor Currents (6.3), CE connection (6.4), Base Curve (6.5), Collector Curve (6.6), Transistor approximation (6.7), Load line (6.11), Operating point (6.12). | [6L] |
| 1.3 | Phototransistor, opto-coupler and its application (7.4), Voltage divider Bias (7.5), VDB analysis (7.6), Q point and design of biasing circuit (7.7). | [5L] |
| <p>Text book: Electronics Principles, Albert Malvino and David Bates, 8th Ed., John Wiley & Sons, Inc. 2015.</p> | | |
| Unit II | Free and Forced Oscillations | [15L] |
| <p>Learning Objective: This unit is intended to</p> <ul style="list-style-type: none"> • familiarize the students about the free, damped and forced oscillations | | |



| | | |
|--|---|--------------|
| <ul style="list-style-type: none"> • make them learn resonance in its different cases. | | |
| <p>Learning Outcomes: At the end of this unit, learners will be able to</p> <ul style="list-style-type: none"> • understand the difference among free, damped and forced oscillations • learn effects of damping on the properties of the oscillator • revise the phenomenon of resonance and apply it in various cases. | | |
| 2.1 | Free oscillation (2.1), damped motion (2.2), energy of damped motion (2.3), forced oscillations and resonance (2.4), analysis of forced vibrations (2.5), analogy between mechanical and electrical quantities (2.6), amplitude and velocity resonances (2.7), power considerations in forced vibration and resonance (2.8), nature of resonance (2.9), phase relations in forced vibrations (2.10), comparison of amplitude and velocity resonances (2.11), coupled vibrations (2.12). | [15L] |
| <p>Text book: A treatise on Oscillations, waves and acoustics by D. Chattopadhyay, 1st Ed., Books and Allied (P) Ltd. 2016.</p> | | |
| Unit III | Astrophysics | [15L] |
| <p>Learning Objective: This unit is intended to</p> <ul style="list-style-type: none"> • study the physical properties of planets. • study the orbital motion of planets of our solar system. • understand the rotational motion of planets and explain the magnetic field of planets. • describe the different layers of Sun. • explain the different phenomena on Sun such as sunspots, solar flares, prominences. | | |
| <p>Learning Outcomes: At the end of this course, learners will be able to</p> <ul style="list-style-type: none"> • estimate the physical properties of planets such as temperature, albedo, solar day etc. • understand crust, core of the earth and its magnetic field. • understand about core and differentiate different layers of the Sun. • explain the different phenomena and nuclear fusion reaction in the Sun. | | |
| 3.1 | <p>Planets: Interior planets, Exterior planets; crust, mantle and core of the Earth; Different region of earth's atmosphere; Rotation of Earth, Magnetosphere; Van Allen Belts- Aurora.</p> <p>The Sun: Structure of Photosphere, Chromosphere, Corona, Sunspots, Solar Flares, Solar Prominences, Solar Plages.</p> | [15L] |
| <p>Text book:</p> | | |



Schaum's Outline of Astronomy: Stacy E. Palen, McGraw-Hill Publishing Company Limited, 2020.

Reference Books:

1. Electronic devices and circuit theory by R. L. Boylestad and L. Nashelsky, 4th Ed., Pearson 1987.
2. Basic Electronics by B. L. Theraja, 1st Ed., S. Chand & Co. 2008.
3. Waves and oscillations by Subrahmanyam and Brij Lal, 2nd Ed., S. Chand & Co. 2018.
4. An Introduction to Astrophysics: Baidyanath Basu, Tanuka Cattopadhyay and Sudhindra Nath Biswas, 2nd Ed., Prentice Hall India Learning Private Limited 2010.
5. An Introduction to Astronomy and Astrophysics: Pankaj Jain, 1st Ed., CRC Press Publishing Company 2015.

Note: Each unit carries equal weightage of total marks of the course.

Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| I | 20% | 30% | 25% | 25% | - | - | 100% |
| II | 20% | 30% | 25% | 25% | - | - | 100% |
| III | 40% | 40% | 20% | - | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • apply the concepts of vector algebra and vector calculus | √ | √ | | | | |
| • understand and apply Newton's laws of motion in three dimension and apply the concept of momentum conservation | √ | √ | | | | |
| • interpret two-particle and many particle systems | √ | √ | | | | |
| • classify various elastic properties of solids | √ | √ | | | | |



B. Sc. (Physics) SEMESTER II

COURSE TITLE: MJ COURSE-IV

COURSE CODE: PHYMJ-S2P4-3CR24 [CREDITS - 03]

| CC IV | Course Code: PHYMJ-S2P4-3CR24 | |
|--|--|-------------|
| Course Learning Outcomes | | |
| <p>After the successful completion of the course, learners will be able to</p> <ul style="list-style-type: none"> • interpret the basic concepts of physical optics, including Huygens' principle and interference and its types • apply second law of thermodynamics • understand Carnot engine and its applications • extract the wave properties of particles. | | |
| Unit I | Physical Optics | [15L] |
| <p>Learning objectives: The unit is intended to</p> <ul style="list-style-type: none"> • familiarize the students with wave nature of light • comprehend that light exhibits wave-like properties, including interference and diffraction • get familiar with phenomenon of interference and its types • understand Huygens's principle, the wave equation and the concept of coherence • apply wave optics principles to analyse and solve problems related to interference. | | |
| <p>Learning outcomes: The learners will be able to</p> <ul style="list-style-type: none"> • understand Huygens' theory and its application in understanding wave propagation • demonstrate proficiency in calculating and interpreting interference patterns resulting from the superposition of two coherent sinusoidal waves • comprehend the concept of coherence and its significance in producing stable interference patterns, enabling them to analyze and predict interference • gain familiarity with the operation and applications of Fresnel's biprism • understand interference by plane film due to plane wave • analyse interference patterns produced by thin films under illumination by a point source, including phenomena such as Newton's rings and their applications • understand the relationship between the thickness of thin films, interference patterns, and the resulting colours observed, enabling them to predict and explain colour changes in thin films. | | |
| 1.1 | Introduction (12.1), Huygens' theory (12.2), superposition of two sinusoidal waves (13.5), coherence (14.3), interference of light waves (14.4), the interference pattern (14.5), the intensity distribution (14.6), Fresnel's biprism (14.8). | [8L] |



| | | |
|---|--|--------------|
| 1.2 | Introduction (15.1), interference by a plane parallel film when illuminated by a plane wave (15.2), interference by a plane parallel film when illuminated by a point source (15.7), colours of thin films (15.9), Newton's rings (15.10). | [7L] |
| <p>Text book: Optics by Ajoy Ghatak 6th Ed., McGraw Hill Edu. Pvt. Ltd. 2017.</p> | | |
| Unit II | Thermodynamics II | [15L] |
| <p>Learning objectives: This unit is intended to</p> <ul style="list-style-type: none"> ● have an in-depth study of laws of thermodynamics and entropy ● foster an intuitive grasp of Carnot engines and refrigerators. | | |
| <p>Learning outcome: After the successful completion of the unit, learners will be able to</p> <ul style="list-style-type: none"> ● recognize the distinction between reversible and irreversible processes and understand the concept of entropy production and its relation to irreversibility ● demonstrate a clear understanding of entropy as a measure of disorder or randomness in a system ● apply second law of thermodynamics ● interpret the second law in terms of heat engines, refrigerators, and heat pumps. ● understand the statistical view of entropy. | | |
| 2.1 | The second law of thermodynamics (24.4), entropy and the performance of engines (24.5), entropy and the performance of refrigerators (24.6), the efficiencies of real engines (24.7), the second law revisited (24.8), a statistical view of entropy (24.9). | [15L] |
| <p>Text book: Introduction to Electrodynamics by David J. Griffiths, 3rd Ed., PHI Learning Pvt. Ltd. 2010.</p> | | |
| Unit III | Modern Physics II | [15L] |
| <p>Learning objectives: This unit is intended to</p> <ul style="list-style-type: none"> ● familiarize students with the wave properties of particles ● make them understand the significance of phase and group velocities ● aware them of uncertainty principle and train them to use its different forms while solving problems ● make them learn the case of particle in a box and quantization of its various properties. | | |
| <p>Learning outcome: After the successful completion of the unit, learners will be able to</p> | | |



| | | |
|---|--|--------------|
| <ul style="list-style-type: none">● understand the nature of de Broglie waves and its properties● develop an idea of wave packet and group velocity● solve the particle in a box problem and learn the effect of boundary conditions on the behaviour of the confined particle● apply uncertainty principle to solve various problems. | | |
| 3.1 | de Broglie Waves (3.1), waves of what? (3.2), describing a wave (3.3), phase and group velocities (3.4), particle diffraction (3.5), particle in a box (3.6), uncertainty principle I (3.7), uncertainty principle II (3.8), applying the uncertainty principle (3.9). | [15L] |
| Text book: Concepts of Modern Physics by A. Beiser 6 th Ed., McGraw Hill Edu. Pvt. Ltd. 2003. | | |
| Reference Books: <ul style="list-style-type: none">● University Physics by H. D. Young, R. A. Freedman and A Lewis Ford, 13th Ed. Pearson Education, 2013.● Fundamentals of Optics by F. Jenkins and H White, 4th edition, McGraw Hill Education, 2017.● Heat and Thermodynamics by Mark W. Zemansky and Richard H. Dittman 7th Ed., McGraw Hill Edu. Pvt. Ltd. 1997.● Modern Physics by Kenneth Krane 4th Ed., Wiley, 2019.● Modern Physics by Jeremy Bernstein, Paul Fishbane, Stephan Gaziorowicz, Pearson, 2000. | | |
| Note: Each unit carries equal weightage of total marks of the course. | | |



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| I | 20% | 30% | 25% | 25% | - | - | 100% |
| II | 20% | 30% | 25% | 25% | - | - | 100% |
| III | 20% | 30% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| <ul style="list-style-type: none"> • interpret the basic concepts of physical optics, including Huygens' principle and interference and its types | √ | √ | | | | |
| <ul style="list-style-type: none"> • apply second law of thermodynamics | √ | √ | | | | |
| <ul style="list-style-type: none"> • understand Carnot engine and its applications | √ | | | | | |
| <ul style="list-style-type: none"> • extract the wave properties of particles | √ | | | | | |



Practical III

Course Code: PHYMJ-S2PR3-1CR24

Course Learning Outcomes

After the successful completion of the course, learner will be able to

- demonstrate practical skills
- correlate the physics theory concepts through practical.

| | |
|----|--|
| 1 | To identify the terminals of various active components and method of using them appropriately. |
| 2 | To study half wave rectifier with various filters. |
| 3 | To study full wave rectifier with various filters. |
| 4 | To study zener diode as a voltage regulator |
| 5 | To study characteristics of a BJT (CE configuration). |
| 6 | To determine the capacitance of a capacitor by discharging it through a voltmeter. |
| 7 | Study of Melde's experiment (with constant mass) |
| 8 | Study of Melde's experiment (with constant length) |
| 9 | To study the oscillations of mass-spring system. |
| 10 | To study resonator. |

Reference Books:

- Advanced Practical Physics by B. L. Worsnop and H. T. Flint, 3rd Ed., Asia Publishing House, New Delhi, 2021
- B. Sc. Practical Physics by C. L. Arora, S. Chand & Co., Reprint Ed., 2010
- University Practical Physics by D. C. Tayal, Edited by Ila Agarwal, 1st Ed., Himalayan Publishing House, 2000.
- A Laboratory Manual of Physics for Undergraduate Classes by D. P. Khandelwal, 1st Ed., Vani Publication House, New Delhi, 1985.
- B. Sc. Practical Physics by Geeta Sanon, 1st Ed., R. Chand & Co., 2007.

Note:

- The duration of each experiment is of 2 hours. Two such experiments are to be performed by each student per week.
- In the external exam, a student will have to perform two experiments, one from each group. The experiment will be of 2-hour duration.
- There should be two examiners, one for each group, in the external examination.
- There should not be more than 10 students per examiner per session in the external examination.



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|---------------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| Practical III | 25% | 25% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • demonstrate practical skills | √ | √ | √ | √ | √ | √ |
| • correlate the physics theory concepts with appropriate practical | √ | √ | | | √ | |



B. Sc. (Physics) SEMESTER II

COURSE TITLE: MJ LAB COURSE-IV

COURSE CODE: PHYMJ-S2PR4-1CR24 [CREDITS - 01]

| Practical IV | Course Code: PHYMJ-S2PR4-1CR24 | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|-------------------------------|---|-----------------------------|---|---|---|---|---|--|---|-------------------------------|---|---|---|----------------------------------|----|
| Course Learning Outcomes | | | | | | | | | | | | | | | | | | | | |
| After the successful completion of the course, learners will be able to: | | | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none">• demonstrate practical skills• correlate the physics theory concepts through practical | | | | | | | | | | | | | | | | | | | | |
| <table border="1"><tbody><tr><td>1</td><td>To study decay of current in an RC circuit.</td></tr><tr><td>2</td><td>To verify Thevenin's theorem.</td></tr><tr><td>3</td><td>To verify Norton's theorem.</td></tr><tr><td>4</td><td>To verify maximum power transfer theorem.</td></tr><tr><td>5</td><td>To determine Planck's constant using LED.</td></tr><tr><td>6</td><td>To study characteristics of photocell.</td></tr><tr><td>7</td><td>To study Edser's 'A' pattern.</td></tr><tr><td>8</td><td>To study characteristics of solar cell.</td></tr><tr><td>9</td><td rowspan="2">Study tor and report submission.</td></tr><tr><td>10</td></tr></tbody></table> | | 1 | To study decay of current in an RC circuit. | 2 | To verify Thevenin's theorem. | 3 | To verify Norton's theorem. | 4 | To verify maximum power transfer theorem. | 5 | To determine Planck's constant using LED. | 6 | To study characteristics of photocell. | 7 | To study Edser's 'A' pattern. | 8 | To study characteristics of solar cell. | 9 | Study tor and report submission. | 10 |
| 1 | To study decay of current in an RC circuit. | | | | | | | | | | | | | | | | | | | |
| 2 | To verify Thevenin's theorem. | | | | | | | | | | | | | | | | | | | |
| 3 | To verify Norton's theorem. | | | | | | | | | | | | | | | | | | | |
| 4 | To verify maximum power transfer theorem. | | | | | | | | | | | | | | | | | | | |
| 5 | To determine Planck's constant using LED. | | | | | | | | | | | | | | | | | | | |
| 6 | To study characteristics of photocell. | | | | | | | | | | | | | | | | | | | |
| 7 | To study Edser's 'A' pattern. | | | | | | | | | | | | | | | | | | | |
| 8 | To study characteristics of solar cell. | | | | | | | | | | | | | | | | | | | |
| 9 | Study tor and report submission. | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | |
| Reference Books: | | | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none">• Advanced Practical Physics by B. L. Worsnop and H. T. Flint, 3rd Ed., Asia Publishing House, New Delhi, 2021• B. Sc. Practical Physics by C. L. Arora, S. Chand & Co., Reprint Ed., 2010• University Practical Physics by D. C. Tayal, Edited by Ila Agarwal, 1st Ed., Himalayan Publishing House, 2000.• A Laboratory Manual of Physics for Undergraduate Classes by D. P. Khandelwal, 1st Ed., Vani Publication House, New Delhi, 1985.• B. Sc. Practical Physics by Geeta Sanon, 1st Ed., R. Chand & Co., 2007. | | | | | | | | | | | | | | | | | | | | |
| Note: | | | | | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none">➤ The duration of each experiment is of 2 hours. Two such experiments are to be performed by each student per week.➤ In the external exam, a student will have to perform two experiments, one from each group. The experiment will be of 2-hour duration.➤ There should be two examiners, one for each group, in the external examination. There should not be more than 10 students per examiner per session in the external examination. | | | | | | | | | | | | | | | | | | | | |



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|--------------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| Practical IV | 25% | 25% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • demonstrate practical skills | √ | √ | √ | √ | √ | √ |
| • correlate the physics theory concepts with appropriate practical | √ | √ | | | √ | |



B. Sc. (Physics) SEMESTER II

COURSE TITLE: MN COURSE-II

COURSE CODE: PHYMN-S2P2-2CR24 [CREDITS - 02]

| EC II | COURSE CODE: PHYMN-S2P2-2CR24 | |
|---|--|--------------|
| Course Learning Outcomes | | |
| <p>At the end of this course, learners will be able to</p> <ul style="list-style-type: none"> • understand the basic concepts of geometrical optics, such as Fermat's principle and its applications • understand the laws of reflection and refraction • extract the basic concepts of temperature and laws of thermodynamics. | | |
| Unit I | Geometrical Optics | [15L] |
| <p>Learning objectives: This unit is intended to</p> <ul style="list-style-type: none"> • make the students familiarize with the behaviour of light rays and ray tracing techniques • introduce to them the techniques of formation of images by mirrors and lenses • apply them solving optical problems • analyse optical phenomena, such as reflection, refraction, dispersion, etc. • make them understand how light behaves and how it can be manipulated using geometric optics principles. | | |
| <p>Learning outcomes: After the successful completion of the unit, learners will be able to</p> <ul style="list-style-type: none"> • understand optical elements and describe behaviour of light ray such as how light rays reflect, refract and disperse when interacting with optical elements • calculate properties such as the position, size, orientation and nature of images formed (virtual or real) by optical systems • gain skill to solving optical problems and understanding of optical instruments, such as different lenses, microscopes, telescopes and camera based on geometric optics. | | |
| 1.1 | Introduction (3.1), laws of reflection and refraction from Fermat's principle (3.2). | [2L] |
| 1.2 | Introduction (4.1), refraction at a single spherical surface (4.2), reflection by a single spherical surface (4.3), the thin lens (4.4), the principle foci and the focal length of a lens (4.5), the Newton's formula (4.6), lateral magnification (4.7), aplanatic points of a sphere (4.8). | [13L] |
| <p>Text book: Optics by Ajoy Ghatak, 6th Ed., McGraw-Hill Education. 2017.</p> | | |
| Unit II | Thermodynamics | [15L] |
| <p>Learning objectives:</p> | | |



This unit is intended to

- provide an in-depth study of thermodynamics by covering its fundamental principles and concepts extensively
- establish a solid foundation and equipping students with the necessary skills to apply thermodynamic principles effectively in various field of study
- foster an intuitive grasp of thermodynamics by prioritizing the underlying Physics.

Learning outcome:

After the successful completion of the unit, learners will be able to

- explain the basic concepts of thermodynamic such as temperature, pressure, system, properties, process, state, cycles and equilibrium
- identify situations of thermal equilibrium and describe the factors influencing it
- define energy transfer through mass, heat and work for closed and control volume systems
- apply the first law of thermodynamics on closed and control volume systems
- recognize the distinction between reversible and irreversible processes and understand the concept of entropy production and its relation to irreversibility.

| | | |
|------------|---|--------------|
| 2.1 | Temperature and thermal equilibrium (21.1), measuring temperatures (21.3), thermal expansion (21.4). | [3L] |
| 2.2 | Heat: Energy in Transit (23.1) The Transfer of Heat (23.2), The First Law of Thermodynamics (23.3), Heat Capacity and Specific Heat (23.4), Work Done on or by an Ideal Gas (23.5), The Internal Energy of an Ideal Gas (23.6), Heat Capacities of an Ideal Gas (23.7), applications of the first law of thermodynamics (23.8). | [12L] |

Text book:

Physics by Halliday, Resnick and Krane, Vol. 1, 5th Ed., Wiley 2017.

Reference Books:

- University Physics by H. D. Young, R. A. Freedman and A. Lewis Ford, 13th Ed., Pearson Education, 2013.
- Fundamentals of Optics by F. Jenkins and H. White, 4th Ed., McGraw Hill Education, 2017.
- Heat and Thermodynamics by Mark W. Zemansky and Richard H. Dittman 7th Ed., McGraw Hill Edu. Pvt. Ltd. 1997.

Note: Each unit carries equal weightage of total marks of the course.



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| I | 20% | 30% | 25% | 25% | - | - | 100% |
| II | 20% | 30% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • understand the basic concepts of geometrical optics, such as Fermat's principle and its applications | √ | √ | | | | |
| • understand the laws of reflection and refraction | √ | √ | | | | |
| • extract the basic concepts of temperature and laws of thermodynamics | √ | √ | | | | |



B. Sc. (Physics) SEMESTER II
COURSE TITLE: MN LAB COURSE-III
COURSE CODE: PHYMN-S2PR3-1CR24 [CREDITS - 01]

| Practical III | | Course Code: PHYMN-S2PR3-1CR24 |
|--|--|--------------------------------|
| Course Learning Outcomes | | |
| After the successful completion of the course, learners will be able to: | | |
| <ul style="list-style-type: none">demonstrate practical skillscorrelate the physics theory concepts through practical | | |
| 1 | To determine the modulus of rigidity of a wire using torsional pendulum. | |
| 2 | To determine the modulus of rigidity of rod by Searle's apparatus. | |
| 3 | To determine elastic constant (Y) by Searle's method. | |
| 4 | To determine elastic constant (η) by Searle's method. | |
| 5 | To determine force constant (k) of a spring. | |
| 6 | To determine refractive index of liquid using lens. | |
| 7 | To determine of focal length of lens using lens Gauss' equation. | |
| 8 | To determine of focal length of a convex lens and a plano-convex lens using auto-correlation method. | |
| 9 | To determine "Y" of a cantilever. | |
| 10 | To determine "Y" of a beam supported at two ends. | |
| Reference Books: | | |
| <ul style="list-style-type: none">Advanced Practical Physics by B. L. Worsnop and H. T. Flint, 3rd Ed., Asia Publishing House, New Delhi, 2021B. Sc. Practical Physics by C. L. Arora, S. Chand & Co., Reprint Ed., 2010University Practical Physics by D. C. Tayal, Edited by Ila Agarwal, 1st Ed., Himalayan Publishing House, 2000.A Laboratory Manual of Physics for Undergraduate Classes by D. P. Khandelwal, 1st Ed., Vani Publication House, New Delhi, 1985.B. Sc. Practical Physics by Geeta Sanon, 1st Ed., R. Chand & Co., 2007. | | |
| Note: | | |
| <ul style="list-style-type: none">➤ The duration of each experiment is of 2 hours. Two such experiments are to be performed by each student per week.➤ In the external exam, a student will have to perform two experiments, one from each group. The experiment will be of 2-hour duration.➤ There should be two examiners, one for each group, in the external examination.➤ There should not be more than 10 students per examiner per session in the external examination. | | |



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|---------------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| Practical III | 25% | 25% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • demonstrate practical skills | √ | √ | √ | √ | √ | √ |
| • correlate the physics theory concepts with appropriate practical | √ | √ | | | √ | |



B. Sc. (Physics) SEMESTER II
COURSE TITLE: MN LAB COURSE-IV
COURSE CODE: PHYMN-S2PR4-1CR24 [CREDITS - 01]

| Practical IV | Course Code: PHYMN-S2PR4-1CR24 |
|--|--|
| Course Learning Outcomes | |
| After the successful completion of the course, learners will be able to | |
| <ul style="list-style-type: none">• demonstrate practical skills• correlate the physics theory concepts through practical | |
| 1 | To do data analysis using excel. |
| 2 | To do least square fitting of the given data. |
| 3 | To study exponential decay of random numbers. |
| 4 | To verify the perpendicular axes theorem of moment of inertia. |
| 5 | To verify the parallel axes theorem of moment of inertia. |
| 6 | To study simple pendulum. |
| 7 | To determine resistivity of the material of a conductor using Ohm's law. |
| 8 | To study the probability distribution for two option system. |
| 9 | To study liquid lens. |
| 10 | To determine of focal length of lens using Gauss' equation. |
| Reference Books: <ul style="list-style-type: none">• Advanced Practical Physics by B. L. Worsnop and H. T. Flint, 3rd Ed., Asia Publishing House, New Delhi, 2021• B. Sc. Practical Physics by C. L. Arora, S. Chand & Co., Reprint Ed., 2010• University Practical Physics by D. C. Tayal, Edited by Ila Agarwal, 1st Ed., Himalayan Publishing House, 2000.• A Laboratory Manual of Physics for Undergraduate Classes by D. P. Khandelwal, 1st Ed., Vani Publication House, New Delhi, 1985.• B. Sc. Practical Physics by Geeta Sanon, 1st Ed., R. Chand & Co., 2007. | |
| Note: <ul style="list-style-type: none">➤ The duration of each experiment is of 2 hours. Two such experiments are to be performed by each student per week.➤ In the external exam, a student will have to perform two experiments, one from each group. The experiment will be of 2-hour duration.➤ There should be two examiners, one for each group, in the external examination.➤ There should not be more than 10 students per examiner per session in the external examination. | |



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|--------------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| Practical IV | 25% | 25% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • demonstrate practical skills | √ | √ | √ | √ | √ | √ |
| • correlate the physics theory concepts with appropriate practical | √ | √ | | | √ | |



B. Sc. (Physics) SEMESTER II

COURSE TITLE: MDC COURSE-II (Space Science-II)

COURSE CODE: PHYMDC-S2P2-2CR24 [CREDITS - 02]

| MDC II | COURSE CODE: PHYMDC-S2P2-2CR24 | |
|--|--|--------------|
| Course Learning Outcomes | | |
| <p>At the end of this course, learners will be able to</p> <ul style="list-style-type: none"> • understand the formation of different kinds of star and their process of evolution. • classify the stars with the help of H-R diagram they would able. • understand the stability of the star due to the mechanical pressure and gravitational pull. • relate formation of different kinds of star such as white dwarf, red-giant, Neutron star and Black-hole • understand the structure of Galaxy. • interpret the rate of expansion of Universe at large scale & estimate age and size of Universe. | | |
| Unit I | Evolution of Star | [15L] |
| <p>Learning objectives: This unit is intended to</p> <ul style="list-style-type: none"> • understand the formation of different kinds of star and their process of evolution • familiarise with the formation of different celestial object depending upon their mass • classify the stars with the help of H-R diagram • understand the stability of the star due to the mechanical pressure and gravitational pull • differentiate formation of different stars such as white dwarf, red-giant, neutron star, black hole etc. | | |
| <p>Learning outcomes: At the end of this unit, learners will be able to</p> <ul style="list-style-type: none"> • interpret the Steller evolution • relate the stability of star with the mechanical pressure and gravitational pull • identify different stars with help of H-R diagram. | | |
| 1.1 | <p>Stellar Evolution: Why do stars evolve? How do stars evolve?, Stars < (less than) 8 Solar mass, Stars > (greater than) 8 Solar Mass, Supernovae, Where do we come from?, Hertzsprung–Russell diagram, Main sequence stars.</p> | [10L] |
| 1.2 | <p>Stellar Remnants: Degenerate Gas Pressure, White dwarfs, Neutron Stars, Chandrashekhar’s Limit, Schwarzschild radius and Black holes.</p> | [5L] |
| <p>Text book:</p> <ul style="list-style-type: none"> • Schaum's Outline of Astronomy: Stacy E. Palen, McGraw-Hill Publishing Company Limited, 2020. | | |
| Unit II | Cosmology | [15L] |



Learning objectives:

This unit is intended to

- understand the structure of Galaxy
- understand the rate of expansion of Universe at large scale
- learn the Hubble's Law.

Learning outcome:

At the end of this unit, learners will be able to

- understand the formation of Galaxy
- explain the expansion of Universe
- estimate the age and size of universe.

| | | |
|------------|--|--------------|
| 2.1 | Galaxies and Clusters: The Milky Way, Normal Galaxies, Active Galaxies and Quasars. | [5L] |
| 2.2 | Cosmology: Hubble's Law, Hubble's Law and expansion of the universe, Hubble's Law and age of the universe, Hubble's Law and size of the universe, The Big bang, Life in the universe. | [10L] |

Text book:

- Schaum's Outline of Astronomy: Stacy E. Palen, McGraw-Hill Publishing Company Limited, 2020

Reference Books:

- An Introduction to Astrophysics: Baidyanath Basu, Tanuka Cattopadhyay and Sudhindra Nath Biswas, 2nd Ed., Prentice Hall India Learning Private Limited 2010.
- An Introduction to Astronomy and Astrophysics: Pankaj Jain, 1st Ed., CRC Press Publishing Company 2015.

Note: Each unit carries equal weightage of total marks of the course.



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| I | 40% | 40% | 10% | 10% | - | - | 100% |
| II | 40% | 40% | 10% | 10% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcome | Programme Outcomes | | | | | |
|---|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| <ul style="list-style-type: none"> • understand the formation of different kinds of star and their process of evolution | √ | | | | | |
| <ul style="list-style-type: none"> • classify the stars with the help of H-R diagram they would able | √ | √ | | | | |
| <ul style="list-style-type: none"> • understand the stability of the star due to the mechanical pressure and gravitational pull | √ | | | | | |
| <ul style="list-style-type: none"> • relate formation of different kinds of star such as white dwarf, red-giant, Neutron star and Black-hole | √ | | | | | |
| <ul style="list-style-type: none"> • understand the structure of Galaxy | √ | | | | | |
| <ul style="list-style-type: none"> • interpret the rate of expansion of Universe at large scale & estimate age and size of Universe | √ | √ | | | | |



B. Sc. (Physics) SEMESTER II
COURSE TITLE: MDC LAB COURSE-III
COURSE CODE: PHYMDC-S2PR3-1CR24 [CREDITS - 01]

Practical III

Course Code: PHYMDC-S2PR3-1CR24

Course Learning Outcomes

After the successful completion of the course, learners will be able to

- demonstrate practical skills
- correlate the Physics theory concepts through practical

| | |
|----|--|
| 1 | To verify Stefan-Boltzmann's Law. |
| 2 | To find the divergence angle of LASER beam. |
| 3 | To find the horizontal component of earth's magnetic field with the help of deflection magnetometer. |
| 4 | To find the Resolving Power of telescope. |
| 5 | Demonstration of Hertz's Experiment. |
| 6 | Demonstration of Newtonian reflecting Telescope |
| 7 | To do data analysis using excel. |
| 8 | Report writing on how eclipses occur. |
| 9 | To determine characteristic of photo cell. |
| 10 | Sky gazing-1(Report writing) |

Reference Books:

- Advanced Practical Physics by B. L. Worsnop and H. T. Flint, 3rd Ed., Asia Publishing House, New Delhi, 2021
- B. Sc. Practical Physics by C. L. Arora, S. Chand & Co., Reprint Ed., 2010
- University Practical Physics by D. C. Tayal, Edited by Ila Agarwal, 1st Ed., Himalayan Publishing House, 2000.
- A Laboratory Manual of Physics for Undergraduate Classes by D. P. Khandelwal, 1st Ed., Vani Publication House, New Delhi, 1985.
- B. Sc. Practical Physics by Geeta Sanon, 1st Ed., R. Chand & Co., 2007.

Note:

- The duration of each experiment is of 2 hours. Two such experiments are to be performed by each student per week.
- In the external exam, a student will have to perform two experiments, one from each group. The experiment will be of 2-hour duration.
- There should be two examiners, one for each group, in the external examination.
- There should not be more than 10 students per examiner per session in the external examination.



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|---------------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| Practical III | 25% | 25% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • demonstrate practical skills | √ | √ | √ | √ | √ | √ |
| • correlate the physics theory concepts with appropriate practical | √ | √ | | | √ | |



B. Sc. (Physics) SEMESTER II
COURSE TITLE: MDC LAB COURSE-IV
COURSE CODE: PHYMDC-S2PR4-1CR24 [CREDITS - 01]

| Practical IV | Course Code: PHYMDC-S2PR4-1CR24 |
|--|--|
| Course Learning Outcomes | |
| After the successful completion of the course, learners will be able to | |
| <ul style="list-style-type: none">• demonstrate practical skills• correlate the physics theory concepts through practical | |
| 1 | Demonstration of Dobsonian Telescope. |
| 2 | Sun spot activity analysis. |
| 3 | Use of Sky gazing mobile application. |
| 4 | Hands on for Sky gazing mobile application. |
| 5 | Report writing on phases of Moon. with diagram |
| 6 | Report writing on “How seasons are formed” with diagram |
| 7 | Visit to ISRO Ahmedabad |
| 8 | Visit to Science city Ahmedabad. |
| 9 | To perform least square curve fitting of the given data. |
| 10 | Sky gazing-2 (Report writing) |
| Reference Books: | |
| <ul style="list-style-type: none">• Advanced Practical Physics by B. L. Worsnop and H. T. Flint, 3rd Ed., Asia Publishing House, New Delhi, 2021• B. Sc. Practical Physics by C. L. Arora, S. Chand & Co., Reprint Ed., 2010• University Practical Physics by D. C. Tayal, Edited by Ila Agarwal, 1st Ed., Himalayan Publishing House, 2000.• A Laboratory Manual of Physics for Undergraduate Classes by D. P. Khandelwal, 1st Ed., Vani Publication House, New Delhi, 1985.• B. Sc. Practical Physics by Geeta Sanon, 1st Ed., R. Chand & Co., 2007. | |
| Note: | |
| <ul style="list-style-type: none">➤ The duration of each experiment is of 2 hours. Two such experiments are to be performed by each student per week.➤ In the external exam, a student will have to perform two experiments, one from each group. The experiment will be of 2-hour duration.➤ There should be two examiners, one for each group, in the external examination.➤ There should not be more than 10 students per examiner per session in the external examination. | |



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|--------------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| Practical IV | 25% | 25% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • demonstrate practical skills | √ | √ | √ | √ | √ | √ |
| • correlate the physics theory concepts with appropriate practical | √ | √ | | | √ | |



B. Sc. (Physics) SEMESTER II

COURSE TITLE: SEC COURSE-II (Programming in “C” Language-II)

COURSE CODE: PHYSEC-S2P2-1CR24 [CREDITS - 01]

| SEC II | COURSE CODE: PHYSEC-S2P2-1CR24 | |
|---|---|-------------|
| Course Learning Outcomes | | |
| <p>At the end of this course, learners will be able to</p> <ul style="list-style-type: none"> • define arrays and its use in programming. • explain different types of arrays and their implementation in programming. • interpret user-defined functions. • understand the use of different functions into C-program. • apply numerical algorithms into C-program and visualize the results of the computations. | | |
| Unit I | Array and Functions | [15L] |
| <p>Learning objectives: This unit is intended to</p> <ul style="list-style-type: none"> • familiarize the students with arrays • infer about the different types of arrays • study user defined functions • infer about elements of user-defined functions • learn the how function works in C-programming • study about nesting of functions and recursion. | | |
| <p>Learning outcomes: At the end of this unit, learners will be able to</p> <ul style="list-style-type: none"> • get to know about an array • apply the use different types of array, one dimensional arrays, two dimensional arrays, multi-dimensional arrays • understand and apply user defined functions • analyze how functions works in C-programming • apply the use of different function declaration and call of function • examine the nesting of functions and recursion. | | |
| 1.1 | arrays: introduction (7.1), one dimensional arrays (7.2), declaration of one dimensional arrays (7.3), initialization of one dimensional arrays (7.4), two dimensional arrays (7.5), initializing two dimensional arrays (7.6), multi-dimensional arrays (7.7). | [7L] |
| 1.2 | user defined functions: introduction (9.1), need for user defined functions (9.2), a multifunction program (9.3), elements of user-defined functions (9.4), definition of functions (9.5), return values and their types (9.6), function calls (9.7), function declaration (9.8), category of functions (9.9), no arguments and no return values (9.10), arguments but no return values | [8L] |



| | | |
|---|--|--|
| | (9.11), arguments with return values (9.12), no arguments but returns a value (9.13), functions that return multiple values (9.14), nesting of functions (9.15), recursion (9.16), passing arrays to functions (9.17). | |
| Text book: | | |
| <ul style="list-style-type: none"> • ANSI C by E Balaguruswamy, 8th Ed., TATA McGraw-Hill Publication 2019 | | |
| Reference Books: | | |
| <ul style="list-style-type: none"> • Computer Programming in C by V. Rajaraman, 2nd Ed., PHI Learning Pvt. Ltd. | | |

Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| I | 10% | 10% | 40% | 40% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • define arrays and its use in programming. | √ | √ | √ | | | |
| • explain different types of arrays and their implementation in programming. | √ | √ | √ | | | |
| • interpret user-defined functions. | √ | √ | | | | |
| • understand the use of different functions into C-program. | √ | √ | | | | |
| • apply numerical algorithms into C-program and visualize the results of the computations. | √ | √ | √ | | | |



B. Sc. (Physics) SEMESTER II
COURSE TITLE: SEC LAB COURSE-II
COURSE CODE: PHYSEC-S2PR2-1CR24 [CREDITS - 01]

| Practical II | Course Code: PHYSEC-S2PR2-1CR24 | | | | | | | | | | | | | | |
|--|---|---|--|---|---|---|--------------------------------------|---|--|---|------------------------------|---|---------------------------------|---|---|
| Course Learning Outcomes | | | | | | | | | | | | | | | |
| After the successful completion of the course, learners will be able to: | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none">• demonstrate practical skills• correlate the physics theory concepts through practical | | | | | | | | | | | | | | | |
| <table border="1"><thead><tr><th colspan="2">Development of algorithm, flow chart and program for the following</th></tr></thead><tbody><tr><td>1</td><td>Finding Largest/Smallest of a set of integers using Array</td></tr><tr><td>2</td><td>Reading and Printing an n x n matrix</td></tr><tr><td>3</td><td>Addition/Subtraction of two 3x3 matrices</td></tr><tr><td>4</td><td>Find median of a set of data</td></tr><tr><td>5</td><td>Swap two numbers using function</td></tr><tr><td>6</td><td>Print Fibonacci sequence using function</td></tr></tbody></table> | | Development of algorithm, flow chart and program for the following | | 1 | Finding Largest/Smallest of a set of integers using Array | 2 | Reading and Printing an n x n matrix | 3 | Addition/Subtraction of two 3x3 matrices | 4 | Find median of a set of data | 5 | Swap two numbers using function | 6 | Print Fibonacci sequence using function |
| Development of algorithm, flow chart and program for the following | | | | | | | | | | | | | | | |
| 1 | Finding Largest/Smallest of a set of integers using Array | | | | | | | | | | | | | | |
| 2 | Reading and Printing an n x n matrix | | | | | | | | | | | | | | |
| 3 | Addition/Subtraction of two 3x3 matrices | | | | | | | | | | | | | | |
| 4 | Find median of a set of data | | | | | | | | | | | | | | |
| 5 | Swap two numbers using function | | | | | | | | | | | | | | |
| 6 | Print Fibonacci sequence using function | | | | | | | | | | | | | | |
| Reference Books: | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none">• Computer Programming in C by V. Rajaraman, 2nd Ed., PHI Learning Pvt. Ltd., 1994. | | | | | | | | | | | | | | | |
| Note: | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none">➤ The duration of each experiment is of 2 hours. One experiment is to be performed by each student per week.➤ In the external exam, a student will have to perform one experiment. The experiment will be of 2-hour duration.➤ The batch for external examination shall have maximum 20 students.➤ There should be two examiners in the external examination.➤ There should not be more than 10 students per examiner per session in the external examination. | | | | | | | | | | | | | | | |



Question Paper Template

| Unit | Remembering/ Knowledge (1) | Understanding (2) | Applying (3) | Analysing (4) | Evaluating (5) | Creating (6) | Total marks |
|--------------|-------------------------------|----------------------|-----------------|------------------|-------------------|-----------------|----------------|
| Practical II | 25% | 25% | 25% | 25% | - | - | 100% |

Mapping of CLOs and PSOs

| Course Learning Outcomes | Programme Outcomes | | | | | |
|--|--------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| • demonstrate practical skills | √ | √ | √ | √ | √ | √ |
| • correlate the physics theory concepts with appropriate practical | √ | √ | | | √ | |