

# University of Mumbai



No. AAMS\_UGS/ICC/2024-25/178

## **CIRCULAR:-**

Attention of all the Principals of the Affiliated Colleges, Directors of the Recognized Institutions is invited to this office Circular No. AAMS\_UGS/ICC/2024-25/115 dated 23<sup>rd</sup> August, 2024 relating to the introduction of the syllabus of M3 Pattern (Scheme –III) Major 4 Credits Science Programs.

They are hereby informed that the recommendations made by the Board of Deans at its meeting held on 23<sup>rd</sup> October, 2024 vide item No. 6.2 (N) has been accepted by the Hon'ble Vice Chancellor as per the powers confirmed upon him under Section 12(7) of the Maharashtra Public Universities Act, 2016 and that in accordance therewith the syllabus of **M1, M2 Pattern (Scheme –II)** of following Science Programs is introduced as per appendix (NEP 2020) with effect from the academic year 2024-25.

### **M1, M2 Pattern (Scheme –II)**

- 1) B.Sc. (Botany) Sem. I & II
- 2) B.Sc. (Mathematics) Sem. I & II
- 3) B.Sc. (Zoology) Sem. I & II
- 4) B.Sc. (Physics) Sem. I & II
- 5) B.Sc. (Microbiology) Sem. I & II

(The said circular is available on the University's website [www.mu.ac.in](http://www.mu.ac.in)).

MUMBAI – 400 032

30<sup>th</sup> October, 2024

To,

(Dr. Prasad Karande)  
REGISTRAR

All the Principals of the Affiliated Colleges, Directors of the Recognized Institutions.

## **BOD/6.2 (N)/23/10/2024**

Copy forwarded with Compliments for information to:-

- 1) The Chairman, Board of Deans,
- 2) The Dean, Faculty of Science & Technology,
- 3) The Chairman, Board of Studies,
- 4) The Director, Board of Examinations and Evaluation,
- 5) The Director, Department of Students Development,
- 6) The Director, Department of Information & Communication Technology,
- 7) The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanaagari.
- 8) The Deputy Registrar, Admissions, Enrolment, Eligibility & Migration Department (AEM).

| <b>Copy forwarded for information and necessary action to :-</b> |                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                                | The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Dept)(AEM),<br><a href="mailto:dr@eligi.mu.ac.in">dr@eligi.mu.ac.in</a>                                                                                                                                    |
| 2                                                                | The Deputy Registrar, Result unit, Vidyanagari<br><a href="mailto:drresults@exam.mu.ac.in">drresults@exam.mu.ac.in</a>                                                                                                                                                             |
| 3                                                                | The Deputy Registrar, Marks and Certificate Unit,. Vidyanagari<br><a href="mailto:dr.verification@mu.ac.in">dr.verification@mu.ac.in</a>                                                                                                                                           |
| 4                                                                | The Deputy Registrar, Appointment Unit, Vidyanagari<br><a href="mailto:dr.appointment@exam.mu.ac.in">dr.appointment@exam.mu.ac.in</a>                                                                                                                                              |
| 5                                                                | The Deputy Registrar, CAP Unit, Vidyanagari<br><a href="mailto:cap.exam@mu.ac.in">cap.exam@mu.ac.in</a>                                                                                                                                                                            |
| 6                                                                | The Deputy Registrar, College Affiliations & Development Department (CAD),<br><a href="mailto:deputyregistrar.uni@gmail.com">deputyregistrar.uni@gmail.com</a>                                                                                                                     |
| 7                                                                | The Deputy Registrar, PRO, Fort, (Publication Section),<br><a href="mailto:Pro@mu.ac.in">Pro@mu.ac.in</a>                                                                                                                                                                          |
| 8                                                                | The Deputy Registrar, Executive Authorities Section (EA)<br><a href="mailto:eau120@fort.mu.ac.in">eau120@fort.mu.ac.in</a><br><br>He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular. |
| 9                                                                | The Deputy Registrar, Research Administration & Promotion Cell (RAPC),<br><a href="mailto:rapc@mu.ac.in">rapc@mu.ac.in</a>                                                                                                                                                         |
| 10                                                               | The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA)<br>dy.registrar.tau.fort.mu.ac.in<br><a href="mailto:ar.tau@fort.mu.ac.in">ar.tau@fort.mu.ac.in</a>                                                                                                         |
| 11                                                               | The Deputy Registrar, College Teachers Approval Unit (CTA),<br><a href="mailto:concolsection@gmail.com">concolsection@gmail.com</a>                                                                                                                                                |
| 12                                                               | The Deputy Registrars, Finance & Accounts Section, fort<br><a href="mailto:draccounts@fort.mu.ac.in">draccounts@fort.mu.ac.in</a>                                                                                                                                                  |
| 13                                                               | The Deputy Registrar, Election Section, Fort<br><a href="mailto:drelection@election.mu.ac.in">drelection@election.mu.ac.in</a>                                                                                                                                                     |
| 14                                                               | The Assistant Registrar, Administrative Sub-Campus Thane,<br><a href="mailto:thanesubcampus@mu.ac.in">thanesubcampus@mu.ac.in</a>                                                                                                                                                  |
| 15                                                               | The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,<br><a href="mailto:ar.seask@mu.ac.in">ar.seask@mu.ac.in</a>                                                                                                                                                   |
| 16                                                               | The Assistant Registrar, Ratnagiri Sub-centre, Ratnagiri,<br><a href="mailto:ratnagirisubcentre@gmail.com">ratnagirisubcentre@gmail.com</a>                                                                                                                                        |
| 17                                                               | The Director, Centre for Distance and Online Education (CDOE),<br>Vidyanagari,<br><a href="mailto:director@idol.mu.ac.in">director@idol.mu.ac.in</a>                                                                                                                               |
| 18                                                               | Director, Innovation, Incubation and Linkages,<br>Dr. Sachin Laddha<br><a href="mailto:pinkumanno@gmail.com">pinkumanno@gmail.com</a>                                                                                                                                              |
| 19                                                               | Director, Department of Lifelong Learning and Extension (DLLE),<br>Dlleuniversityofmumbai@gmail.com                                                                                                                                                                                |

**Copy for information :-**

|   |                                                                                                                     |
|---|---------------------------------------------------------------------------------------------------------------------|
| 1 | P.A to Hon'ble Vice-Chancellor,<br><a href="mailto:vice-chancellor@mu.ac.in">vice-chancellor@mu.ac.in</a>           |
| 2 | P.A to Pro-Vice-Chancellor<br><a href="mailto:pvc@fort.mu.ac.in">pvc@fort.mu.ac.in</a>                              |
| 3 | P.A to Registrar,<br><a href="mailto:registrar@fort.mu.ac.in">registrar@fort.mu.ac.in</a>                           |
| 4 | P.A to all Deans of all Faculties                                                                                   |
| 5 | P.A to Finance & Account Officers, (F & A.O),<br><a href="mailto:camu@accounts.mu.ac.in">camu@accounts.mu.ac.in</a> |

**To,**

|   |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | The Chairman, Board of Deans<br><a href="mailto:pvc@fort.mu.ac.in">pvc@fort.mu.ac.in</a>                                                                                                                                                                                                                                                                                                                                 |
| 2 | <b>Faculty of Humanities,</b><br><b>Dean</b><br>1. Prof.Anil Singh<br><a href="mailto:Dranilsingh129@gmail.com">Dranilsingh129@gmail.com</a><br><b>Associate Dean</b><br>2. Dr.Suchitra Naik<br><a href="mailto:Naiksuchitra27@gmail.com">Naiksuchitra27@gmail.com</a><br>3.Prof.Manisha Karne<br><a href="mailto:mkarne@economics.mu.ac.in">mkarne@economics.mu.ac.in</a>                                               |
|   | <b>Faculty of Commerce &amp; Management,</b><br><b>Dean</b><br>1. Dr.Kavita Laghate<br><a href="mailto:kavitalaghate@jbims.mu.ac.in">kavitalaghate@jbims.mu.ac.in</a><br><b>Associate Dean</b><br>2. Dr.Ravikant Balkrishna Sangurde<br><a href="mailto:Ravikant.s.@somaiya.edu">Ravikant.s.@somaiya.edu</a><br>3. Prin.Kishori Bhagat<br><a href="mailto:kishoribhagat@rediffmail.com">kishoribhagat@rediffmail.com</a> |

|   |                                                                                                                                                                                                                                                                                                                                                                     |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Faculty of Science &amp; Technology</b><br><b>Dean</b><br>1. Prof. Shivram Garje<br><a href="mailto:ssgarje@chem.mu.ac.in">ssgarje@chem.mu.ac.in</a><br><b>Associate Dean</b><br>2. Dr. Madhav R. Rajwade<br><a href="mailto:Madhavr64@gmail.com">Madhavr64@gmail.com</a><br>3. Prin. Deven Shah<br><a href="mailto:sir.deven@gmail.com">sir.deven@gmail.com</a> |
|   | <b>Faculty of Inter-Disciplinary Studies,</b><br><b>Dean</b><br>1. Dr. Anil K. Singh<br><a href="mailto:aksingh@trcl.org.in">aksingh@trcl.org.in</a><br><b>Associate Dean</b><br>2. Prin. Chadrashekhhar Ashok Chakradeo<br><a href="mailto:cachakradeo@gmail.com">cachakradeo@gmail.com</a>                                                                        |
| 3 | Chairman, Board of Studies,                                                                                                                                                                                                                                                                                                                                         |
| 4 | The Director, Board of Examinations and Evaluation,<br><a href="mailto:dboee@exam.mu.ac.in">dboee@exam.mu.ac.in</a>                                                                                                                                                                                                                                                 |
| 5 | The Director, Board of Students Development,<br><a href="mailto:dsd@mu.ac.in@gmail.com">dsd@mu.ac.in@gmail.com</a> DSW <a href="mailto:directr@dsw.mu.ac.in">directr@dsw.mu.ac.in</a>                                                                                                                                                                               |
| 6 | The Director, Department of Information & Communication Technology,<br><a href="mailto:director.dict@mu.ac.in">director.dict@mu.ac.in</a>                                                                                                                                                                                                                           |

## As Per NEP 2020

### University of Mumbai



#### Title of the program

- A- U.G. Certificate in Physics
- B- U.G. Diploma in Physics
- C- B.Sc. (Physics)
- D- B.Sc. ( Hons.) in Physics
- E- B.Sc. (Hons. with Research) in Physics

#### Syllabus for

#### Semester – Sem I & II (Scheme – II)

Ref: GR dated 20<sup>th</sup> April, 2023 for Credit Structure of UG

(With effect from the academic year 2024-25  
Progressively)

# University of Mumbai



(As per NEP 2020)

| Sr. No. | Heading                                                             | Particulars                                                                                                              |                                                            |
|---------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| 1       | Title of program<br>O: _____ A                                      | A                                                                                                                        | U.G. Certificate in Physics                                |
|         | O: _____ B                                                          | B                                                                                                                        | U.G. Diploma in Physics                                    |
|         | O: _____ C                                                          | C                                                                                                                        | B.Sc. (Physics)                                            |
|         | O: _____ D                                                          | D                                                                                                                        | B.Sc. (Hons.) in Physics                                   |
|         | O: _____ E                                                          | E                                                                                                                        | B.Sc. (Hons. with Research) in Physics                     |
| 2       | Eligibility<br>O: _____ A                                           | A                                                                                                                        | HSC(Science)<br>OR<br>Passed Equivalent Academic Level 4.0 |
| 3       | Duration of program<br>R: _____                                     | A                                                                                                                        | One Year                                                   |
| 4       | Intake Capacity<br>R: _____                                         | 120                                                                                                                      |                                                            |
| 5       | Scheme of Examination<br>R: _____                                   | NEP<br>40% Internal<br>60% External, Semester End Examination<br>Individual Passing in Internal and External Examination |                                                            |
| 6       | R: _____ Standards of Passing                                       | 40%                                                                                                                      |                                                            |
| 7       | Credit Structure<br>Sem. I - R: _____ A<br><br>Sem. II - R: _____ B | Attached herewith                                                                                                        |                                                            |

|    |                                                    |                             |            |
|----|----------------------------------------------------|-----------------------------|------------|
| 8  | Semesters                                          | A                           | Sem I & II |
| 9  | Program Academic Level                             | A                           | 4.5        |
| 10 | Pattern                                            | Semester                    |            |
| 11 | Status                                             | New                         |            |
| 12 | To be implemented from Academic Year Progressively | From Academic Year: 2024-25 |            |

  
 Sign of the BOS  
 Chairman  
 Name:  
**Dr.T.N.GHORUDE**  
 BOS in Physics

Sign of the  
 I/c. Associate Dean  
**Dr. Madhav R. Rajwade**  
 Faculty of Science &  
 Technology

Sign of the  
 I/c Dean  
**Prof. Shivram S. Garje**  
 Faculty of Science &  
 Technology

# Preamble

## 1) Introduction

The FYBSc Physics syllabus (Under Graduate Certificate in Physics) is designed in accordance with the objectives and guidelines of the National Education Policy 2020. This program aims to provide a fundamental understanding of the principles of physics, including mechanics, thermodynamics, electromagnetism, optics, and modern physics, through a comprehensive curriculum of theoretical and practical courses. We aim to provide not only subject knowledge but also to acquire core scientific values and critical thinking skills in learners. This syllabus is structured to equip students with a solid theoretical and practical foundation, fostering analytical abilities for problem-solving, exploring scientific opportunities, and developing entrepreneurship skills. Continuous evaluation of learners will be conducted based on both practical skills and theoretical understanding through class tests and assignments.

## 2) Aims and Objectives

The aims and objectives of the FYBSc Physics (Under Graduate Certificate in Physics) curriculum are to provide learners with a fundamental understanding of the principles of physics, including mechanics, electromagnetism, optics. This curriculum is designed to develop applications of physics knowledge for academic and entrepreneurial pursuits.

The aims and objectives align with broader educational goals, focusing on both academic and professional development. The syllabus aims to impart knowledge related to physical sciences, current trends, and advancements in the field, fostering analytical abilities, problem-solving skills, and entrepreneurial aptitude. Continuous evaluation will be conducted through class tests, activities and assignments to ensure a comprehensive understanding of both theoretical and practical aspects of physics..

## 3) Learning Outcomes

The learners will develop an understanding of fundamental principles of physics, including mechanics, electromagnetism, optics and acquire laboratory skills for applications in industries, research, and academia. The learners will develop an aptitude for exploring the opportunities for self-employment and entrepreneurship activities.

## 4) Any other point (if any)

The skills and knowledge acquired through this programme will make the learners well-equipped for exploring the diverse fields of Physics and applying them to research or higher academic pursuits.



## 5) Credit Structure of the Program (Sem I, II, III, IV, V & VI)

### Under Graduate Certificate in Physics

#### Credit Structure (Sem. I & II)

#### Credit distribution structure for 4- years Honours/ Honours with Research Degree Program with ME-ME (B. Sc.)- Major & Minor

| Year<br>(Level) | Semester                                                                                                                                                      | Major (M1)   |           | Minor (M2)   | Open Electives Related to other faculty | VSC, SEC Related to core | AEC, VEC, IKS              | OJT, FP, CEP, RP Related to core | Minimum credits for the year (Sem) | Cumulative minimum credits required for award of Certificate/ Diploma/ Degree |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|--------------|-----------------------------------------|--------------------------|----------------------------|----------------------------------|------------------------------------|-------------------------------------------------------------------------------|
|                 |                                                                                                                                                               | Mandatory    | Electives |              |                                         |                          |                            |                                  |                                    |                                                                               |
| 1<br>4.5        | I                                                                                                                                                             | 4<br>(2+2)   | ---       | 4<br>(2+2)   | 2                                       | VSC:2<br>SEC: 2          | AEC: 2<br>VEC: 2<br>IKS: 2 | CC: 2                            | 44<br>(22 + 22)                    | (44) Certificate in Faculty                                                   |
|                 | II                                                                                                                                                            | 6<br>(2+2+2) | ---       | 6<br>(2+2+2) | 2                                       | SEC: 2                   | AEC: 2<br>VEC: 2           | CC: 2                            |                                    |                                                                               |
|                 | Cum Cr.                                                                                                                                                       | 10           | ---       | 10           | 4                                       | 6 (2+4)                  | 4+4+2                      | 4                                |                                    |                                                                               |
|                 | Exit option: Award of UG Certificate in 2 Core (M1 & M2) with 44 credits and additional 4 credits core NSQF course/ Internship OR continue with Major & Minor |              |           |              |                                         |                          |                            |                                  |                                    |                                                                               |
| 2<br>5          | III                                                                                                                                                           | 8            | ---       | 4            | 2                                       | VSC: 4                   | AEC: 2                     | FP: 2                            | 44<br>(22 + 22)                    | (88) Diploma in Faculty                                                       |
|                 | IV                                                                                                                                                            | 6            | ---       | 6            | 2+2                                     | SEC:2                    | AEC: 2                     | CEP: 2                           |                                    |                                                                               |
|                 | Cum Cr.                                                                                                                                                       | 24           | ---       | 20           | 10                                      | 6+6                      | 8+4+2                      | 4+2+2                            |                                    |                                                                               |
|                 | Exit option: Award of UG Diploma in Major AND Minor with 88 credits and additional 4 credits core NSQF course/ Internship OR continue with Major & Minor      |              |           |              |                                         |                          |                            |                                  |                                    |                                                                               |

**SCHEME 2: 2 Subjects**

| Year<br>(Level) | Semester                                                                                           | Major (M1) |           | Minor (M2) | Open Electives<br>Related to other faculty | VSC, SEC<br>Related to core | AEC, VEC, IKS | OJT, FP, CEP, RP<br>Related to core | Minimum credits for the year (Sem) | Cumulative minimum credits required for award of Certificate/Diploma/Degree |
|-----------------|----------------------------------------------------------------------------------------------------|------------|-----------|------------|--------------------------------------------|-----------------------------|---------------|-------------------------------------|------------------------------------|-----------------------------------------------------------------------------|
|                 |                                                                                                    | Mandatory  | Electives |            |                                            |                             |               |                                     |                                    |                                                                             |
| 3<br>5.5        | V                                                                                                  | 10         | 4         | 4          | ----                                       | VSC:2                       | ---           | CEP/FP: 2                           | 44<br>(22 + 22)                    | (132)<br><br>Three years Bachelor-Major and Minor                           |
|                 | VI                                                                                                 | 10         | 4         | 4          | ---                                        | ---                         | ---           | OJT: 4                              |                                    |                                                                             |
|                 | Cum Cr.                                                                                            | 44         | 8         | 28         | 10                                         | 8+6                         | 8+4+2         | 4+2+2+2+4                           |                                    |                                                                             |
|                 | Exit option: Award of UG Degree in Major and Minor with 132 credits OR continue with Major & Minor |            |           |            |                                            |                             |               |                                     |                                    |                                                                             |
| 4<br>6.0        | VII                                                                                                | 14         | 4         | ---        | RM: 4                                      | ---                         | ---           | ---                                 | 44<br>(22 + 22)                    | (176)<br><br>Four years UG Honours Degree-Major and Minor                   |
|                 | VIII                                                                                               | 14         | 4         | ---        | ---                                        | ---                         | ---           | OJT: 4                              |                                    |                                                                             |
|                 | Cum Cr.                                                                                            | 72         | 16        | 28         | 10+4                                       | 8+6                         | 8+4+2         | 4+2+2+2+4+4                         |                                    |                                                                             |
|                 | Award of Four year UG Honours Degree in Major and Minor with 176 credits                           |            |           |            |                                            |                             |               |                                     |                                    |                                                                             |
| 4<br>6.0        | VII                                                                                                | 10         | 4         | ---        | RM: 4                                      | ---                         | ---           | RP: 4                               | 44<br>(22 + 22)                    | (176)<br><br>Four years UG Honours with Research Degree-Major and Minor     |
|                 | VIII                                                                                               | 10         | 4         | ---        | ---                                        | ---                         | ---           | RP: 8                               |                                    |                                                                             |
|                 | Cum Cr.                                                                                            | 64         | 16        | 28         | 10+4                                       | 8+6                         | 8+4+2         | 4+2+2+2+4+12                        |                                    |                                                                             |
|                 | Award of Four year UG Honours Research Degree in Major and Minor with 176 credits                  |            |           |            |                                            |                             |               |                                     |                                    |                                                                             |

**[Abbreviation: OE– Open Electives, VSEC-Vocational and Skill Enhancement Course, VSC– Vocation Skill Course, SEC– Skill Enhancement Course, AEC – Ability Enhancement Course, VEC – Value Education Course, IKS – Indian Knowledge System, OJT – On Job Training, FP – Field Project, CEP – Continuing Education Program, CC – Co-Curricular, RP – Research Project, ZIKS- Zoological Indian Knowledge System, NSQF- National Skills Qualification Framework]**

## F.Y.B.Sc. Physics (USPH) Course Structure

**Mandatory courses (MJ), Vocation Skill Courses (VSC) and Skill Enhancement Courses (SEC)**

**Offered as Major / Minor courses**

### Semester I

| Ladder          | Course Type      | Title                                                                  | Credits | Hours    | Marks |
|-----------------|------------------|------------------------------------------------------------------------|---------|----------|-------|
| Major 1 (MJ1)   | Theory           | Introduction to Mechanics                                              | 2       | 30       | 50    |
| Major P1 (MJP1) | Practical        | PHYSICS PRACTICAL COURSE –USPHP1                                       | 2       | 60       | 50    |
| Minor-1         | Theory           | Basic Electronics                                                      | 2       | 30       | 50    |
| Minor-2         | Theory           | Digital Electronics                                                    | 2       | 30       | 50    |
| VSC             | Theory+Practical | PCB Making                                                             | 1+1     | 15+30=45 | 50    |
| SEC             | Practical        | Basic Instrumentation skills and Basic Mathematical Skills for Physics | 2       | 60       | 50    |

### Semester II

| Ladder          | Course Type | Title                            | Credits | Hours | Marks |
|-----------------|-------------|----------------------------------|---------|-------|-------|
| Major 2 (MJ2)   | Theory      | Optics                           | 2       | 30    | 50    |
| Major 3 (MJ3)   | Theory      | Electricity and Magnetism        | 2       | 30    | 50    |
| Major P2 (MJP2) | Practical   | PHYSICS PRACTICAL COURSE –USPHP2 | 2       | 60    | 50    |
| Minor-3         | Theory      | Applied Optics                   | 2       | 30    | 50    |
| Minor-4         | Theory      | Applied Electronics              | 2       | 30    | 50    |
| Minor-5         | Theory      | Electrical Instruments           | 2       | 30    | 50    |
| SEC-2           | Practical   | ICT tools for Physics            | 2       | 60    | 50    |

# Sem. - I

## **Mandatory course**

### **Syllabus**

#### **B.Sc. (Physics)**

#### **(Sem.- I)**

**Credits = 2 + 2**

**Name of the course: Paper I – Introduction to Mechanics**

#### **Course Objectives (CO):**

After successful completion of this course students will be able to:

- CO 1. Explain Newton's laws of motion, friction, work, energy and able to solve problems using them.
- CO 2. Learn the mechanics of multi-particle system using concepts of center of mass and conservation laws.
- CO 3. Study the mechanics of undamped/ (simple harmonic motion, uniform circular motion) and damped oscillations (Forced oscillations, two body oscillation)
- CO 4. Describe qualitatively how undamped and damped oscillations are implemented in physical problems such as torsional, compound, and simple pendulums.
- CO 5. Demonstrate quantitative problem solving skills in all the topics covered in the syllabus.

#### **Course Outcomes (OC):**

After successful completion of this course the learner will be able to:

- OC 1. Understand Newton's laws of motion, friction, work, energy and able to solve problems using them.
- OC 2. Comprehend Work and Energy equivalence and its applications through suitable numerical.
- OC 3. Understand mechanics of multi-particle system using concepts of center of mass and conservation laws.
- OC 4. Understand mechanics of undamped/ (simple harmonic motion, uniform circular motion) and damped oscillations
- OC 5. Understand how undamped and damped oscillations are implemented in physical problems
- OC 6. Demonstrate quantitative problem solving skills in all the topics covered

## Paper-1 Introduction to Mechanics

| Module 1: Unit-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 15hr |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <p><b>1. Newton's Laws of Motion:</b> Newton's first, second and third laws of motion, interpretation and applications, pseudo forces, inertial and non-inertial frames of reference Worked out examples (with friction present). (HCV: 5.1 to 5.5)</p> <p><b>2. Friction:</b> Advantages &amp; disadvantages of friction in daily life, Friction as the component of Contact force, Kinetic Friction, Static friction, laws of friction, Understanding friction at atomic level. (HCV: 6.1 to 6.5)</p> <p><b>3. Work and Energy:</b> Kinetic Energy, Work and Work-energy theorem, Potential Energy, Conservative and Non-Conservative Forces, Different forms of Energy: Mass Energy Equivalence Worked out Examples. (HCV: 8.1, 8.2, 8.5, 8.6, 8.11)</p> |      |

| Module 2: Unit-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15 hr |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| <p>1. Many Particles System, Centre of Mass of solid objects, Conservation of momentum in a system of particle, Angular momentum of a particle and system of particle, conservation of angular momentum.<br/>(RH: 7.3, 7.4, 7.5, 10.1, 10.2, 10.4)</p> <p>2. <b>Oscillations:</b> The Simple Harmonic Oscillator, Relation between Simple Harmonic Motion and Uniform Circular Motion, Damped Harmonic Motion, Forced Oscillations and Resonance, Two Body Oscillations.<br/>RH: 17.2, 17.6, 17.7, 17.8, 17.9</p> <p>Examples of Simple Harmonic oscillations: Simple Pendulum, Simple Pendulum, Torsional Pendulum and Compound pendulum (Qualitative study)<br/>HP: 9.1.1(1,3,4)</p> |       |

## Reference Books

1. HCV: H.C. Verma, Concepts of Physics-Part I (Second Reprint of 2020) BharatiBhavan Publishers and Distributers
2. RH:Resnick and Halliday: Physics – I , 5th Edition.
3. Mechanics – H. S. Hans and S. P. Puri, Tata McGraw Hill (2nd ED.).

## **Major Practical-1**

**Name of the Course: PHYSICS PRACTICAL COURSE –USPHP1**

### **Course Objectives (CO):**

- CO1. To upgrade the skill in handling of basic laboratory instruments.
- CO2. To enhance learners' skills in calibration of instruments and calculation techniques.
- CO3. To upgrade the skill of learners in minimization of Error minimization in the laboratory.
- CO4. To upgrade the skill good laboratory practices.

### **Course Outcomes (OC):**

Upon completion of the course, the learners should be able to:

- OC1. Safely practice, basic laboratory procedures and protocols inside a laboratory
- OC2. Acquire the skills of basic calibration and handling of instrumentation in laboratory.
- OC3. Appreciate the basics of Physics and their use in laboratory.
- OC4. Acquire skills to perform various practical in lab.



## Major Practical-1

**Name of the Course: PHYSICS PRACTICAL COURSE –USPHP1**

### **INSTRUCTIONS:**

- 1) All the measurements and readings should be written with proper units in SI system only.
- 2) After completing all the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination.
- 3) While evaluating practical, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.
- 4) Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

Note: Exemption of two experiments from section A and / or B and / or C may be given if student carries out any one of the following activities.

- Collect the information of at least five Physicists with their work or any three events on physics, report that in journal.
- Execute a mini project to the satisfaction of teacher in-charge of practical.
- Participate in a study tour or visit & submit a study tour report.
- For practical examinations, the learner will be examined in ONE experiments (from any group).
- Each experiment will be of three lecture hours' duration.
- A Minimum 4 from each group and in all minimum 8 experiments must be reported in journal.
- All the skill experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester I as per the minimum requirements.

**A. Regular Experiment:**

| Sr No                           | Name of the Experiment                                                                                                                      |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>GROUP A</b>                  |                                                                                                                                             |
| 1                               | Torsional Oscillation: To determine modulus of rigidity $\eta$ of a material of wire by Torsional oscillations                              |
| 2                               | Bifilar Pendulum: Determination of moment of inertia of rectangular and cylindrical bar about an axis passing through its centre of gravity |
| 3                               | Moment of inertial of Flywheel                                                                                                              |
| 4                               | Young's Modulus of a wire material by method of vibrations                                                                                  |
| 5                               | Bar Pendulum- determination of g                                                                                                            |
| 6                               | LDR Characteristics: To study the dependence of LDR resistance on intensity of light                                                        |
| <b>GROUP B</b>                  |                                                                                                                                             |
| 7                               | Frequency of AC Mains: To determine frequency of AC mains (Sonometer wire)                                                                  |
| 8                               | To study Thermistor characteristics: Resistance Vs Temperature                                                                              |
| 9                               | To determine capacitance in AC circuits using R and C                                                                                       |
| 10                              | To determine Inductance in AC circuits using L and C                                                                                        |
| 11                              | To determine the horizontal component of Earth's magnetic field(H) in the laboratory using deflection and vibration magnetometer            |
| 12                              | To determine the self-inductance of a coil with Anderson's Bridge                                                                           |
| <b>GROUP C:Skill Experiment</b> |                                                                                                                                             |
| 1                               | Use of Vernier Callipers, Micrometer Screw Gauge and Travelling Microscope                                                                  |
| 2                               | Graph plotting (Plot BE/A verses A graph for 30 atoms, Plot Packing Fraction graph for 30 atoms)                                            |
| 3                               | Spectrometer: Schuster's Method                                                                                                             |
| 4                               | To determine the Resistance & Capacitance using Color code/Number & verify using Multimeter (Analog/Digital).                               |
| 5                               | Use of digital multimeter                                                                                                                   |
| 6                               | Absolute and relative error calculation                                                                                                     |

**Note:** Minimum **8** experiments (Four From each group) and **4** Skill experiments should be completed and reported in the journal, in the first semester. **Certified Journal is a must**, to be eligible to appear for the semester end practical examination.

**Semester End Practical Examination:**

**Scheme of Examination: 50 Marks Duration: TWO Hours**

There will be no internal assessment for practical. A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement. The duration of the practical examination will be two hours per experiment. There will be **ONE** experiment (from any group) through which the candidate will be examined in practical. The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for its skill and understanding of physics.

**Minor course**  
**Syllabus**  
**B.Sc. (Physics)**  
**(Sem.- I)**  
**Credits = 2 + 2**

**Name of the course: Basic Electronics**

**Course Objectives (CO):**

After successful completion of this course students will be able to:

- CO1. To impart knowledge of basic concepts in Electronics.
- CO2. To provide the skills and methods required to construct electronic circuits
- CO3. To provide exposure of linear and digital electronics circuits.

**Course Outcomes (OC):**

On successful completion of this course students will be able to:

- OC1. Understand basic concept of electronic devices resistors, capacitors, inductors, transformers and P-N Junction diode.
- OC2. Understand the basic concept of AC generator, basic terms, phasor diagram, AC circuit using Resistance, Capacitance and Inductance.
- OC3. Apply knowledge to develop circuits using electronic devices.

## Minor Basic Electronics

| Module 1: Unit 1: Basic Circuit Components                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 15hr |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <p><b>1. Resistors:</b> Introduction of resistor, units, Resistor value using Color Code, Resistive circuits: Series circuit, characteristics of series circuit, series voltage divider, open and short in series circuit, Parallel circuit, laws of parallel circuit, open and short in parallel circuit.</p> <p><b>2. Capacitors:</b> Principles of capacitance, units, color code, capacitors in series and parallel.</p> <p><b>3. Inductors:</b> Introduction, units, inductor color code, self and mutual inductance, Inductance in series and parallel</p> <p><b>4. Transformers:</b> Introduction, Step-up and Step-down Transformers, Turn-Ratio, Voltage and Current Ratio.</p> <p><b>5. P-N Junction Diode:</b> construction, formation of depletion layer, forward and reverse biasing, and I-V characteristics.</p> |      |

| Module 2: Unit 2: AC Fundamentals                                                                                                                                                                                                                                                                                                                                                                                                                              | 15 hr |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Types of Alternating Waveforms, Basic AC Generator, Definitions of Cycle, Time Period, Frequency and Amplitude, Characteristics of a Sine Wave, Audio and Radio Frequencies, Different Values of Sinusoidal Voltage and Current, Average and RMS value of AC, Phase of an AC, Phasor Diagram, Vector Representation of an Alternating Quantity, AC through pure resistance, inductance and capacitance. Concept of Reactance and Impedance, Application of AC. |       |

### References:

1. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004)
2. Electrical Circuits, M. Nahvi, J. Edminister, Schaum's Outline Series, Tata McGraw-Hill
3. Electrical Circuits, K.A. Smith and R.E. Alley (2014) Cambridge University Press
4. Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.

**Minor course  
Syllabus  
B.Sc. (Physics)  
(Sem.- I)**

**Name of the course: Digital Electronics**

**Course Objectives (CO):**

After successful completion of this course students will be able to:

CO1. Know the concept of IC logic families

CO2. Learn the basics of Number systems.

CO3. Understand the basics of Boolean functions & logic Gates

CO4. Will able to explain the fitness for particular event.

**Course Outcomes (OC):**

On successful completion of this course students will be able to:

OC1. Understand the concept of digital logic system.

OC2. Get knowledge of Number systems.

OC3. Know the idea of Boolean functions & logic Gates

OC4. Understand and explain the different flip-flops and timing circuit.

## Minor Digital Electronics

| Module 1: Unit-I: Number System and Logic Gates                                                                                                                                                                                                                                                                                                                                                                            | 15hr |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1. Number system and codes: Binary, octal, hexadecimal and decimal Number systems and their inter conversion, BCD numbers (8421-2421), Binary addition and subtraction, signed and unsigned binary numbers, 1's and 2's complement representation.<br>2. Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, Ex NOR and their truth tables), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem. |      |

| Module 2: Unit-II: Combinational Logic Circuits                                                                                                                                                                                                             | 15 hr |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| The Half adder, the full adder, subtractor circuit. Multiplexer demultiplexer, decoder.<br><b>Flip flop and Timing circuit:</b> set-reset latches, D-flipflop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T- flipflop. |       |

### References:

1. Digital Fundamentals by T. L. Floyd, Pearson International Publications, Ninth Edition, 2000
2. Electronics Principles by Malvino and Leach, Mc. Graw Hill, Third edition. 2000
3. Modern Digital Electronics by R P Jain, Tata McGraw-Hill Education, 2003.
4. Fundamental of Digital Circuits by A. Anandkumar

## **Vocational Skill Course**

**Credits = 2**

### **Name of the Course: USPHPVSC2: PCB Making**

#### **Course Objectives (CO):**

On successful completion of this course students will be able to:

CO1. Learn techniques required for soldering of electronic components.

CO2. Learn to create effective PCB layouts.

#### **Course Outcomes (OC):**

On successful completion of this course students will be able to:

OC1. Solder basic electronic components on a PCB.

OC2. Develop schematic electronic circuit designing skills.

OC3. Design and Develop PCBs.

#### **Module I: Unit I: Circuit Prototyping Skills**

(07 Hours)

1. Soldering electronic components
2. Circuit assembly on general purpose board
  - A. Bridge rectifier with capacitor filter and regulator
  - B. Second order active Filter
  - C. Wheatstone bridge for temperature measurement
  - D. 555 based LED flasher
3. Testing
4. Soldering of surface mount devices

#### **Module II: Unit II: PCB Design Software**

(08 Hours)

1. Schematic circuit entry software
2. PCB Layout
  - A. Footprint assignment  
Creating board outlines for various layers: Bottom routing, Solder mask bottom, Legend or silk screen Top, Drill layer
  - B. Placement on the board
  - C. Routing
  - D. Post processing, Assembly and testing



**List of Experiments:**

1. Single side PCB
2. Double side PCB
3. Multy-layer PCB
4. Schematic / Components design review.
5. Determine what footprints are required to be built, and build them incorporating.
6. Component placement.
7. Power and Ground Plane assignment.
8. Critical net routing.

**References:**

1. Electronic Product Design Vol. I Basic for PCB Design – by Er. Mehta S.D.
2. Printed circuit boards: Design fabrication , Assmbly and testing – R S Khandpur.
3. PCB Design and Layout Fundamentals – by Roger Hu
4. PCB Design and Technology – by Walter C Bosehart

## **Skill Enhancement Course (SEC)**

**Credits = 2**

**Name of the Course: USPHSEC1: Basic Instrumentation skills and Basic Mathematical Skills for Physics**

### **Course Objectives (CO):**

- CO1. Generate awareness among students about handling different laboratory instruments scientifically.
- CO2. Develop concepts of accuracy precision, resolution, range and errors/uncertainty in measurement.
- CO3. Understand various types of electronic components and devices so as to construct simple circuits
- CO4. Expose students to systematic of scientific calculator.
- CO5. Illustrate necessary mathematical concepts to develop corresponding skills
- CO6. Develop the problem solving among learners

### **Course Outcomes (OC):**

Upon completion of the course, the learners should be able to:

- OC1. Accomplish desired skills to handle different laboratory instruments scientifically.
- OC2. Acquire knowledge about precision and accuracy in measurements.
- OC3. Develop basic electronic circuit using different techniques.
- OC4. Develop confidence to use scientific calculator systematically.
- OC5. Apply mathematical tools to understand theoretical concepts of physics.
- OC6. Demonstrate problem-solving skills for all the topics covered.

This course is designed for learners to get exposure with various aspects of instruments and their usage through hands-on mode.

**Module 1: Unit 1: Basic Instrumentation skills** (30 Hours)

- 1.1. Study and use of Vernier Callipers & Micrometer Screw Gauge
- 1.2. Study and use of Travelling Microscope.
- 1.3. Study and use of Spectrometer.
- 1.4. Study and determination of Focal length of a convex lens.
- 1.5. Fundamentals of Electronic Component- Resistor, potentiometer, Capacitor, Inductor, Diode, Transistor, LED, Zener diode.
- 1.6. Use of Multimeter (analog, Digital), Voltmeter, Ammeter.
- 1.7. Use of CRO - voltage ( AC, DC), Frequency and Phase measurement.
- 1.8. Different types of power supplies.
- 1.9. Logic gate IC Testing.
- 1.10. Soldering electronic circuits.
- 1.11. Study and use of Thevenin's theorem.
- 1.12. Building Electronic Circuits using Breadboard.
- 1.13. Graph plotting - plotting of graphs and finding slope and intercept.
- 1.14. Graph plotting - semi log graph paper.
- 1.15. Theory of errors and calculating-Error for given data

**Module 2: Unit 2: Basic Mathematical Skills** (30 Hours)

- 2.1 Use of scientific Calculator
- 2.2 Basic trigonometry and its applications in physics
- 2.3 Concept of logarithm and its application to Physics
- 2.4 Concept of derivatives and its application to Physics
- 2.5 Concept of integration and its application to Physics
- 2.6 Concept of differential equations(1st order) and its application to Physics

# Sem. – II

**Mandatory course**  
**Syllabus**  
**B.Sc. (Physics)**  
**(Sem.- II)**  
**Credits = 2 + 2 + 2**

**Name of the course: Paper I – Optics**

**Course Objectives (CO):**

After successful completion of this course students will be able to:

- CO1. Explain the nomenclature used in lenses, lens equations for single convex lenses, and sign convention. lens maker's equation, Newton's lens equation and principal foci positions.
- CO2. Describe Lateral, Longitudinal and Angular magnification, Equivalent focal length and power of two thin lenses, Concept of cardinal points and their significance
- CO3. Explain qualitatively Spherical aberration & reduction, chromatic aberration & reduction.
- CO4. Study of Fresnel and Fraunhofer type of diffraction and Fraunhofer diffraction pattern due to a single slit and double slit,
- CO5. Learn Michelson's Interferometer and its Applications
- CO6. Describe Polarization and types of Polarization
- CO7. The students learn to apply their knowledge to solve problems that are covered in the all syllabus.

**Course Outcomes (OC):**

After successful completion of this course students will be able to:

- OC 1. Understand the nomenclature used in lenses, lens equations for single convex lenses, and sign convention. lens maker's equation, Newton's lens equation and principal foci positions.
- OC 2. To Understand Lateral, Longitudinal and Angular magnification, Equivalent focal length and power of two thin lenses, Concept of cardinal points and their significance
- OC 3. To comprehend qualitatively Spherical aberration & reduction, chromatic aberration & reduction.

OC 4. To understand Fresnel and Fraunhofer type of diffraction and Fraunhofer diffraction pattern due to a single slit and double slit,  
 OC 5. To understand Michelson's Interferometer and its Applications  
 OC 6. To understand Polarization and types of Polarization  
 OC 7. Students should be able to solve problems related to the topics that are covered in the syllabus.

| Module 1: Unit-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 15hr |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <p><b>1. Lenses and Lens Maker's Equation:</b> Introduction to lenses, Terminology and sign conventions, Introduction to Thin lenses and Lens equation for single convex lens, Lens maker's equation: Positions of the Principal Foci and Newton's Lens equation.<br/> <b>(SBA: 4.1, 4.2, 4.3, 4.7, 4.8, 4.9, 4.10, 4.10.1, 4.11)</b></p> <p><b>2. Magnification by a lens and power of lens:</b> Lateral, Longitudinal and Angular magnification, Deviation by a thin lens and its power, Equivalent focal length of two thin lenses, Focal length of the equivalent lens &amp; power of two thin lenses, Concept of cardinal points and their significance<br/> <b>(SBA: 4.12, 4.12.1, 4.12.2, 4.12.3, 4.15, 4.16, 4.17, 4.17.1, 4.17.2, 4.17.3, 4.17.4, 5.2 )</b></p> <p><b>3. Introduction to Aberration in lenses:</b> Spherical aberration &amp; reduction, chromatic aberration &amp; reduction (Qualitative).<br/>           SBA: 9.2, 9.5, 9.5.1, 9.10<br/>           Suitable numerical with appropriate difficulty level.</p> |      |
| Module 2: Unit-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 15hr |
| <p><b>1. Fresnel diffraction:</b> Introduction, Huygens-Fresnel's theory, Fresnel's assumptions, Distinction between interference and diffraction, Fresnel and Fraunhofer types of diffraction<br/> <b>(SBA: 17.1, 17.2, 17.3, 17.6, 17.7)</b></p> <p><b>2. Fraunhofer diffraction:</b> Introduction, Fraunhofer diffraction at a single slit, intensity distribution in diffraction pattern due to a single slit, Fraunhofer diffraction at double slit (Qualitative), Distinction between single slit and double slit diffraction patterns.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |

( SBA: 18.1, 18.2, 18.2.1, 18.4, 18.4.2)

**3. Michelson's Interferometer:** Principle, construction, working,  
Applications of Michelson Interferometer: a) Measurement of  
wavelength b) Determination of the difference in the wavelength of  
two waves c) Determination of the refractive index of gases.

(SBA: 15.7, 15.7.1 to 15.7.3, 15.8, 15.8.1, 15.8.2, 15.8.4)

**4. Polarization:** Introduction, Polarization, Types of Polarization

(SBA: 20.1, 20.2, 20.5, 20.5.1, 20.5.2, 20.5.3)

### Reference:

SBA: Dr. N. Subrahmanyam, Brijlal, and Dr. M. N. Avadhanulu, A Textbook  
of Optics, 25th Revised Edition (2012) S. Chand.

## Major Course

### Name of the Course: Paper – II: Electricity and Magnetism

#### Course Objectives (CO):

After successful completion of this course students will be able to:

- CO1. Explain the AC circuit theory in case of pure resistance, inductance, capacitance and series combinations of LR, CR and LCR circuits.
- CO2. Apply the knowledge of AC circuit theory to understand the working of AC bridges such as Maxwell's inductance bridge, De Sauty's bridge, Wien bridge
- CO3. Explain basic circuit theorems (Ohm's law, Kirchoff's laws, Thevenin's, Norton's, and Maximum Power Transfer theorems).
- CO4. Describe magnetic properties of matter, concepts of magnetic permeability, magnetic forces, magnetic field, magnetization, Biot Savarts law.
- CO5. Solve numerical based on the topics that are covered in the syllabus.

#### Course Outcomes (OC):

After successful completion of this course students will be able to:

- OC1. Understand AC circuit theory in case of pure resistance, inductance, capacitance and series combinations of LR, CR and LCR circuits.
- OC2. Understand the working of AC bridges such as Maxwell's inductance bridge, De Sauty's bridge, Wien bridge
- OC3. Comprehend circuit theorems (Ohm's law, Kirchoff's laws, Thevenin's, Norton's, and Maximum Power Transfer theorems).
- OC4. Understand magnetic properties of matter, concepts of magnetic permeability, magnetic forces, magnetic field, magnetization, Biot-Savarts law.
- OC5. Students learn to apply their knowledge to solve problems related to the topics that are covered in the syllabus.

| Module 1: Unit-I                                                                                                                                                                                                           | 15hr |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>1. Alternating current theory:</b> (Review: Concept of L, R, and C) AC circuit containing pure R, pure L and pure C, representation of sinusoids by complex numbers, Series L-R, C-R and LCR circuits, Resonance in LCR |      |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <p>circuit (series), Q- Factor.</p> <p><b>(TT: 11.29, 11.30, 11.32, 12.5, 12.6, 13.1, 13.7, 13.9, 13.10, 13.11, 13.12, 13.13, 13.14, 13.17).</b></p> <p><b>2. AC bridges:</b> General AC Bridge, Maxwell's Inductance Bridge, Maxwell's L/C Bridge, De Sauty Bridge, Wien Bridge. (Bridge diagram, balancing condition derivation, applications).</p> <p><b>(TT: 16.1, 16.2, 16.3, 16.9, 16.11, 16.12).</b></p>                                                                                                                                                                                                                                                                                                                                                                                                        |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |
| <b>Module 2: Unit-II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>15hr</b> |
| <p><b>1.Circuit Theorems:</b> (Review: Ohm's law, Kirchhoff's laws) Ideal Current and Voltage Sources, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem. Problems related to circuit analysis using the above theorems. <b>(TT: 2.15, 2.16, 2.18, 2.25, 2.30)</b></p> <p>(Coulomb's Law, The Electric Field for Review)</p> <p><b>2. Magnetic properties of matter:</b> Introduction, Magnetic Permeability, Magnetization</p> <p><b>(Chapter 9: 1, 2, 3)</b></p> <p>SOP: Solid State Physics, S.O Pillai (5<sup>th</sup> Edition), New Age International Limited.</p> <p><b>3. Magnetostatics:</b> Magnetic Fields, Magnetic forces, Currents</p> <p>The Biot-Savart Law: Steady Currents, The Magnetic Field of a Steady Current</p> <p><b>(DJG: 5.1.1, 5.1.2, 5.1.3, 5.2, 5.2.1, 5.2.2)</b></p> |             |

### References:

1. TT: B.L, Theraja and A.K. Theraja, A Textbook of Electrical Technology Vol. I, S. Chand Publication
2. DJG: Introduction to Electrodynamics 3rd Edn by D. Griffith
3. BS: Mechanics and Electrodynamics Rev Edn. 2005, by Brijlal and Subramanayan and Jeevan Seshan

## **Major Practical-2**

**Name of the Course: USPHP2: PHYSICS PRACTICAL COURSE**

### **Course Objectives (CO):**

- CO1. To upgrade the skill in handling of basic laboratory instruments.
- CO2. To enhance learners' skills in calibration of instruments and calculation techniques.
- CO3. To upgrade the skill of learners in minimization of Error minimization in the laboratory.
- CO4. To upgrade the skill good laboratory practices.

### **Course Outcomes (OC):**

Upon completion of the course, the learners should be able to:

- OC1. Safely practice, basic laboratory procedures and protocols inside a laboratory
- OC2. Acquire the skills of basic calibration and handling of instrumentation in laboratory.
- OC3. Appreciate the basics of Physics and their use in laboratory.
- OC4. Acquire skills to perform various practical in lab.

## **Name of the Course: USPHP2: PHYSICS PRACTICAL COURSE**

### **INSTRUCTIONS:**

- 1) All the measurements and readings should be written with proper units in SI system only.
- 2) After completing all the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination.
- 3) While evaluating practical, weightage should be given to circuit/ray diagram, observations, tabular representation, experimental skills and procedure, graph, calculation and result.
- 4) Skill of doing the experiment and understanding physics concepts should be more important than the accuracy of final result.

**Note: Exemption of two experiments from section A and / or B and / or C may be given if student carries out any one of the following activities.**

- Collect the information of at least five Physicists with their work or any three events on physics, report that in journal.
- Execute a mini project to the satisfaction of teacher in-charge of practical.
- Participate in a study tour or visit & submit a study tour report.
- For practical examinations, the learner will be examined in **ONE** experiment (one from any group).
- Each experiment will be of three lecture hours' duration.
- A Minimum 4 from each group and in all minimum 8 experiments must be reported in journal.

All the skill experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester II as per the minimum requirements.

**A. Regular Experiment:**

| <b>Sr. No.</b>                           | <b>Name of the Experiments</b>                                                                                       |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>GROUP A</b>                           |                                                                                                                      |
| 1                                        | Study of LASER Beam Divergence                                                                                       |
| 2                                        | Spectrometer: To determine of angle of Prism                                                                         |
| 3                                        | Spectrometer: To determine refractive index of prism material                                                        |
| 4                                        | Combination of Lenses: To determine equivalent focal length of a lens system by magnification method                 |
| 5                                        | Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings.                        |
| 6                                        | Determination of diameter of thin wire using Wedge Shaped Film                                                       |
| <b>GROUP B</b>                           |                                                                                                                      |
| 7                                        | Study of Logic gates & To verify De Morgan's Theorems                                                                |
| 8                                        | To study EX-OR Gate and verify its truth table                                                                       |
| 9                                        | To study half adder and full adder and verify their truth table Ex-OR Gate                                           |
| 10                                       | To study load regulation of a Bridge Rectifier                                                                       |
| 11                                       | To study Zener Diode as Regulator                                                                                    |
| 12                                       | Transistor configurations : CB/CE/CC (study of input-output characteristics)                                         |
| <b>GROUP C: DEMONSTRATION EXPERIMENT</b> |                                                                                                                      |
| 1                                        | Radius of ball bearings (single pan balance)                                                                         |
| 2                                        | Use of Oscilloscope: Wave forms at output of half wave , bridge rectifiers with and without Capacitor filter, Ripple |
| 3                                        | Use of PC for graph plotting                                                                                         |
| 4                                        | I-V Characteristics of LED                                                                                           |
| 5                                        | Testing of components (Resistors , Diode , Transistor , capacitor)                                                   |
| 6                                        | Study of I-V characteristics of solar cell                                                                           |

**Note:** Minimum **8** experiments (Four From each group) and **4** Demo experiments should be completed and reported in the journal, in the first semester. **Certified Journal is must**, to be eligible to appear for the semester end practical examination.

**Semester End Practical Examination:**

**Scheme of Examination: 50 Marks Duration: TWO Hours**

There will be no internal assessment for practical. A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement. The duration of the practical examination will be two hours per experiment. There will be **ONE** experiment (one from any group) through which the candidate will be examined in practical. The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for its skill and understanding of physics.

**Minor course  
Syllabus  
B.Sc. (Physics)  
(Sem.- II)**

**Credits = 2 + 2 + 2**

**Name of the course: Applied Optics**

**Course Objectives (CO):**

After successful completion of this course students will be able to:

CO1. Understand the principles of thin and thick lenses, including the Lens Maker's Equation, Newton's lens equation, and magnification (both lateral and longitudinal).

CO2. Analyze the behavior of lenses in co-axial systems, considering equivalent focal lengths and cardinal points.

CO3. Explore the properties of thick lenses, including their cardinal points, with a focus on practical examples.

CO4. Investigate aberrations such as spherical aberration and chromatic aberration, emphasizing conditions for achromatic aberration.

CO5. Apply knowledge of optical systems to real-world scenarios, including oil immersion objectives in high-power microscopes, telescope objectives, and camera lenses.

**Course Outcomes (OC):**

By the end of this course, students will be able to:

CO1. Solve problems related to lens behaviour, cardinal points, and focal lengths.

CO2. Identify and correct aberrations in optical systems.

CO3. Analyze and interpret interference phenomena, including thin film interference, fringes in wedge-shaped films, and Newton's rings.

CO4. Operate a Michelson's interferometer and apply it for wavelength measurement and other practical purposes.

CO5. Demonstrate understanding of Fabry-Perot interferometers and etalons, particularly in qualitative contexts.

## Minor Applied Optics

| <b>Module 1: Unit-I: Lens and Aberration</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>15hr</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <p>1. Thin &amp; thick Lens, Lens Maker's Equation (Review), Newton's lens equation, magnification-lateral, Longitudinal and angular. Equivalent focal length of two thin lenses, cardinal points of co-axial system of two thin lenses, Thick lens, cardinal points of thick lens, Ramsden and Huygens eyepiece.</p> <p><b>2. Aberration:</b> Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration and condition for achromatic aberration, oil immersion objective of high power microscope, achromatism of telescope objective and camera lens.</p> <p>(Emphasis must be placed on explaining examples from day-to-day life and solving more Problems)</p> |             |

| <b>Module 2: Unit-II: Combinational Logic Circuits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>15 hr</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <p>1. Interference, Interference in thin films, Fringes in Wedge shaped films, Newton's Rings (Reflective)</p> <p>2. <b>Michelson's Interferometer:</b> Principle &amp; Working, Applications: Measurement of Wavelength, Determination of difference in the wavelength of two waves, Thickness of Thin transparent film, Determination of RI of gases, Standardisation of Metre scale. Fabry Perot Interferometer and etalon (qualitative)</p> <p>(Emphasis must be placed on understanding applications based on interference and solving more Problems)</p> |              |

### References:

1. N. Subramanyam , Brijlal, and M N Avadhanulu , A Textbook of Optics, 25th revised ed.(2012) S. Chand (Main Reference)
2. Ashok Kumar, D R Gulati, H R Gulati, Fundamentals of Optics, 2018, R Chand & Co. (Further Reading)
3. Devraj Singh, Fundamentals of Optics, 2nd edition (2015), PHI (Further Reading)

**Minor course  
Syllabus  
B.Sc. (Physics)  
(Sem.- II)**

**Name of the course: Applied Electronics**

**Course Objectives (CO):**

After successful completion of this course students will be able to:

- CO1. Gain knowledge of measuring instruments used in Physics laboratory.
- CO2. Explore principle of Cathode Ray Oscilloscope and its applications.
- CO3. Investigate tuning circuit behaviour, Q-value and bandwidth.
- CO4. Learn about direct and indirect coupled circuits and filters.
- CO5. Understand the general features of time base signals, different types of time base circuits.
- CO6. Study specific sweep circuits, including exponential sweep, transistor-based sweeps, and current time base generators.
- CO7. Understand general use of Transducers, LVDT, Photodiode, LDR, Thermistor and Microphone.

**Course Outcomes (OC):**

By the end of this course, students will be able to:

- OC1. Explore the working of a Cathode Ray Oscilloscope (CRO), including the cathode ray tube (CRT) and beam deflection.
- OC2. Design and analyze resonance in series and parallel LCR circuits.
- OC3. Calculate the Q-value and bandwidth of tuning circuits.
- OC4. Recognize the general features of time base signals, types of time base circuits.
- OC5. Learn methods for generating time base waveforms.
- OC6. Explore sweep circuits, including exponential, transistor-based, and constant current sweeps.



## Minor Applied Electronics

| <b>Module 1: Unit-I:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>15hr</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <p><b>1. Measuring Instruments:</b> PMMC Multimeter – Digital Multimeter– Cathode Ray Oscilloscope (CRO):- Principle – Cathode Ray Tube – Deflection of the Beam – Blanking or Flyback or Retrace-Deflection Sensitivity- Single Trace Oscilloscope – Recurrent Sweep.</p> <p><b>2. Tuning Circuits and Filters:</b> Resonance in series and parallel LCR circuits – Operating characteristic of a tuning circuit – Q value – Bandwidth – Tuning circuit in radio receivers – Double tuned transformers – direct and indirect coupled circuits – coefficient of coupling – filters: low pass filter-high pass filter– band pass filter-band stop filter.</p> |             |

| <b>Module 2: Unit-II: Amplitude and Angle Modulation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>15 hr</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <p><b>1.Time base Circuits:</b> General features of a time base signal – Types of time base circuits – Methods of Generating a time base Waveform – Exponential Sweep circuit – Sweep Circuit Using Transistor Switch– A Transistor Constant Current Sweep – Miller Sweep Circuit – Bootstrap Sweep Circuit –Current Time Base Generator.</p> <p><b>2.Transducers:</b> General information-LDR-Thermistor –Thermocouple – Photodiode –Phototransistor LVDT-Piezoelectric transducer, Microphone-moving coil.</p> |              |

### References:

1. Electronic Instruments and Systems, R.G. Gupta – TMH (2001)
2. Basic Electronics – Solid State, B.L. Theraja-S Chand (2005)
3. A text Book of Applied Electronics, R.S. Sedha – S. Chand (2005)
4. Electronic Instrumentation (2 Ed.) H.S. Kalsi, TMH (2006).

**Minor course  
Syllabus  
B.Sc. (Physics)  
(Sem.- II)**

**Name of the course: Electrical Instruments**

**Course Objectives (CO):**

After successful completion of this course students will be able to:

CO1. Understand the characteristics and behavior of voltage and current sources in electrical circuits.

CO2. Apply Kirchhoff's current law (KCL) and voltage law (KVL) to analyze circuits.

CO3. Analyze simple DC circuits using loop and nodal analysis techniques.

CO4. Understand the purpose and operation of ammeters and voltmeters in both DC and AC circuits.

**Course Outcomes (OC):**

By the end of this course, students will be able to:

CO1. Perform loop and nodal analysis for simple DC circuits.

CO2. Use ammeters and voltmeters effectively.

CO3. Analyze single-phase series and parallel R-L-C AC circuits, considering sinusoidal waveforms, peak values, RMS values, and power factor.

CO4. Understand voltage and current relations in star and delta connections for three-phase balanced circuits.

CO5. Learn about induction-type single-phase and three-phase wattmeters and energy meters.

CO6. Understand the principles and performance equations of D'Arsonval Galvanometers, Vibration Galvanometers, and Ballistic Galvanometers.

CO7. Explore DC and AC potentiometers, including their construction, standardization, and applications.

CO8. Study bridge balance equations and measurement techniques, including self-inductance measurement using Maxwell's bridge and capacitance measurement using Schering bridge.

## Minor Electrical Instruments

| <b>Module 1: Unit-I:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>15hr</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <ol style="list-style-type: none"> <li>1. Voltage and current sources, Kirchoff's current and voltage laws, loop and nodal analysis of simple circuits with dc excitation. Ammeters, voltmeters: (DC/AC) (4 hours)</li> <li>2. Representation of sinusoidal waveforms, peak and rms values, power factor. Analysis of single-phase series and parallel R-L-C ac circuits. Three-phase balanced circuits, voltage and current relations in star and delta connections. Wattmeters: Induction type, single phase and three phase wattmeter, Energy meters: AC. Induction type single phase and three phase energy meter. (6 hours)</li> <li>3. Instrument Transformers: Potential and current transformers, ratio and phase angle errors, phasor diagram, methods of minimizing errors; testing and applications. (5 hours)</li> </ol> |             |

| <b>Module 2: Unit-II: Amplitude and Angle Modulation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>15 hr</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <ol style="list-style-type: none"> <li>1. Galvanometers: General principle and performance equations of D'Arsonval Galvanometers, Vibration Galvanometer and Ballistic Galvanometer. (3 hours)</li> <li>2. Potentiometers: DC Potentiometer, Crompton potentiometer, construction, standardization, application. AC Potentiometer, Drysdale polar potentiometer; standardization, application. (3 hours)</li> <li>3. DC/AC Bridges General equations for bridge balance, measurement of self-inductance by Maxwell's bridge (with variable inductance &amp; variable capacitance), Hay's bridge, Owen's bridge, measurement of capacitance by Schearing bridge, errors, Wagner's earthing device, Kelvin's double bridge. (7 hours)</li> </ol> |              |

### References:

1. Sawhney A K. A Course in Elec. & Electronics Measurements & Instrumentation. Dhanpatrai & Co, 1978.
2. Helfrick A D, Cooper W D. Modern Electronic Instrumentation and Measurement

3. Techniques. PHI, 2016.
4. Kulshreshtha DC. Basic Electrical Engineering. Mc Graw Hill Publications, 2019. 4. David G Alciatore and Michel B Histan, Introduction to Mechatronics and
5. Measurement Systems. Tata McGraw Hill Education Private Limited, 3rd Edition, 2015.
6. Vincent Del Toro. Electrical Engineering Fundamentals. Prentice Hall India, 2009.

## **Skill Enhancement Course (SEC)**

**Credits = 2**

**Name of the Course: USPHSEC2: ICT tools for Physics**

### **Course Objectives (CO):**

CO1. To know how to use the most common Microsoft Office programs.

CO2. To be able to create documents for printing and sharing.

CO3. To be able to create and share presentations.

CO4. To be able to manage and store data in a spreadsheet.

### **Course Outcomes (OC):**

On successful completion of this course students will be able to

OC1. Create a word document, save the word document and print the word document.

OC2. Demonstrate various insert features and mail merge feature of a word document.

OC3. Create, edit, save, format and print presentations.

OC4. Create and manipulate simple slide shows.

OC5. Create, open, view, edit, save and print a workbook.

OC6. Learn to use functions, formulas, charts and graphs.

### **Module 1: Unit 1: MS-Word and MS-Power Point** (15 Hours)

1. Introduction to MS Word, starting word, creating a Document, Saving and Printing a document, Move and Copy Text, Cut and Paste, Finding Text, Replace Command, Checking Spelling and Grammar
2. Inserting Picture, Formatting Text, fonts, Using Bullets and Numbering in Paragraphs, Inserting equations and symbols
3. Page Setup, Inserting Page Breaks, Using Headers and Footers in the Document, inserting page numbering, Print Preview, Print Options
4. Creating Tables, Formatting a Table
5. Using Mail Merge.
6. Introduction to power point presentation, creating a blank presentation, adding new slides, saving a presentation, printing options
7. Designing a presentation
8. Animation and transition, Slide show

### **Module 2: Unit 2: MS-EXCEL** (15 Hours)

1. Creating spreadsheet and adding information to it, different data types
2. Moving data values, editing data values, inserting/ deleting rows and columns
3. Data editing: find & replace, spell check,
4. Data formatting techniques
5. Working with different mathematical, text, date and time formulae
6. Page layout options, adding header, footer and page numbering
7. Working with sort and filter functions
8. Working with multiple spreadsheets.

All the above topics to be covered through Hands on sessions.

### **References:**

1. *Mastering MS Office ( ebook) by Bittu Kumar*
2. *Excel 2010 Bible by John Walkenbach, John Wiley & Sons*

## QUESTION PAPER PATTERN (External and Internal)

### FYBSc Physics Evaluation pattern and Question paper pattern for Semester End Theory Examination of Major Course

|                                                                                                                                                      |                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Internal Continuous Assessment: 40% (20 Marks)</b>                                                                                                | <b>Semester End Examination: 60% (30 Marks)</b>                                                                                                                              |
| <b>Continuous Evaluation through:</b><br><br>Quizzes, Class Tests, presentation, project, role play, creative writing, assignment etc.( at least 3 ) |                                                                                                                                                                              |
| <b>Format of Question Paper: 30 Marks Duration: ONE Hour</b>                                                                                         |                                                                                                                                                                              |
| Unit -I<br><br>(15Marks)                                                                                                                             | Q:1 A) Attempt any <b>Two</b> 10Marks<br><br>i) Theory<br>ii) Theory<br>iii) Theory<br>iv) Theory<br><br>B) Attempt any <b>One</b> 05 Marks<br><br>i) Problem<br>ii) Problrm |
| Unit -II<br><br>(15Marks)                                                                                                                            | Q:2 A) Attempt any <b>Two</b> 10Marks<br><br>i) Theory<br>ii) Theory<br>iii) Theory<br>iv) Theory<br><br>B) Attempt any <b>One</b> 05 Marks<br><br>i) Problem<br>ii) Problrm |

**FYBSc Physics Evaluation pattern and Question paper pattern for Semester End Practical Examination of Major Course**

| <b>Internal Continuous Assessment: 40% (20 Marks)</b>                                          | <b>Semester End Examination: 60% (30 Marks)</b> | <b>Duration for End semester examination</b> |
|------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------|
| Viva/ assignment/ objective question test (15 Marks), Overall performance (5 Marks) = 20 Marks | As per paper pattern                            | 1 hrs                                        |



**FYBSc Physics Evaluation pattern and Question paper pattern for  
Semester End Practical Examination of Vocational Skill Courses and  
Skill Enhancement Courses**

**Format of Question Paper:**

**VSC: 2 credits**

**Duration: 60 Hrs , Total marks: 50**

**(30 Marks for Theory paper + 20 Marks for Practical Exam.)**

|                                                                |                                                                             |
|----------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>Semester End Theory<br/>Examination:<br/>60% (30 Marks)</b> | <b>Internal Semester End<br/>Practical Examination:<br/>40 % (20 Marks)</b> |
| <b>As per paper pattern<br/>attached</b>                       | <b>As per practical exam. pattern<br/>attached</b>                          |

**Theory Paper Pattern for 30 marks Semester End Theory Examination:**

Duration - These examinations shall be of **one hours** duration

**Duration: 1 Hrs**

**Total Marks -30**

|               |                                        |                       |
|---------------|----------------------------------------|-----------------------|
| <b>Que -1</b> | <b>Attempt any Three (on Unit- I )</b> | <b>Total Marks 15</b> |
| a)            |                                        | 5                     |
| b)            |                                        | 5                     |
| c)            |                                        | 5                     |
| d)            |                                        | 5                     |
| e)            |                                        | 5                     |
| <b>Que -2</b> | <b>Attempt any Three (on Unit- II)</b> | <b>Total Marks 15</b> |
| a)            |                                        | 5                     |
| b)            |                                        | 5                     |
| c)            |                                        | 5                     |
| d)            |                                        | 5                     |
| e)            |                                        | 5                     |

**Internal Practical Examination Pattern for 20 marks Semester End Examination:**

1. Duration - These examinations shall be of **Two hours** duration in laboratory

| Sr. No. |                   | Total 20 Marks |
|---------|-------------------|----------------|
| 1       | One Experiment    | 15 arks        |
| 2       | Certified Journal | 3 Marks        |
| 3       | Vi-va             | 2 Marks        |

**Format of Question Paper:**

**SEC: 2 credits**

Internal Assessment: **20 marks**

**External: Semester End Practical Examination : 30 Marks**

**Duration: 2 Hours**

|                                                | Marks     |
|------------------------------------------------|-----------|
| One Experiment from either Group A and Group B | 20        |
| Certified Journal                              | 05        |
| Viva based on Group A and Group B Experiments. | 05        |
| <b>Total Marks</b>                             | <b>30</b> |

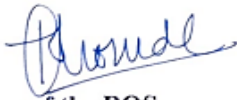
## Letter Grades and Grade Points:

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

## Appendix B

### Justification for B.Sc. (PHYSICS)

|    |                                                                                                                                 |                                                                                                                                                                                                                                                                                         |
|----|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Necessity for starting the course:                                                                                              | The necessity for starting the B.Sc. (Physics) course lies in its role as a foundational, interdisciplinary, and practical program that prepares students for higher education, diverse career opportunities and active participation in addressing scientific and societal challenges. |
| 2. | Whether the UGC has recommended the course:                                                                                     | Yes                                                                                                                                                                                                                                                                                     |
| 3. | Whether all the courses have commenced from the academic year 2023-24                                                           | The course has already commenced in the university and in the academic year 24-25, it is restructured under NEP 2020                                                                                                                                                                    |
| 4. | The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available: | This course is aided/self-financed based on sanction given by University of Mumbai to affiliated colleges time to time.                                                                                                                                                                 |
| 5. | To give details regarding the duration of the Course and is it possible to compress the course?                                 | The duration of the program is three years (6 semesters). It is not possible to compress the course.                                                                                                                                                                                    |
| 6. | The intake capacity of each course and no. of admissions given in the current academic year:                                    | The intake capacity is variable from the college to college based on sections received from the University.                                                                                                                                                                             |
| 7. | Opportunities of Employability / Employment available after undertaking these courses:                                          | B.Sc. (Physics) graduates are versatile and can adapt their skills to various industries, make them valuable assets in the workforce. Additionally, continuous learning and staying updated on industry trends can enhance career prospects and open up new opportunities.              |

  
**Sign of the BOS  
Chairman  
Name:  
Dr.T.N.GHORUDE  
BOS in Physics**

**Sign of the  
I/c. Associate Dean  
Dr. Madhav R. Rajwade  
Faculty of Science &  
Technology**

**Sign of the  
I/c Dean  
Prof. Shivram S. Garje  
Faculty of Science &  
Technology**