# Faculty of Science &Technology

## Template for Defining Course: S.Y.B.Sc. Physics (NEP-2024 Pattern) June2025

| Course Pattern : CBCS Pattern | | | | |
|---|---|---|---|---|
| **Course Part Definition** | **Course Part Term Definition** | | | |
| **SY** | **Sem-III** | | **Sem-IV** | |
| Min Papers - 21 | Min Papers | 11 | Min Papers | 10 |
| Max Papers - 21 | Max Papers | 11 | Max Papers | 10 |
| Min Marks - 1100 | Min Marks | 550 | Min Marks | 550 |
| Max Marks - 1100 | Max Marks | 550 | Max Marks | 550 |
| Total Credits - 44 | Total Credits | 22 | Total Credits | 22 |

| Sem | Paper Name | Paper Type (General/ Special/Skill/OEC/ AE/VEC/ IKS/CC) | Credits | No. of Lect in (Hr. per week) | Teaching Learning Method | Assessment Method (Theory/ Practical) | Total Marks | | External (UA) | Internal (CA) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Max Marks | Min Marks | Max Marks | Min Marks | Max Marks | Min Marks |
| **SEM III** | | | | | | | | | | | | |
| | **Major** | | | | | | | | | | | |
| **III** | PHY-MJ-231 Modern Physics | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | PHY-IKS-232 Ancient Indian Astronomy | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | PHY-MJP-233 Physics Laboratory-III | Practical | 2 | 4 | Laboratory | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| | **SEC** | | | | | | | | | | | |
| **III** | PHY-SEC-234 Physics Laboratory Skills | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | PHY-SECP-235 Skill Lab-I | Practical | 2 | 4 | Laboratory | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Minor** | | | | | | | | | | | |
| **III** | PHY-MN-236(A) Fundamentals of Physics | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | PHY-MN-236(B) Solar, Thermal and Photovoltaic System | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | PHY-MNP-236(C) Minor Lab-I | Practical | 2 | 4 | Laboratory | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Generic/Open Elective course Group *(Select any One)*** | | | | | | | | | | | |
| **III** | PHY-OE-237 Space Technology and Applications | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Basket of Ability Enhancement/Value Education Course *(Select any One)*** | | | | | | | | | | | |
| **III** | AEC-238 A- Marathi | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | AEC-238 B - Hindi | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Basket of Cocurricular Course *(Select any One)*** | | | | | | | | | | | |
| **III** | CC-239 A NCC-III | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | CC-239 B NSS-III | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | CC-239 C Yoga-III | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | CC-239 D Sports-III | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | CC-239 E Student Welfare III | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **III** | Total Papers 11 | | 22 | | | | 550 | | | | | |

| SEM IV | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Major** | | | | | | | | | | | |
| **IV** | PHY-MJ-241 Basic Electronics | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | PHY-MJP-243 Physics Laboratory-IV | Practical | 2 | 4 | Laboratory | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Basket of OJT/Int./ CEP** | | | | | | | | | | | |
| **IV** | PHY-CEP- 242 Physics and Society | Practical | 4 | 8 | Practical | Practical | 100 | 40 | 60 | 24 | 40 | 16 |
| | **VC** | | | | | | | | | | | |
| **IV** | PHY-VC-244 Instrumentation | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | PHY-VCP-245 Vocational Lab-I | Practical | 2 | 4 | Laboratory | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Minor** | | | | | | | | | | | |
| **IV** | PHY-MN-246(A) Fundamentals of Electronics | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | PHY-MNP-246(B) Minor Lab-2 | Practical | 2 | 4 | Laboratory | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Generic/Open Elective course Group *(Select any One)*** | | | | | | | | | | | |
| | PHY-OE-247 Indian Defense Systems | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Basket of Ability Enhancement/Value Education Course *(Compulsory Group)*** | | | | | | | | | | | |
| **IV** | AEC-248 A- Marathi | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | AEC-248 B - Hindi | Theory | 2 | 2 | Lectures | Theory | 50 | 20 | 30 | 12 | 20 | 8 |
| | **Basket of Cocurricular Course *(Select any One)*** | | | | | | | | | | | |
| **IV** | CC-249 A NCC-IV | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | CC-249 B NSS-IV | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | CC-249 C Yoga-IV | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | CC-249 D Sports-IV | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| **IV** | CC-249 E Student Welfare | Practical | 2 | 4 | Practical | Practical | 50 | 20 | 30 | 12 | 20 | 8 |
| | Total Papers 10 | | 22 | | | | 550 | | | | | |

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School of Physical Sciences

**PRATAP COLLEGE (Autonomous), AMALNER**

**Affiliated to KBC North Maharashtra University, Jalgaon**

**'A+' Grade NAAC Re-Accredited (3rd Cycle)**

**(CGPA 3.52)**

# SYLLABUS

**FOR**

**S.Y. B.Sc. (PHYSICS)**

**As per NEP 2020**

(With effect from June 2025)

## Preamble

Pratap College, Amalner got Autonomous status from the academic year 2019-20. The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process and examination & evaluation systems. Pratap College Amalner is affiliated to Kavayitri Bahinabai Chaudhari North Maharashtra University Jalgaon as per the directions of UGC. Pratap (Autonomous) College, Amalner is going to implement the National Education Policy (NEP 2020) to undergraduate program. The main objective of the framing the syllabi of S.Y.B.Sc. (Physics) is to create skilled minds and therefore expectation is to equip the students with the knowledge and understanding of concepts of physics rather than the ability to remember facts so that they may have a reasonable comprehensive and complete grasp of principles of Physics. It is expected that the students studying Physics will apply investigations and problem solving skills, effectively communicate the theoretical concepts, and appreciate the contribution that the study of Physics makes to our understanding of the world.

**Board of Studies (Physics),**

**Pratap (Autonomous) College, Amalner**

## OBJECTIVES

1. To provide education in physics of the highest quality at the undergraduate level and generate graduates of the caliber sought by industries and public service as well as academic teachers and researchers of the future.
2. To acquire deep knowledge in fundamental aspects of Physics and basic knowledge in the specialized thrust areas like Basic electronics, Wave Oscillations, Electrical Circuits and Networks, Renewable Energy Sources , Thermal Physics, Sensors: Science and Technology
3. To develop ability among the students to identify, remember and grasp the meaning of basic facts, concepts and principles of Physics.
4. To develop observational skills, confidence in using scientific equipment and relate the knowledge of scientific concepts to quantitative and physical measurement.
5. Acquire knowledge, skills, working methods and ways of expression which will reflect on all round development of the students' attitudes towards scientific thinking and its applications.
6. To develop attitudes such as concern for accuracy and precision, objectivity, and Enquiry.
7. The overall aim is to provide comprehensive knowledge and understanding in the relevant fields and enable students to pursue the physics subject at an advanced level later and to attract outstanding students from all back grounds.

**Course Code: PHY-MJ-231**
**Course Title: Modern Physics**

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|---|---|
| **Course Code: PHY-MJ-231** | **Course Category: Major Course (DSC)** |
| **Course Title: Modern Physics** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA):20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To understand the principles of modern physics and theories related to atomic structure
- To understand how the theories evolved has helped in the development of applications like LASER.

**Course Outcomes: On completion of the course students will be able to**

- Understand the fundamental principles of modern physics and modern atomic theories
- Correlate the knowledge gained with other disciplines in physics.

## Course Content:

**Unit 1: Matter Waves** **(12 L, 12 M)**

The quantum theory of light, De Broglie Waves, Wave Function, De Broglie Wave velocity, Wave and group Velocities, The Diffraction of Particles, The Uncertainty principle, Applications of the Uncertainty Principle: Non-existence of electron in atomic nucleus, measurement of energy emitted in an atomic process, Heisenberg's gamma ray microscope: a thought experiment, The wave particle duality

Reference: Perspectives of Modern Physics by Arthur Beiser, Mac Graw Hill

**Unit2: Modern Theories for H-Atom** **(10L, 10 M)**

The Nuclear Atom, Electron Orbits, Atomic Spectra, The Bohr Atom, Energy Levels and Spectra, Atomic Excitation, The Franck-Hertz Experiment, The Correspondence Principle, Nuclear Motion and Reduced Mass, Hydrogenic Atoms, Bohr-Sommerfield model

Reference: Perspectives of Modern Physics by Arthur Beiser, Mac Graw Hill

**Unit3: LASERs** **(08 L, 08 M)**

Introduction: Basic elements and complete Laser System, Lasers and Laser Light properties: wavelength, energy, directionality, monochromaticity, coherence time and length, Light Emission and Absorption in Quantum Theory, Einstein Theory of Light–Matter Interactions: absorption, emission, stimulated emission, construction and working of different types of lasers (Ruby , He-Ne and Semiconductor), applications of lasers

Reference: LASER Physics by Peter W, Milonni and Joseph H. Eberly, WIELY

**Reference Books:**


1. Perspectives of Modern Physics by Arthur Beiser, Mac Graw Hill
2. LASER Physics by Peter W, Milonni and Joseph H. Eberly, WIELY
3. Modern Physics by B.L.Theraja, S. Chand publishing.
4. Elementary Modern Physics by A.P.Arya, Addison-Wesley Publishing Company.
5. Concept of Modern Physics by Arthur Beiser, McGraw Hill(6th edition).
6. Modern Physics by N.K.Sehgal,K.L.Chopraand, D.L.Sehgal (S.Chand & sons Publishing).
7. Concepts of Modern Physics by S. L. Gupta, S. Gupta, Dhanpat Rai Publications.
8. An Introduction to Laser: Theory and applications by M.N.Avadhanulu. S. Chand Publishing.
9. Lasers and nonlinear optics by B.B.Laud, John Wiley and Sons.

**Course Code: PHY-IKS-232**
**Course Title: Ancient Indian Astronomy**

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|---|---|
| **Course Code: PHY-IKS-232** | **Course Category: Major Specific IKS (DSC)** |
| **Course Title: Ancient Indian Astronomy** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To introduce the students to developments in Ancient Indian Astronomy
- To reveal the scientific base of Ancient Indian Astronomy.
- To understand the use of knowledge of astronomy in daily life.

**Course Outcomes: On completion of the course students will be able to:**

- Understand the scientific base of Ancient Indian Astronomy and the developments in it.
- Apply the knowledge of basic concepts in Astronomy in daily life.

## Course Content:

**Unit 1: Introduction to Ancient Indian Astronomy (9L, 9M)**

Astronomy in India: A Survey[1], Astronomical Practices in India[2], Some Ancient Indian Astronomers and their work[3], Later Developments[3]

[1]https://cbseacademic.nic.in/web_material/Circulars/2012/68_KTPI/Module_1.pdf(Pages:11 to 23)

[2]https://ncert.nic.in/textbook/pdf/keks105.pdf(Pages: 2 to 8)

[3]https://ncert.nic.in/textbook/pdf/keks105.pdf(Pages: 8 to 17)

**Unit 2: Time in Indian Astronomy (12L, 12M)**

Concept of Rashi and Nakshatra:Zodiac and Rashi, Nakshatra System[4],Time in Indian Astronomy: Introduction, civil day, sidereal day, solar year and civil calendar, solar month and lunar month, lunar year, adhikmaas, kshayamass, yuga system, Indian eras, time on microscopic scale[5]

[4]https://ia903206.us.archive.org/1/items/indian-astronomy-an-introduction-s.-balachandra-rao/Indian%20Astronomy%20-%20%20An%20Introduction%20-%20S.Balachandra%20Rao.pdf(Pages: 32-34)

[5]https://ia903206.us.archive.org/1/items/indian-astronomy-an-introduction-s.-balachandra-rao/Indian%20Astronomy%20-%20%20An%20Introduction%20-%20S.Balachandra%20Rao.pdf (Pages:39-55)

**Unit 3: Calendar in Indian Astronomy (9 L, 9 M)**

Hindu calendar, Indian calendar and panchang, tithi, naksatra, yoga, karana, vara

https://ia903206.us.archive.org/1/items/indian-astronomy-an-introduction-s.-balachandra-rao/Indian%20Astronomy%20-%20%20An%20Introduction%20-%20S.Balachandra%20Rao.pdf (Pages: 56 to 70)

References:


1. Internet resources:
   http://jantarmantar.org
   www.skyandtelescope.com
   www.space-india.com
   https://www.iiap.res.in
2. Knowledge traditions and practices of India: Module 1: Astronomy in India, A Class XI text-book, CBSE
3. Indian Astronomy: An introduction by S Balchandra Rao, University Press (India) Ltd., Hyderabad

## Course Code: PHY-MJP-233
## Course Title: Physics Laboratory-III

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|---|---|
| **Course Code: PHY-MJP-233** | **Course Category: Major Course** |
| **Course Title: Physics Laboratory-III** | **Type: Theory** |
| **Total Contact Hours: 60 (4/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |
| **Course Objectives**:<br>• To perform experiments related to theories in modern physics, which will help to understand the theoretical principles more clearly. | |
| **Course Outcomes: On completion of the course students will be able to:**<br>• Design, plan and execute experiment related to theories in modern physics,<br>• Demonstrate experimental skills necessary to perform such experiments. | |

## Experiments:

1. Determination of an electronic charge using P-N junction diode.
2. I-V characteristics of a photocell.
3. Determination of Planck's constant by using a Photocell.
4. To verify Inverse square law of light using a photocell.
5. Determination of Planck's constant by using LEDs.
6. Comparison of luminous intensities of two light sources by using photovoltaic cell
7. To determine the wavelength of light from LASER source using Diffraction grating.
8. To study the beam divergence by using LASER.
9. To determine the number of lines in a transmission diffraction grating by knowing the wavelength of laser light.
10. To determine the beam-size of Laser.
11. Study of the I-V characteristics of Solar cell and find its fill factor.
12. Study the effect of illumination intensity on the characteristics of solar cell.
13. Comparison of luminous intensities of two light sources by using photovoltaic cells.
14. Determination of the decrement factor by using Logarithmic decrement (in air / water).
15. Study of resonance using Kater's pendulum.
16. Comparison of capacitance of capacitors by De Sauty's method.

**Note:**

- Any eight experiments need to be performed.
- New experiments can be added to this list with prior permission from BOS (Physics)

**Reference Books:**


1. A Text book of practical Physics by Shrinivasan and Balasubranian.
2. B.Sc. Practical Physics by Harnam Singh and Dr. P.S. Hemne, S. Chand.
3. Advanced Level Practical Physics by J. M.Nelkon, J. M. Ogloom, EIBS
4. B.Sc. Practical Physics by C.L. Arora, S. Chand and Co. Ltd , Delhi
5. Advanced level Physics Practicals by Michael Nelson and Jon M. Ogborn,Heinemann Educational Publishers

**Course Code: PHY-SEC-234**
**Course Title: Physics Laboratory Skills**

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|---|---|
| **Course Code: PHY-SEC-234** | **Course Category: Skill Enhancement Course (SEC)** |
| **Course Title: Physics Laboratory Skill** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |
| **Course Objectives**:<br>• To expose the students to various physics laboratory skills.<br>• To make students ready to work perfectly in physics laboratory. | |
| **Course Outcomes: On completion of the course students will be able to**<br>• Assess the possible sources of error in the measurements.<br>• Analyze observed data.<br>• Present the observed data in a scientific way.<br>• Work in a physics laboratory safely. | |

## Course Content:

1. **Basic measurement skills: (08 L, 08M)**
   a. Concept of error, types of errors, sources of errors, methods to avoid errors, importance of taking multiple readings, choice of range during measurement.
   b. Demonstration of above skills by using equipment like vernier caliper, micrometer screw gauge, measuring cylinder, travelling microscope etc.
2. **Data Analysis skills (07 L, 07 M)**
   a. Concept of accuracy, precision, resolution, least count, statistical methods of data analysis: mean, standard deviation, most probable value, estimation of error, care about units during calculations.
   b. Demonstration of above skills by using some available data of any experiment performed in the laboratory at S Y B Sc level.
   References: https://secure-edia.collegeboard.org/digitalServices/pdf/ap/ap-physics-data-analysis-student-guide.pdf
3. **Data presentation skills (08 L, 08 M)**
   a. Laboratory notebooks writing tips, to what significant figure the measurement/result is to be reported, presenting data in the form of graph: selection of variables, selection of units, selection of scale, types of graphs, how to write a journal sheet.
   b. Demonstration of above skills by using some available data of any experiment performed in the laboratory at S Y B Sc level.

Reference: ……..

4. **Laboratory safety skills (07 L, 07 M)**
   a. Equipment handling and care: precautions to be taken while handling lasers, electrical,electronic equipment, chemicals.
   b. Demonstration of the above skills by examples like precautions to be taken while handling lasers, multimeter, CRO for measurement of electrical parameters,handlingelectromagnets, strong acids etc.

Reference: https://fens.sabanciuniv.edu/sites/fens.sabanciuniv.edu/files/2023-11/su-fens-laboratory-safety-handbook.pdf

**Reference Books:**


1. Modern Electronic Instrumentation and measurement Techniques by Albert D. Helfrick and William D. Cooper, PHI
2. AP® Physics 1 and 2 Lab Investigations Student Guide to Data Analysis by Peter Sheldon, Collegeboard
3. Laboratory Safety Handbook b FENS LABORATORY SAFETY TEAM, Sabancı University
4. Introduction to Measurements and Instrumentation by Arun K. Ghosh, PHI
5. Laboratory Safety Handbook by Fens Laboratory Safety Team, Sabanci University
6. Instrumentation by Nakra and Chaudhari
7. Instrumentation, Device and systems by C S Rangan, G R Sharma and V S V Mani, Mc Graw Hill

**Course Code: PHY-SECP-235**
**Course Title: Skill Laboratory-I**

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|---|---|
| **Course Code: PHY-SECP-235** | **Course Category: Skill Enhancement Course (SEC)** |
| **Course Title: Skill Laboratory-I** | **Type: Practical** |
| **Total Contact Hours: 60 (4/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |
| **Course Objectives**:<br>• To expose the students to various physics laboratory skills.<br>• To make students ready to work perfectly in physics laboratory. | |
| **Course Outcomes: On completion of the course students will be able to**<br>• Assess the possible sources of error in the measurements.<br>• Analyze observed data.<br>• Present the observed data in a scientific way.<br>• Work in a physics laboratory safely. | |

## Laboratory Experiments:

Note: Apply the principles and precautions learned in Physics Skill theory paper while performing the following experiments:

1] To study the characteristics of a common emitter n-p-n (or p-n-p) transistor and to find out the values of current and voltage gains.
2] To study the resistance offered by distilled water and water added with sodium chloride to it.
3] To show that a current measuring device has finite non-zero resistance.
4] To show that a voltage measuring device has non-infinite resistance.
5] To show that the earth's magnetic field has both vertical and horizontal components.
6] To demonstrate repulsion/attraction between two conductors carrying current in opposite/same direction.
7] To study various factors on which the internal resistance of a cell depends.
8] To study infrared radiations emitted by different sources using phototransistor.
9] To study the luminosities of various electric lamps of different powers and make.
10] Finding the Uncertainty in Calculations from Measurements.
11] Determining the Best Fit Line from Statistical Methods.
12] To show that the period of oscillation of a pendulum depends on its length.
13] Determine the diameter of capillary tube using travelling microscope.
14] To find a relationship between resistance and voltage for an electric bulb
15] Measurement of voltage and time period of an AC signal using CRO.
16] Calculation of standard deviation from the given experimental data.
17] Use of C.R.O as a measurement tool for different electrical parameters(frequency, a.c. /d.c. voltage, pulse height, pulse width, rise time and fall time).
18] Determination of the focal length of a concave lens by combination method.

Note: Any eight of the above experimetns can be performed

Reference Books:


8. Modern Electronic Instrumentation and measurement Techniques by Albert D. Helfrick and William D. Cooper, PHI
9. Laboratory Safety Handbook by Fens Laboratory Safety Team, Sabanci University


Web references:

1. https://ncert.nic.in/textbook/pdf/kest104.pdf

## Course Code: PHY-MN-236(A) Course Title: Fundamentals of Physics

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|---|---|
| **Course Code: PHY-MN-236(A)** | **Course Category:Minor Course (MIN)** |
| **Course Title: Fundamentals of Physics** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA):20 Marks** | **University Assessment (UA): 30 Marks** |
| **Course Objectives**:<br>• To understand the principles of modern physics and theories related to atomic structure<br>• To understand how the theories evolved has helped in the development of applications like LASER. | |
| **Course Outcomes: On completion of the course students will be able to**<br>• Understandthe fundamental principles of modern physics and modern atomic theories<br>• Corelate the knowledge gained with other disciplines in physics. | |

## Course Content:

**Unit 1: Matter Waves** **(12 L, 12 M)**

The quantum theory of light, De Broglie Waves, Wave Function, De Broglie Wave velocity, Wave and group Velocities, The Diffraction of Particles, The Uncertainty principle, Applications of the Uncertainty Principle: Non-existence of electron in atomic nucleus, measurement of energy emitted in an atomic process, Heisenberg's gamma ray microscope: a thought experiment, The wave particle duality

Reference: Perspectives of Modern Physics by Arthur Beiser, Mac Graw Hill

**Unit 2: Modern Theories for H-Atom** **(10L, 10 M)**

The Nuclear Atom, Electron Orbits, Atomic Spectra, The Bohr Atom, Energy Levels and Spectra, Atomic Excitation, The Franck-Hertz Experiment, The Correspondence Principle, Nuclear Motion and Reduced Mass, Hydrogenic Atoms, Bohr-Sommerfield model

Reference: Perspectives of Modern Physics by Arthur Beiser, Mac Graw Hill

**Unit 3: LASERs** **(08 L, 08 M)**

Introduction: Basic elements and complete Laser System, Lasers and Laser Light properties: wavelength, energy, directionality, monochromaticity, coherence time and length, Light Emission and Absorption in Quantum Theory, Einstein Theory of Light–Matter Interactions: absorption, emission, stimulated emission, construction and working of different types of lasers (Ruby , He-Ne and Semiconductor), applications of lasers

Reference: LASER Physics by Peter W, Milonni and Joseph H. Eberly, WIELY

**Reference Books:**


10. Perspectives of Modern Physics by Arthur Beiser, Mac Graw Hill
11. LASER Physics by Peter W, Milonni and Joseph H. Eberly, WIELY
12. Modern Physics by B.L.Theraja, S. Chand publishing.
13. Elementary Modern Physics by A.P.Arya, Addison-Wesley Publishing Company.
14. Concept of Modern Physics by Arthur Beiser, McGraw Hill(6th edition).
15. Modern Physics by N.K.Sehgal,K.L.Chopraand, D.L.Sehgal (S.Chand & sons Publishing).
16. Concepts of Modern Physics by S. L. Gupta, S. Gupta, Dhanpat Rai Publications.
17. An Introduction to Laser: Theory and applications by M.N.Avadhanulu. S. Chand Publishing.
18. Lasers and nonlinear optics by B.B.Laud, John Wiley and Sons.

## Course Code: PHY-MN-236(B)
## Course Title: Solar Thermal & Photovoltaic Systems

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|---|---|
| **Course Code: PHY-MN-236(B)** | **Course Category: Minor Course (MIN)** |
| **Course Title:**<br>**Solar Thermal & Photovoltaic Systems** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |
| **Course Objectives**:<br>• To understand different applications of solar energy.<br>• To understand the methods and principles of the conversion of solar energy into thermal and electrical energy.<br>• Understand the common instruments used for converting solar energy in other forms. | |
| **Course Outcomes: On completion of the course students will be able to:**<br>• Understand the nature of solar energy and its applications.<br>• Understand the methods and principles of the conversion of solar energy in thermal and electrical energy.<br>• Get an overview of different terminologies used in solar thermal and photovoltaic systems.<br>• Make a proper choice of solar energy technology depending on application/requirement. | |

## Course Content:

**Unit 1: Understanding solar energy: (08 L, 08 M)**

Nature of solar radiation, availability of solar radiation, geographical distribution, measurement of solar radiation.

**Unit 2: Solar to thermal energy conversion (08 L, 08 M)**

Conversion of solar energy to thermal energy, different types of collectors: flat plate collector, Evacuated Tube Collectors, different applications: solar water heater, solar dryer, solar cooker.

**Unit 3: Solarto Electrical Energy conversion (06L,06 M)**

Introduction to solar photovoltaics, construction and working of solar cells, I-V characteristics of solar cell, cell-module-array, power production: from milliwatt to megawatt, types of solar modules, series and parallel connection of modules and their I-V characteristics.

**Unit 4:Solar photovoltaic applications (08 L, 08 M)**

Standalone system: Introduction, Solar lanterns and solar streetlight, block diagram, role of each component, Grid connected system: Introduction, block diagram, inverter, AC and DC distribution box, energy meters, earthing, lightning arresters.

**Reference Books:**


1. Solar Energy by S P Sukhatme, J K Nayak, McGraw Hill Education.
2. Solar thermal Energy by Sreekumar, New Age International Private Limited.
3. Off-Grid PV Systems: Design and Installation, GSES, First Edition International.
4. Grid-Connected PV Systems Design and Installation – International version, GSES

## Course Code: PHY-MNP-236(C)
## Course Title: Minor Lab-I

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|---|---|
| **Course Code: PHY-MNP-236(C)** | **Course Category: Minor Course (MIN)** |
| **Course Title:Minor Lab-I** | **Type: Theory** |
| **Total Contact Hours: 60 (4/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To apply the theoretical knowledge gained in PH-214 and 215 in practical applications
- To perform experiments which will give more insight into the topics learned in PH-214 and 215.

**Course Outcomes: On completion of the course students will be able to:**

- Differentiate between solar power and solar energy and measure these quantities
- Understand and measure performance parameters of solar thermal devices
- Understand and measure performance parameters of solar modules and their various combinations
- Identify different components in SPV system, understand their specifications
- Design a simple stand-alone SPV system

## Laboratory Experiments:

**Group A: Any four**

1. Determination of an electronic charge using P-N junction diode.
2. I-V characteristics of a photocell.
3. Determination of Planck's constant by using a Photocell.
4. To verify Inverse square law of light using a photocell.
5. Determination of Planck's constant by using LEDs.
6. Comparison of luminous intensities of two light sources by using photovoltaic cell
7. To determine the wavelength of light from LASER source using Diffraction grating.
8. To study the beam divergence by using LASER.
9. To determine the number of lines in a transmission diffraction grating by knowing the wavelength of laser light.
10. Determination of the decrement factor by using Logarithmic decrement (in air / water).

**Group B: Any four**

1. Use of solar power meter to measure solar power as a function of time and estimate daily solar energy availability
2. To find performance coefficient of box-type solar cooker
3. I-V Characteristic of solar cell and determination of performance parameters
4. I-V characteristic of solar module and determination of performance parameters
5. Effect of tilt of solar module on performance parameters
6. Effect of solar radiation intensity on performance parameters
7. I-V characteristics of series connected solar modules
8. I-V characteristics of parallel connected solar modules
9. Use of bypass diode in solar system
10. Use of blocking diode in solar system

Reference Book:


1. A Text book of practical Physics byShrinivasan and Balasubranian.
2. B.Sc. Practical Physics by Harnam Singh and Dr. P.S. Hemne, S. Chand.
3. Advanced Level Practical Physics by J. M.Nelkon, J. M. Ogloom, EIBS
4. B.Sc. Practical Physics by C.L. Arora, S. Chand and Co. Ltd , Delhi

5. Advanced level Physics Practicals by Michael Nelson and Jon M. Ogborn,Heinemann Educational Publishers
6. Solar Photovoltaics: A Lab Training Manual by Chetan S. Solanki et al, Foundation Books

**Course Code: PHY-OE-237**
**Course Title: Space Technology and Applications (India)**

| | |
|---|---|
| **Course Code: PHY-OE-237** | **Course Category: Open Elective (OE)** |
| **Course Title:**<br>**Space Technology and Applications (India)** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |
| **Course Objectives**:<br>• To make students aware about the structure of Indian space science and technology sector,<br>• To get knowledge about the various types of satellite launchers developed by India,<br>• To get knowledge about various type so satellites developed by India,<br>• To know various applications evolved from Indian space science program**.** | |
| **Course Outcomes: On completion of the course students will be able to:**<br>• To understand the developments in Indian Space Science Programs,<br>• To understand various applications of Indian Space Science Programs | |

## Course Content:

**Unit 1: Indian Space Science and Technology (07 L, 07 M)**
Introduction, Beginning of global space exploration, INCOSPAR , Establishment of ISRO, ISRO Centers, ISRO's Achievements,ISRO and Students
**Reference:** https://www.ursc.gov.in/science-promotion/books/pdf/01_ISRO_Genesis_and_Journey_Nagendra.pdf

**Unit 2: Indian Satellite Launchers: (08 L, 08 M)**
General introduction: Satellite launchers, basic stages in it
Launchers under usage: Polar Satellite Launch Vehicle (PSLV), Geosynchronous Satellite Launch Vehicle (GSLV), Geosynchronous Satellite Launch Vehicle Mark III (LVM3), Sounding Rockets
Launchers under development: Human Rated Launch Vehicle (HRLV), Small Satellite Launch Vehicle (SSLV), Reusable Launch Vehicle - Technology Demonstrator (RLV-TD), Scramjet Engine - TD
**Reference:**https://www.isro.gov.in/Launchers.html

**Unit 3: Indian Satellites (07 L, 07 M)**
Communication Satellites, Earth Observation Satellites, Scientific Spacecraft, Navigation Satellites, Experimental Satellites, Small Satellites, Student Satellites
**Reference:** https://www.isro.gov.in/Satellites.html

**Unit 4: Space Applications: (08 L, 08 M)**
Satellite Communication Applications. Television, Radio Networking, Telecommunications, Telemedicine, Tele-education, Satellite Meteorology, Satellite Aided Search and Rescue (SAS&R), Standard Time and Frequency Signal Dissemination Services, GPS Aided Geo Augmented Navigation (GAGAN), Applications of IRNSS, Disaster Management Support (DMS) Programme, Remote Sensing Applications, Earth Observation Application Sciences.
(Note: Allthe applications in this unit are informative.)
**Reference:** https://www.isro.gov.in/SpaceApplications.html

**References:**


1. https://www.ursc.gov.in/science-promotion/books/pdf/01_ISRO_Genesis_and_Journey_Nagendra.pdf
2. https://www.isro.gov.in/Launchers.html
3. https://www.isro.gov.in/Satellites.html
4. https://www.isro.gov.in/SpaceApplications.html

## Course Code: PHY-MJ-241
## Course Title: Basic Electronics

| | |
|---|---|
| **Course Code: PHY-MJ-241** | **Course Category: Major Course (DSC)** |
| **Course Title: Basic Electronics** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA): 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

1. To impart knowledge about principles and applications of electronic devices: diode and BJT
2. To impart knowledge about fundamental digital electronics principles and simple digital circuits.

**Course Outcomes:**On completion of the course students will be able to….

1. Understand working principle of diode analog circuits,
2. Design simple diode analog circuits,
3. Understand working principle of BJT in applications like amplifier and switch,
4. Understand basic digital electronics principles,
5. Apply those principles in simple Digital electronic circuits.

## Course Content:

**Unit 1: Rectifiers and Power Supply (8L, 8M)**

Rectifier Circuits: Introduction, half-wave rectifier, full-wave rectifier, full-wave bridge rectifier: transformer calculations, analyzing the circuit operation, frequency of the output waveform; Capacitor input filter: half-wave rectifier filtering, full-wave rectifier filtering; Zener Diode and its characteristics, Zener-diode application: Zener diode as a voltage regulator.

*Reference: Grob's Basic Electronics by Mitchel E Schultz, The McGraw-Hill Companies*

**Unit 2: Bipolar Junction Transistor (BJT) (10 L, 10 M)**

The unbiased transistor, the biased transistor, transistor currents, alpha and beta current gain, the CE connection, the base curve, collector curves, regions of operation, the load line, the operating point, two kinds of transistor circuits: amplifying and switching, the transistor switch, base-biased LED driver.

*Reference: Electronic Principles by Malvino and Bates, The McGraw-Hill Companies*

**Unit3: Digital Electronics (12 L, 12M)**

Digital signal, use of digital circuits, counting in decimal and binary: place value, inter conversions; bits, bytes, nibbles and word-size, Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR: Boolean expression, logic symbol, truth table; NAND Gate as the Universal Gate, combining logic Gates: circuits from Boolean expression, Boolean expression from truth table, truth table from Boolean expression, Arithmetic circuits: Binary addition, half adder and full adder, binary subtraction.

*Reference: Digital Electronics: Principles and Applications by Roger Tokheim, McGraw Hill*

**Reference Books:**


1. Grob's Basic Electronics by Mitchel E Schultz, The McGraw-Hill Companies
2. Electronic Principles by Malvino and Bates, The McGraw-Hill Companies
3. Digital Electronics: Principles and Applications by Roger Tokheim, McGraw Hill
4. Principles of Electronics by V. K. Mehta, Rohit Mehta, S. Chand Publications
5. Digital Principles and Applications by Malvino and Leach, Mc Graw-Hill Publication
6. Modern Digital Electronics by R. P. Jain, Tata Mc Graw-Hill Pvt. Ltd.,
7. Fundamentals of Digital Circuits by A. Anand Kumar, PHI Learning Pvt. Ltd.
8. Electronic Devices and Circuits by Allen Mottershead, Good year Publishing Company

9. Electronic fundamentals and applications by J. D. Ryder, Prentice Hall
10. Electronic devices and circuits by S. Salivahanan and N. Suresh Kumar, Tata Mc-Graw Hill.

# Course Code: PHY-MJP-243
# Course Title: Laboratory-IV

| | |
|---|---|
| **Course Code: PHY-MJP-243** | **Course Category: Major Course** |
| **Course Title: Laboratory-IV** | **Type: Major Lab** |
| **Total Contact Hours: 60 (4/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

l. To provide high qualityeducation to the physics students at the undergraduate level and generate graduates with skill forindustries and publicservice as well as academic teachers and researchers of the future.

2. To impart deep knowledge in fundamental aspects of Physics and basic Of Electronicsandelectrical circuit skills.

3. To create ability to identify, the practical problems of Physics.

4. To develop skills, confidence in using scientific equipmentand relate the knowledge of scientific concepts to quantitative and physicalmeasurement.

5.Development of the students' attitudes towardsscientific thinking and its applications.

6. To develop attitudes such as concern for accuracy and precision, objectivity, and Enquiry.

**Course Outcomes:**

- Students Will acquire Practical skill.
- Student will be able to apply the acquired skill,
-

## List of Experiment:

**Note: (**Any eight experiments are to be performed by the individual student to Complete the course).

17. Study of full wave rectifier with capacitor filter and to calculate its ripple factor.
18. Study of Zener diode as a voltage regulator.
19. Study of CE transistor characteristics to find out ‘β’ of the transistor.
20. Study of logic gates (AND, OR and NOT) using diodes and transistors.
21. Verification of De Morgan’s Theorems (using ICs).
22. To study the characteristics of Light Emitting Diode (LED).
23. Experimental verification of NAND gate as a universal building block.
24. Experimental verification of NOR gate as a universal building block.
25. To study I –V characteristic of (i) a resistor and (ii) a p–n junction diode and compare it.
26. Frequency response of CE single stage transistor amplifier and to calculate its bandwidth.
27. Study of resonance by series LCR circuit.

## Reference Books:


6. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
7. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
8. . A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
9. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.

10. . A text Book of Experimental Physics – Dr. V.Y. Rajopadhye, V.L.Purohit and A. S. Deshpande (Continental Prakashan, Poona-30).
11. AN ADVANCED COURSE IN PRACTCIAL PHYSICS- D. Chattopadhyay and P.C. Rakshit.
12. Practical Physics by R. K. Shukla, Anchal Srivastava (New Age International).
13. B.Sc. Practical Physics by Harnam Singh and Dr. P.S. Hemne (S. Chand).
14. College Practical Physics: Khanna and Gulati (S. Chand and Co. Ltd , Delhi)
15. Practical Physics: Gupta and Kumar (Pragati Prakashan Meerat)
16. Advanced Level Practical Physics: J. M.Nelkon, J.M.Ogloom (EIBS)
17. A Text book of practical Physics: Shrinivasan and Balasubranian
18. A Text book of practical Physics: Indu Prakash and Ramkrishna.
19. B.Sc. Practical Physics by C.L. Arora (S. Chand and Co. Ltd , Delhi)

# PHY-CEP-242

**OJT**

Credit-4 Lecture 8/ week

**Course Code: PHY-VC-244**
**Course Title: Instrumentation**

| | |
|---|---|
| **Course Code: PHY-VC-244** | **Course Category: Vocational Course (VC)** |
| **Course Title: Instrumentation** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To understand Measurement skills.
- To understand the methods and principles of the Digital Multimeter, CRO, Function generator.
- To understand the Use of CRO to measure electrical quantities.

**Course Outcomes: On completion of the course students will be able to:**

- Understand the basics of measurement skills.
- Understand the methods and principles of Q-meter and LCR Bridges.
- Student will be able to measure electrical quantities such as a.c, d.c voltage and current, frequency and phase using CRO.
- Student will be able to use generators to generate various signals having required frequency, voltage and phase.
- Students will be able to understand the basic physics behind the biomedical instrumentation such as Endoscopy, tomography, etc.

## Course content:

**Unit-I Parameters of Electrical Quantities (06 L, 06 M)**

Introduction, Basic electrical quantities, Electrical current and charge, Electrical voltage, Resistance, capacitance, inductance and impedance, Electrical power and electrical energy Voltage, current and power representation in time and frequency, Time domain, Frequency domain.

**Unit II: Measurements of Electrical Quantities(06 L, 06 M)**

Voltage, current and resistance measuring instruments: Meters, Oscilloscopes, Spectrum and signal analysers,Electrical power and energy measuring instruments,

Reference: Measurements of Electrical Quantitiesby Ján Šaliga (https://data.kemt.fei.tuke.sk/Meranie_BC/en/materials/Short%20textbook.pdf)

**Unit III: Multimeters (09 L, 09 M)**

Types of multimeters:analog and digital, Electric circuits: series, parallel,The Basics of Digital Multimeters,Front panel: (a) dial: setting the function and range, understanding count, (b) diplay: resolution and accuracy, display notations, (c) ports: measurement input ports, voltage measuremtns, current measurements; clamp or current trnasformer, continuity measurement, measurements of resistance, diode, capacitance and frequency, advanced multimeter functions: hold, max/min/avg

Reference: *The Basics of Digital Multimeters by IDEAL INDUSTRIES INC., USA*

**Unit-IVDigital Oscilloscopes (09 L, 09 M)**

Front panel controls: function of each control, displaying a voltage waveform, triggering, extednal triggering,x-y operation, digital storage oscilloscopes, measurement techniques, phase difference,

Reference: *NOTES ONOSCILLOSCOPES by Middle East University*

**References:**


1. Instrumentation Measurement and Analysis-B. C. Nakra, K. K. Chaudhari, McGraw Hill.
2. A Course in Electrical and Electronic Measurements and Instrumentation-A. K. Sawhney, Puneet Sawhney, Dhanpat Rai and Sons Educational and Technical Publishers.
3. Modern Electronic Instrumentation and Measurement Techniques- Albert D. Helfrick, William D. Cooper.
4. Transducers and Instrumentation-D.V.S. Murty, PHI learning Pvt. Ltd.
5. A text book in Electrical Technology - B L Theraja - S Chand and Co.
6. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
7. Logic circuit design, Shimon P. Vingron, 2012, Springer.
8. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.
9. Electronic Devices and circuits, S. Salivahanan& N. S.Kumar, 3rd Ed., 2012, Tata Mc-GrawHill.
10. Electronic Instrumentation-H. S. Kalsi, McGraw Hill.
11. Instrumentation Devices and Systems Second Edition-C S Ranjan, C R Sharma, V S V Mani.
12. https://pim-resources.coleparmer.com/instruction-manual/20034-14-15.pdf

# PHY-VCP-245 Vocational Lab-I
# Credit-2 H-4

1. Use of C.R.O as a measurement tool for different electrical parameters (frequency, a.c. /d.c. voltage, pulse height, pulse width, rise time and fall time).
2. To obtain Lissajous figures using C.R.O. and find unknown frequency.
3. Measurement of errors.
4. Velocity of sound by phase shift method.
5.Verification of Ohm's law using a multimeter to measure voltage, current and resistance in a simple circuit.
6. Measurement of resistance using analog and digital multimetersto understand sensitivity and resolution.
7. Verification of laws of capacitances for series and parallel combinations
8. Determine a high resistance by Leakage Method.
9. To determine time constant of R-C circuit using charging and discharging of condenser through resistor.
10. Measuring an unknown self-Inductance using Maxwell's Inductance Bridge.
11. To study the series LCR circuit and plot the resonance curve at the constant frequency.
12. To study the parallel LCR circuit and plot the resonance curve at the constant frequency.

**Course Code: PHY-MN-246(A)**
**Course Title: Fundamentals of Electronics**

## Course Content:

**Unit 1: Rectifiers and Power Supplies (8L, 14M)**
Rectifier Circuits: Introduction; The Half-wave rectifier, the full-wave rectifier, the full-wave bridge rectifier: transformer calculations, analyzing the circuit operation, frequency of the output waveform; Capacitor input filter: Half-wave rectifier filtering, full-wave rectifier filtering; Zener Diodes and their characteristics, Zener-diode application: Zener regulators

*Reference: Grob's Basic Electronics by Mitchel E Schultz, The McGraw-Hill Companies*

**Unit 2: Bipolar Junction Transistors (10 L, 16 M)**
The unbiased transistor, the biased transistor, transistor currents, alpha and beta current gain, the CE connection, the base curve, collector curves, regions of operation, the load line, the operating point, two kind of transistor circuits: amplifying and switching, the transistor switch, base-biased LED driver
*Reference: Electronic Principles by Malvino and Bates, The McGraw-Hill Companies*

**Unit3: Digital Electronics (12 L, 20M)**
Digital signal, use of digital circuits, counting in decimal and binary, place value, interconversions, bits, bytes, nibbles and word-size, Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR: Boolean expression, logic symbol, truth table, NAND Gate as the Universal Gate, combining logic Gates: circuits from Boolean expression, Boolean expression from truth table, truth table from Boolean expression, Arithmetic circuits: Binary addition, half adder and full adder, binary subtraction.

*Reference: Digital Electronics: Principles and Applications by Roger Tokheim, McGraw Hill*

**Reference Books:**


11. Grob's Basic Electronics by Mitchel E Schultz, The McGraw-Hill Companies
12. Electronic Principles by Malvino and Bates, The McGraw-Hill Companies
13. Digital Electronics: Principles and Applications by Roger Tokheim, McGraw Hill
14. Principles of Electronics by V. K. Mehta, Rohit Mehta, S. Chand Publications
15. Digital Principles and Applications by Malvino and Leach, Mc Graw-Hill Publication
16. Modern Digital Electronics by R. P. Jain, Tata Mc Graw-Hill Pvt. Ltd.,
17. Fundamentals of Digital Circuits by A. Anand Kumar, PHI Learning Pvt. Ltd.
18. Electronic Devices and Circuits by Allen Mottershead, Good year Publishing Company
19. Electronic fundamentals and applications by J. D. Ryder, Prentice Hall
20. Electronic devices and circuits by S. Salivahanan and N. Suresh Kumar, Tata Mc-Graw Hill.

## Course Code: PHY-MNP-246(B)
## Course Title: Minor Lab-2

| | |
|---|---|
| **Course Code: PHY-MNP-246(B)** | **Course Category:Minor Course** |
| **Course Title: Minor Lab-2** | **Type: Minor Lab** |
| **Total Contact Hours: 60 (4/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

l. To provide high qualityeducation to the physics students at the undergraduate level and generate graduates with skill forindustries and publicservice as well as academic teachers and researchers of the future.

2. To impart deep knowledge in fundamental aspects of Physics and basic Of Electronicsandelectrical circuit skills.

3. To create ability to identify, the practical problems of Physics.

4. To develop skills, confidence in using scientific equipmentand relate the knowledge of scientific concepts to quantitative and physicalmeasurement.

5.Development of the students' attitudes towardsscientific thinking and its applications.

6. To develop attitudes such as concern for accuracy and precision, objectivity, and Enquiry.

**Course Outcomes:**

- Students Will acquire Practical skill.
- Student will be able to apply the acquired skill,
-

## List of Experiment:

**Note: (**Any eight experiments are to be performed by the individual student to Complete the course).

28. Study of full wave rectifier with capacitor filter and to calculate its ripple factor.
29. Study of Zener diode as a voltage regulator.
30. Study of CE transistor characteristics to find out ‘β’ of the transistor.
31. Study of logic gates (AND, OR and NOT) using diodes and transistors.
32. Verification of De Morgan’s Theorems (using ICs).
33. To study the characteristics of Light Emitting Diode (LED).
34. Experimental verification of NAND gate as a universal building block.
35. Experimental verification of NOR gate as a universal building block.
36. To study I –V characteristic of (i) a resistor and (ii) a p–n junction diode and compare it.
37. Frequency response of CE single stage transistor amplifier and to calculate its bandwidth.
38. Study of resonance by series LCR circuit.

## Reference Books:


20. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia Publishing House.
21. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

22. . A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
23. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.
24. . A text Book of Experimental Physics – Dr. V.Y. Rajopadhye, V.L.Purohit and A. S. Deshpande (Continental Prakashan, Poona-30).
25. AN ADVANCED COURSE IN PRACTCIAL PHYSICS- D. Chattopadhyay and P.C. Rakshit.
26. Practical Physics by R. K. Shukla, Anchal Srivastava (New Age International).
27. B.Sc. Practical Physics by Harnam Singh and Dr. P.S. Hemne (S. Chand).
28. College Practical Physics: Khanna and Gulati (S. Chand and Co. Ltd , Delhi)
29. Practical Physics: Gupta and Kumar (Pragati Prakashan Meerat)
30. Advanced Level Practical Physics: J. M.Nelkon, J.M.Ogloom (EIBS)
31. A Text book of practical Physics: Shrinivasan and Balasubranian
32. A Text book of practical Physics: Indu Prakash and Ramkrishna.
33. B.Sc. Practical Physics by C.L. Arora (S. Chand and Co. Ltd , Delhi)

## Course Code: PHY-OE-247
## Course Title: Defense Science and Technology (India)

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|---|---|
| **Course Code: PHY-OE-247** | **Course Category: Minor Course (MIN)** |
| **Course Title:**<br>**Defense Science and Technology (India)** | **Type: Theory** |
| **Total Contact Hours: 30 (2/week)** | **Course Credits: 02** |
| **College Assessment (CA) Marks: 20 Marks** | **University Assessment (UA): 30 Marks** |

**Course Objectives**:

- To make students aware about the organizational structure of Indian Defence System.
- To get knowledge about the various types of missiles developed by India,
- To get knowledge about various types of technologies developed by Indian Defence Laboratories.

**Course Outcomes: On completion of the course students will be able to:**

- To understand the developments in Indian Defence sector.
- To understand contribution of different technologies developed by Indian Defence Sector in various other fields.

## Course Content:

**Unit 1: Organizational Structure of Defense in India** **(08 L, 8 M)**

Ministry of Defense, the Armed forces: Army, Navy, Airforce, BSF

**https://nalsarpro.org/Portals/23/Day%201%20session%202-Saxena%20Sangeeta%20-Organizational%20Structure%20of%20Defence%20in%20India.pdf**

https://drdo.gov.in/drdo/student-corner

**Unit 2: Missiles** **(12 L, 12 M)**

History of Missiles[1],Classification of Missiles[2], Guided Missiles[3], Integrated Guided Missile Programme[4],Brahmos Missile[5],Antisatellite missile[6]

[1]https://www.brahmos.com/content.php?id=10&sid=8

[2]https://www.brahmos.com/content.php?id=10&sid=9

[3]https://drdo.gov.in/drdo/sites/default/files/publcations-document/Guided%20Missiles.pdf

https://en.wikipedia.org/wiki/Guided_missiles_of_India

[4]https://www.brahmos.com/content.php?id=10&sid=25

[5]https://www.brahmos.com/content.php?id=10&sid=10

[6]https://drdo.gov.in/drdo/sites/default/files/publcations-document/ASAT_book_English.pdf

**Unit 3: Technologies Developed by Indian Defense Laboratories (Few Examples)(10 L, 10 M)**

Land Systems, Naval Systems, Air Systems, Communication Systems,

https://defenceexim.gov.in/WriteReadData/modN.pdf

School of Physical Sciences

**PRATAP COLLEGE (Autonomous), AMALNER**

**Affiliated to KBC North Maharashtra University, Jalgaon**

**'A+' Grade NAAC Re-Accredited (3rd Cycle)**

**(CGPA 3.52)**

# SYLLABUS

**FOR**

**S. Y. B. Sc. (PHYSICS)**

**As per NEP 2020**

(With effect from June 2025)

# Preamble

Pratap College, Amalner got Autonomous status from the academic year 2019-20. The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process and examination & evaluation systems. Pratap College Amalner is affiliated to Kavayitri Bahinabai Chaudhari North Maharashtra University Jalgaon as per the directions of UGC. Pratap (Autonomous) College, Amalner is going to implement the National Education Policy (NEP 2020) to undergraduate program. The main objective of the framing the syllabi of S.Y.B.Sc. (Physics) is to create skilled minds and therefore expectation is to equip the students with the knowledge and understanding of concepts of physics rather than the ability to remember facts so that they may have a reasonable comprehensive and complete grasp of principles of Physics. It is expected that the students studying Physics will apply investigations and problem solving skills, effectively communicate the theoretical concepts, and appreciate the contribution that the study of Physics makes to our understanding of the world.

**Board of Studies (Physics),**

**Pratap (Autonomous) College, Amalner**