# B.Sc., PHYSICS

# Syllabus

## Program Code: UPH

**2023 - Onwards**


**MANNAR THIRUMALAI NAICKER COLLEGE**

**(AUTONOMOUS)**

**Re-accredited with "A" Grade by NAAC**

**PASUMALAI, MADURAI – 625 004**

# GUIDLINESS FOR OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

## (FOR UG PROGRAM FROM 2023 -2024 ONWARDS)

### ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the UG Degree program must have passed the Higher Secondary Education (respective groups – Arts / Science) of the Government of Tamil Nadu or any other state or its equivalent qualification.

### DURATION OF THE COURSE

The duration of the course shall be three academic years comprising six semesters with two semesters in each academic year.

**Subjects of Study**

Part I : Tamil / Hindi /

Part II : English

Part III :

1.Core Subjects
2.Allied Subjects
3.Electives

Part IV:

1.Non Major Electives (I Year)
2.Skill Based Subjects
3.Environmental Studies - Mandatory Subject
4.Value Education - Mandatory Subject

Part V :

Extension Activities

# ARTS & SCIENCE

## CBCS COURSE STRUCTURE FOR UG PROGRAMS

| Sem I | Credit | Sem II | Credit | Sem III | Credit | Sem IV | Credit | Sem V | Credit | Sem VI | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.1. Language - Tamil | 3 | 2.1. Language - Tamil | 3 | 3.1. Language - Tamil | 3 | 4.1. Language - Tamil | 3 | 5.1 Core Course – \CC IX | 4 | 6.1 Core Course – CC XIII | 4 |
| 1.2 English | 3 | 2.2 English | 3 | 3.2 English | 3 | 4.2 English | 3 | 5.2 Core Course – CC X | 4 | 6.2 Core Course – CC XIV | 4 |
| 1.3 Core Course – CC I | 4 | 2.3 Core Course – CC III | 4 | 3.3 Core Course – CC V | 4 | 4.3 Core Course – CC VII Core Industry Module | 4 | 5. 3.Core Course CC -XI | 4 | 6.3 Core Course – CC XV | 4 |
| 1.4 Core Course – CC II | 4 | 2.4 Core Course – CC IV | 4 | 3.4 Core Course – CC VI | 4 | 4.4 Core Course – CC VIII | 4 | 5. 3.Core Course –/ Project with viva-voce CC - XII | 4 | 6.4 Elective -VII Generic/ Discipline Specific | 3 |
| 1.5 Elective I Generic/ Discipline Specific | 3 | 2.5 Elective II Generic/ Discipline Specific | 3 | 3.5 Elective III Generic/ Discipline Specific | 3 | 4.5 Elective IV Generic/ Discipline Specific | 3 | 5.4 Elective V Generic/ Discipline Specific | 3 | 6.5 Elective VIII Generic/ Discipline Specific | 3 |
| 1.6 Skill Enhancement Course SEC-1 (NME) | 2 | 2.6 Skill Enhancement Course SEC-2 (NME) | 2 | 3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill) | 1 | 4.6 Skill Enhancement Course SEC-6 | 2 | 5.5 Elective VI Generic/ Discipline Specific | 3 | 6.6 Extension Activity | 1 |
| 1.7Ability Enhancement Compulsory Course (AECC) Soft Skill-1 | 2 | 2.7 Skill Enhancement Course – SEC-3(NME) | 2 | 3.7 Skill Enhancement Course SEC-5 | 2 | 4.7 Skill Enhancement Course SEC-7 | 2 | 5.6 Value Education | 2 | 6.7 Professional Competency Skill | 2 |
| 1.8 Skill Enhancement - (Foundation Course) | 2 | 2.8 Ability Enhancement Compulsory Course (AECC) Soft Skill-2 | 2 | 3.7 Ability Enhancement Compulsory Course (AECC) Soft Skill-3 | 2 | 4.7 7Ability Enhancement Compulsory Course (AECC) Soft Skill-4 | 2 | 5.5 Summer Internship /Industrial Training | 2 | | |
| | | | | 3.8 E.V.S | - | 4.8 E.V.S | 2 | | | | |
| | **23** | | **23** | | **22** | | **25** | | **26** | | **21** |
| | **Total Credit Points** | | | | | | | | | | **140** |

## QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL ASSESSMENT

**Note: Duration – 1 hour**

**(FOR PART I, PART II & PART III)**

The components for continuous internal assessment are:

**Part –A**

Four multiple choice questions (answer all) 4 x01= 04 Marks

**Part –B**

Two questions (‘either …. or ‘type) 2 x05= 10 Marks

**Part –C**

Two questions (‘either …. or ‘type) 2 x 08=16 Marks

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**Total** 30 Marks

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**THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:**

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two tests and their average --15 marks

Seminar /Group discussion / Quiz Test --5 marks

Assignment --5 marks

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Total 25 Marks

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## QUESTION PAPER PATTERN FOR THE SUMMATIVE EXAMINATIONS:

**Note: Duration- 3 hours**

**Part –A**

| | | |
|---|---|---|
| Ten multiple choice questions | 10 x01 | = 10 Marks |

No Unit shall be omitted: not more than two questions from each unit.)

**Part –B**

| | | |
|---|---|---|
| Five Paragraph questions (‘either …. or ‘type) | 5 x 05 | = 25 Marks |

(One question from each Unit)

**Part –C**

| | | |
|---|---|---|
| Five Paragraph questions (‘either …. or ‘type) | 5 x 08 | = 40 Marks |

(One question from each Unit)

| | |
|---|---|
| Total | 75 Marks |

## PART-IV- SKILL BASED PAPERS / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)

## QUESTION PAPER PATTERN FOR THE CONTINUOUS INTERNAL ASSESSMENT (SKILL BASED AND NME COURSES) DURATION – 1 HOUR

- 50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and converted for 15 marks

## THE COMPONENTS FOR CONTINUOUS INTERNAL ASSESSMENT ARE:

| | |
|---|---|
| Two tests and their average | --15 marks |
| Seminar /Group discussion / Quiz Test | -- 5 marks |
| Assignment | -- 5 marks |
| Total | 25 Marks |

**SUMMATIVE EXAMINATION PATTERN (SKILL BASED AND NME COURSES) DURATION – 3 HOURS**

Pattern of the Question Paper for Skill Based and Non-Major Elective courses (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

## PART-IV- ENVIRONMENTAL STUDIES AND VALUE EDUCATION

## QUESTION PAPER PATTERN (INTERNAL ASSESSMENT)

Pattern of the Question Paper for Environmental Studies & Value Education (Internal)

50 MCQs will be asked for each internal assessment tests (50 x 1=50 Marks) and converted for 15 marks

| | | |
|---|---|---|
| Two tests and their average | -- | 15 marks |
| Project | -- | 10 marks |
| | | --- |
| Total | | 25 Marks |
| | | --- |

* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

**SUMMATIVE EXAMINATION PATTERN**

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

**PART V EXTENSION ACTIVITIES: (MAXIMUM MARKS: 100)**

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

Internal Examinations - - 25 Marks

Summative Examinations - - 75 Marks

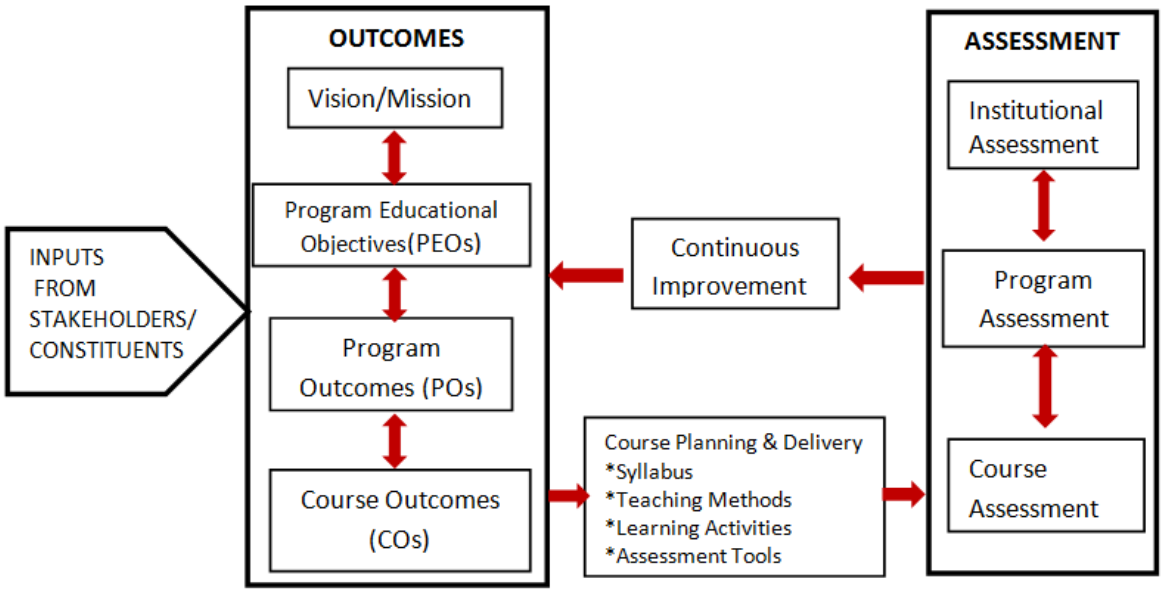
**100**

## *OUTCOME BASED EDUCATION:*

OBE starts with the identification and articulation of clear and measurable learning outcomes for each course or program. These outcomes describe the skills, knowledge, and abilities that students are expected to acquire. The curriculum, instructional methods, and assessments are aligned with the defined learning outcomes. This ensures that everything taught and evaluated is directly related to what students are expected to learn.

The Learning Outcomes-Based Approach to curriculum planning and transaction in our institution ensures whether the teaching-learning processes are oriented towards enabling students to attain the defined learning outcomes relating to the courses within a programme. The outcome based approach, particularly in the context of undergraduate studies, requires a significant shift from teacher-centric to learner-centric pedagogies and from passive to active/participatory pedagogies.

**Assessment Method:** The students are assessed with 2 internal examination and the summative examination which includes problem based assignments; practical assignment laboratory reports; observation of practical skills; individual project reports ,case-study reports; team project reports; oral presentations, including seminar presentation; viva voce interviews; computerized adaptive testing; etc. and any other pedagogic approaches as per the context.



## INSTITUTIONAL VISION

To Mould the learners into accomplished individuals by providing them with a stimulus for social change through character, confidence and competence.

## INSTITUTIONAL MISSION

1. Enlightening the learners on the ethical and environmental issues.

2. Extending holistic training to shape the learners in to committed and competent citizens.

3. Equipping them with soft skills for facing the competitive world.

4. Enriching their employability through career oriented courses.

5. Ensuring accessibility and opportunity to make education affordable to the underprivileged.

**Highlights of the Revamped Curriculum**:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS),**
**MADURAI – 625 004**
**B.SC PHYSICS CURRICULUM**
***(For the student admitted during the academic year 2023-2024 onwards)***

| Course Code | Title of the Course | Hrs | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|
| | | | | Int | Ext | Total |
| **FIRST SEMESTER** | | | | | | |
| **Part – I** | **Tamil / Alternative Course** | | | | | |
| 23UTAGT11 | தமிழ் இலக்கிய வரலாறு - I | 6 | 3 | 25 | 75 | 100 |
| **Part – II** | **English** | | | | | |
| 23UENGE11 | GENERAL ENGLISH - I | 6 | 3 | 25 | 75 | 100 |
| **Part - III** | **Core Courses** | | | | | |
| 23UPHCC11 | PROPERTIES OF MATTER AND ACOUSTICS | 5 | 5 | 25 | 75 | 100 |
| 23UPHCP11 | PHYSICS PRACTICAL - I | 4 | 4 | 25 | 75 | 100 |
| **Part - III** | **Elective Course** | | | | | |
| 23UMTEA11 | ALLIED MATHEMATICS - I | 5 | 4 | 25 | 75 | 100 |
| **Part IV** | **Non Major Elective** | | | | | |
| 23UPHNM11 | PHYSICS FOR EVERY DAY LIFE | 2 | 2 | 25 | 75 | 100 |
| **Part IV** | **Foundation Course** | | | | | |
| 23UPHFC11 | INTRODUCTORY PHYSICS | 2 | 2 | 25 | 75 | 100 |
| | **Total** | 30 | 23 | 175 | 525 | 700 |
| **SECOND SEMESTER** | | | | | | |
| **Part – I** | **Tamil / Alternative Course** | | | | | |
| 23UTAGT21 | தமிழ் இலக்கிய வரலாறு – II | 6 | 3 | 25 | 75 | 100 |
| **Part – II** | **English** | | | | | |
| 23UENGE21 | GENERAL ENGLISH - II | 6 | 3 | 25 | 75 | 100 |
| **Part - III** | **Core Courses** | | | | | |
| 23UPHCC21 | HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS | 5 | 5 | 25 | 75 | 100 |
| 23UPHCP21 | PHYSICS PRACTICAL 2 | 4 | 4 | 25 | 75 | 100 |
| **Part - III** | **Elective Course** | | | | | |
| 23UMTEA21 | ALLIED MATHEMATICS - II | 5 | 4 | 25 | 75 | 100 |
| **Part IV** | **Non Major Elective** | | | | | |
| 23UPHNM21 | PHYSICS OF MEDICAL INSTRUMENTS | 2 | 2 | 25 | 75 | 100 |
| **Part IV** | **Skill Enhancement course** | | | | | |
| 23UPHSC21 | FUNDAMENTALS OF ASTROPHYSICS | 2 | 2 | 25 | 75 | 100 |
| | **Total** | 30 | 23 | 175 | 525 | 700 |


FIRST SEMESTER

| | | | | |
|---|---|---|---|---|
| **Course Name** | PROPERTIES OF MATTER AND ACOUSTICS | | | |
| **Course Code** | 23UPHCC11 | **L** | **P** | **C** |
| **Category** | CORE PAPER | **5** | **-** | **5** |

**COURSE OBJECTIVES:**

- Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers. It gives us information about the internal forces which act between the constituent parts of the substance. Students who undergo this course are successfully bound to get a better insight and understanding of the subject.

**UNIT - I ELASTICITY** **15**

Hooke's law – stress-strain diagram – elastic constants –Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses)

**UNIT - II BENDING OF BEAMS** **15**

Cantilever– expression for Bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope

**UNIT - III FLUID DYNAMICS** **15**

*Surface tension*: Definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar's method– variation of surface tension with temperature

*Viscosity*: Definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille's formula –corrections – terminal velocity and Stoke's formula– variation of viscosity with temperature

**UNIT - IV WAVES AND OSCILLATIONS** **15**

Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and Sharpness of resonance.

Laws of transverse vibration in strings – sonometer – determination of AC frequency using sonometer – determination of frequency using Melde's string apparatus

**UNIT - V ACOUSTICS OF BUILDINGS AND ULTRASONICS** **15**

Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.

*Ultrasonic waves*: Production of ultrasonic waves – Piezoelectric crystal method –magneto striction effect – application of ultrasonic waves

| | |
|---|---|
| **Total Lecture Hours** | **75** |

**BOOKS FOR STUDY:**

- D.S.Mathur, 2010, Elements of Properties of Matter, S.Chandand Co.
- BrijLaland N. Subrahmanyam, 2003, Properties of Matter, S.Chandand Co
- D.R.KhannaandR.S.Bedi, 1969, Textbook of Sound, AtmaRamand sons
- BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition,Vikas Publishing House.
- R.Murugesan,2012, Properties of Matter, S.Chand and Co.

**BOOKS FOR REFERENCES:**

- C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers
- H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, R. Chand and Co.
- A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India.

**WEB RESOURCES:**

- **https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work**
- **http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.html**
- **https://www.youtube.com/watch?v=gT8Nth9NWPM**
- **https://www.youtube.com/watch?v=m4u-SuaSu1sandt=3s**
- **https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work**
- **https://learningtechnologyofficial.com/category/fluid-mechanics-lab/**
- **http://www.sound-physics.com/**
- **http://nptel.ac.in/courses/112104026/**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | ✓ | SKILL ORIENTED | | | ENTREPRENEURSHIP | | | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | | GLOBAL | ✓ | | | |
| **Changes Made in the Course** | Percentage of Change | | **40** | No Changes Made | | | New Course | | | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Relate elastic behavior in terms of three moduli of elasticity and working of torsion pendulum. | K1 to K4 |
| CO2 | Able to appreciate concept of bending of beams and analyze the expression, quantify and understand nature of materials. | K1 to K4 |
| CO3 | Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems. | K1 to K4 |
| CO4 | Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. Set up experiment to evaluate frequency of ac mains | K1 to K4 |
| CO5 | Understand the concept of acoustics, importance of constructing buildings with good acoustics. Able to apply their knowledge of ultrasonic in real life, especially in medical field and assimilate different methods of production of ultrasonic waves | K1 to K4 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| CO5 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 3 | 1 | 3 | - | 2 |
| CO 4 | 3 | 1 | 3 | - | 2 |
| CO 5 | 3 | 1 | 3 | - | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | PROPERTIES OF MATTER AND ACOUSTICS | HRS | PEDAGOGY |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **I** | Hooke's law – stress-strain diagram – elastic constants –Poisson's ratio – relation between elastic constants and Poisson's ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses) | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **II** | Cantilever– expression for Bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young's modulus – non-uniform bending– experiment to determine Young's modulus by Koenig's method – uniform bending – expression for elevation – experiment to determine Young's modulus using microscope | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **III** | Surface tension: Definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar's method– variation of surface tension with temperature<br>Viscosity: Definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille's formula –corrections – terminal velocity and Stoke's formula– variation of viscosity with temperature | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and Sharpness of resonance.<br>Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer–determination of frequency using Melde's string apparatus | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Intensity of sound – decibel – loudness of sound –reverberation – Sabine's reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.<br>*Ultrasonic waves*: Production of ultrasonic waves – Piezoelectric crystal method –magneto striction effect – application of ultrasonic waves | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | | **Section B Either or Choice** | **Section C Either or Choice** |
| | | | **MCQs** | | | |
| | | | **No. of. Questions** | **K - Level** | | |
| **CI AI** | **CO1** | **K1 – K4** | 2 | K1, K2 | K1 OR K1 | K3 OR K3 |
| | **CO2** | **K1 – K4** | 2 | K1,K2 | K2 OR K2 | K4 OR K4 |
| **CI AII** | **CO3** | **K1 – K4** | 2 | K1, K2 | K2 OR K2 | K3 OR K3 |
| | **CO4** | **K1 – K4** | 2 | K1,K2 | K3 OR K3 | K4 OR K4 |
| **Question Pattern CIA I & II** | | **No. of Questions to be asked** | 4 | | 4 | 4 |
| | | **No. of Questions to be answered** | 4 | | 2 | 2 |
| | | **Marks for each question** | 1 | | 5 | 8 |
| | | **Total Marks for each section** | 4 | | 10 | 16 |

| Distribution of Marks with K Level CIA I & CIA II | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Section B (Either / Or Choice)** | **Section C (Either / Or Choice)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | **2** | **10** | **-** | **12** | **21.43** | **-** |
| | **K2** | **2** | **10** | **-** | **12** | **21.43** | |
| | **K3** | **-** | **-** | **16** | **16** | **28.57** | **42.86** |
| | **K4** | **-** | **-** | **16** | **16** | **28.57** | **71.43** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |
| **CIA II** | **K1** | **2** | | | **2** | **3.57** | **-** |
| | **K2** | **2** | **10** | | **12** | **21.43** | |
| | **K3** | | **10** | **16** | **26** | **46.43** | **25.00** |
| | **K4** | | | **16** | **16** | **28.57** | **71.43** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K - LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1 – K4 | 2 | K1, K2 | K1, K1 | K2, K2 |
| 2 | CO2 | K1 – K4 | 2 | K1, K2 | K2, K2 | K2, K2 |
| 3 | CO3 | K1 – K4 | 2 | K1, K2 | K2, K2 | K3, K3 |
| 4 | CO4 | K1 – K4 | 2 | K1, K2 | K3, K3 | K3, K3 |
| 5 | CO5 | K1 – K4 | 2 | K1, K2 | K4, K4 | K4, K4 |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| K Level | Section A (Multiple Choice Questions) | Section B (Either or Choice | Section C (Either/ or Choice) | Total Marks | % of (Marks without choice) | Consolidated % |
| K1 | 5 | 10 | | 15 | 10.72 | - |
| K2 | 5 | 20 | 32 | 57 | 40.71 | 51.43 |
| K3 | | 10 | 32 | 42 | 30.00 | 30.00 |
| K4 | | 10 | 16 | 26 | 18.57 | 18.57 |
| Marks | 10 | 50 | 80 | 140 | 100 | 100 |
| NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels. | | | | | | |

## Summative Examinations - Question Paper – Format

| Q. No. | Unit | CO | K-level | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | | **PART – A** | **(10 x 1 = 10 Marks)** |
| 1. | **Unit - I** | **CO1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | **Unit - I** | **CO1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | **Unit - II** | **CO2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | **Unit - II** | **CO2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | **Unit - III** | **CO3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | **Unit - III** | **CO3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | **Unit - IV** | **CO4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | **Unit - IV** | **CO4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | **Unit - V** | **CO5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | **Unit - V** | **CO5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions | | **PART – B** | | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit - I** | **CO1** | **K1** | |
| | | **OR** | | |
| 11. b) | **Unit - I** | **CO1** | **K1** | |
| 12. a) | **Unit - II** | **CO2** | **K2** | |
| | | **OR** | | |
| 12. b) | **Unit - II** | **CO2** | **K2** | |
| 13. a) | **Unit - III** | **CO3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO3** | **K2** | |
| 14. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit - IV** | **CO4** | **K3** | |
| 15. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 15. b) | **Unit - V** | **CO5** | **K4** | |

| Answer **ALL** the questions | | **PART – C** | | **(5 x 8 = 40 Marks)** |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO1** | **K2** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO1** | **K2** | |
| 17. a) | **Unit - II** | **CO2** | **K2** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO2** | **K2** | |
| 18. a) | **Unit - III** | **CO3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO3** | **K3** | |
| 19. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO4** | **K3** | |
| 20. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO5** | **K4** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | PHYSICS PRACTICAL 1 | | | |
| **Course Code** | 23UPHCP11 | **L** | **P** | **C** |
| **Category** | CORE PRACTICAL | - | 4 | 4 |

**COURSE OBJECTIVES:**

- Apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

**SEMESTER - I LIST OF EXPERIMENTS** **45**

**Minimum of Eight Experiments from the list:**

1. Determination of rigidity modulus without mass using Torsional pendulum.
2. Determination of rigidity modulus with masses using Torsional pendulum.
3. Determination of moment of inertia of an irregular body.
4. Verification of parallel axes theorem on moment of inertia.
5. Verification of perpendicular axes theorem on moment of inertia.
6. Determination of moment of inertia and g using Bifilar pendulum.
7. Determination of Young's modulus by stretching of wire with known masses.
8. Verification of Hook's law by stretching of wire method.
9. Determination of Young's modulus by uniform bending – load depression graph.
10. Determination of Young's modulus by non-uniform bending – scale and telescope.
11. Determination of Young's modulus by cantilever – load depression graph.
12. Determination of Young's modulus by cantilever – oscillation method
13. Determination of Young's modulus by Koenig's method – ( or unknown load)
14. Determination of rigidity modulus by static torsion.
15. Determination of Y, n and K by Searle's double bar method.
16. Determination of surface tension and interfacial surface tension by drop weight method.
17. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.
18. Determination of critical pressure for streamline flow.
19. Determination of Poisson's ratio of rubber tube.
20. Determination of viscosity by Poiseullie's flow method.
21. Determination of radius of capillary tube by mercury pellet method.
22. Determination of g using compound pendulum.

**Total Lecture Hours** **45**

**BOOKS FOR STUDY:**

- Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., A Text Book of Practical Physics, 2017 Edition, Sultan Chand & Sons

**BOOKS FOR REFERENCES:**

- Ouseph.C., Practical Physics and Electronics, 2013, S.Viswanathan.P.Ltd.

**WEB RESOURCES:**

- **https://nptel.ac.in/course.html/physics/experimental physics I, II and III**
- **https://nptel.ac.in/courses/115/105/115105110/**
- **https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | **25** | No Changes Made | | New Course | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Remembering the Aim and apparatus used in the experiment | **K1** |
| **CO2** | Understanding of laws and formulas of the experiment | **K2** |
| **CO3** | Applying the knowledge to do the experiment | **K4** |
| **CO4** | Calculating and examining the aim of the experiment | **K3** |
| **CO5** | Interpreting the result of the experiment | **K2** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

| CO / PO MAPPING: | | | | | |
|---|---|---|---|---|---|
| **COS** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** |
| **CO 1** | **3** | **2** | **3** | **-** | **2** |
| **CO 2** | **3** | **2** | **3** | **-** | **2** |
| **CO 3** | **3** | **2** | **3** | **-** | **2** |
| **CO 4** | **3** | **2** | **3** | **-** | **2** |
| **CO 5** | **3** | **2** | **3** | **-** | **2** |
| **WEITAGE** | | | | | |
| **WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS** | | | | | |

**LESSON PLAN:**

| SEM | PRACTICAL 1 | HRS | PEDAGOGY |
|---|---|---|---|
| **I** | 1. Determination of Young's modulus by uniform bending – Pin and Microscope<br>2. Determination of Young's modulus by non-uniform bending – scale and telescope.<br>3. Determination of Young's modulus by cantilever – load depression graph.<br>4. Determination of rigidity modulus with masses using Torsional pendulum<br>5. Determination of surface tension and interfacial surface tension by drop weight method.<br>6. Determination of co-efficient of viscosity by Stokes' method – terminal velocity.<br>7. Determination of viscosity by Poiseullie's flow method.<br>8. Determination of g using compound pendulum. | **45** | **Demonstration and Video** |

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **No. of. Questions** | **K - Level** |
| **CIA-I** | **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| **Question Pattern CIA - I** | | No. of Questions to be asked | **1** Question for Each Student | |
| | | No. of Questions to be answered | **1** | |
| | | Marks for each question | **30** | |
| | | Total Marks for each section | **30** | |

| Distribution of Marks with COs & K Level for Correction of CIA I | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO1** | Aim and apparatus | **K1** | **2.0** |
| | **CO2** | Formula and Tabular Column | **K2** | **5** |
| | **CO3** | Understanding and Observation | **K4** | **12.0** |
| | **CO4** | Calculation and Graph | **K3** | **8.0** |
| | **CO5** | Interpretation of result | **K2** | **3.0** |
| | **Total Marks** | | | **30** |

| Distribution of Marks with K Level CIA I | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Distribution of the work of the experiment** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | Aim and apparatus | 2 | 6.66 | - |
| | **K2** | Formula and Tabular Column<br>Interpretation of result | 8 | 26.67 | |
| | **K3** | Understanding and Observation | 8 | 26.67 | **33.33** |
| | **K4** | Calculation and Graph | 12 | 40.00 | **60.00** |
| | **Marks** | | **30** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| **Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)** | | | |
|---|---|---|---|
| **COs** | **K - Level** | **No. of Questions** | **K – Level** |
| **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| No. of Questions to be Asked | | **1** Question for Each Student | |
| No. of Questions to be answered | | **1** | |
| Marks for each question | | **60** | |
| Total Marks for each section | | **60** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | |

| **Distribution of Marks with COs & K Level for Correction of the Summative Exam** | | | |
|---|---|---|---|
| **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CO1** | Aim and apparatus | **K1** | **5** |
| **CO2** | Formula and Tabular Column | **K2** | **10** |
| **CO3** | Understanding and Observation | **K4** | **25** |
| **CO4** | Calculation and Graph | **K3** | **15** |
| **CO5** | Interpretation of result | **K2** | **5** |
| **Total Marks** | | | **60** |

| **Distribution of Marks with K Level** | | | | |
|---|---|---|---|---|
| **K Level** | **Parameters for K-Level** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | Aim and apparatus | **5** | **8.33** | **-** |
| **K2** | Formula and Tabular Column, Interpretation of result | **15** | **25.00** | **8.33** |
| **K3** | Understanding and Observation | **25** | **41.67** | **33.33** |
| **K4** | Calculation and Graph | **15** | **25.00** | **75.00** |
| **Marks** | | **60** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

| **Course Name** | ALLIED MATHEMATICS - I | | | |
|---|---|---|---|---|
| **Course Code** | 23UMTEA11 | **L** | **P** | **C** |
| **Category** | ELECTIVE | 5 | - | 4 |

**COURSE OBJECTIVES:**

- To explore the fundamental concepts of Mathematics.
- To acquire knowledge about finding approximate roots of the polynomial equations.
- To improve students' ability in applications of matrices and calculus.
- Students are exposed to understanding the concept of derivatives and their applications.
- To expose double and triple integrals and their applications

**UNIT – I SOLUTIONS OF TRANSCENDENTAL AND ALGEBRAIC EQUATIONS 15**

Iteration method, Bisection method, Newton's method – Regula Falsi method, Horner's method(without proof) (Simple problems only

**UNIT – II SOLUTIONS OF SIMULTANEOUS EQUATIONS 15**

Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method - Gauss Jacobi method (Restricted to three variables only) (Simple problems only)

**UNIT - III MATRICES 15**

Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of inverse matrix

**UNIT – IV DIFFERENTIAL CALCULUS 15**

n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians– Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates

**UNIT - V APPLICATION OF INTEGRATION 15**

Evaluation of double, triple integrals – Simple applications to area, volume, and centroid.

**Total Lecture Hours 75**

**BOOKS FOR STUDY:**

- P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences
- Numerical Analysis, S. Chand & Company Ltd., New Delhi-55
  Unit I : Chapter 1

  Unit II: Chapter 2
- P. Duraipandian and Dr. S. Udayabaskaran (1997), "Allied Mathematics" , Vol I

  Chennai: Muhil Publishers.
  Unit III: Chapter 1 - Sec – 1.1.1, 1.1.2, 1.2, 1.4.3

- P. Duraipandian and Dr. S. Udayabaskaran (1997), "Allied Mathematics" , Vol II. Chennai: Muhil Publishers.

Unit IV : Chapter 1 - Sec – 1.1.1,1.1.2,1.2,1.4.3

Unit V: Chapter 3 – Sec - 3.4, 3.4.1, 3.5.1, 3.5.2, 3.6

**BOOKS FOR REFERENCES:**

- S.J.Venkatesan, "Allied Mathematics - I", Sri Krishna Publications, Chennai.
- P. R. Vittal (2003), "Allied Mathematics", Margham Publication, Chennai
- A.Singaravelu "Numerical Methods"Meenakshi Publications

**WEB RESOURCES:**

- **https;//www.mathwarehous.com/**
- **https;//www.mathhelp.com/**
- **https;//www.mathsisfun.com/**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | ✓ | NATIONAL | | GLOBAL | |
| **Changes Made in the Course** | Percentage of Change | | No Changes Made | | New Course | ✓ | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Find out the approximate roots of polynomial equations. | K1 to K4 |
| CO2 | Develop the skills of finding roots of simultaneous equations | K1 to K4 |
| CO3 | Demonstrate knowledge about matrices and their applications | K1 to K4 |
| CO4 | Carry out calculations of problems related to curvature and radius of curvature. | K1 to K4 |
| CO5 | Evaluate double and triple integrals, and enabled to understand the applications of integration in real-life situation | K1 to K4 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 3 | 3 | | | | |
| CO2 | 2 | 1 | 2 | 2 | 2 | 2 | | | | |
| CO3 | 3 | 2 | 2 | 3 | 1 | 2 | | | | |
| CO4 | 2 | 2 | 2 | 2 | 2 | 2 | | | | |
| CO5 | 2 | 1 | 2 | 2 | 3 | 2 | | | | |

S- STRONG M – MEDIUM L - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 2 | 1 | | |
| CO 2 | 3 | 2 | 1 | | |
| CO 3 | 3 | 2 | 1 | | |
| CO 4 | 3 | 2 | 1 | | |
| CO 5 | 3 | 2 | 1 | | |
| WEIGHTAGE | 15 | 10 | 5 | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | 3 | 2 | 1 | | |

**LESSON PLAN:**

| UNIT | ALLIED MATHEMATICS – I | HRS | PEDAGOGY |
|---|---|---|---|
| I | Iteration method, Bisection method, Newton's method – Regula Falsi method, Horner's method(without proof) (Simple problems only | 15 | Chalk & Talk |
| II | Gauss Elimination method - Gauss Jordan method – Gauss Seidel Iterative method - Gauss Jacobi method (Restricted to three variables only) (Simple problems only) | 15 | Chalk & Talk |
| III | Characteristic equation of a square matrix– Eigen values and eigen vectors – Cayley – Hamilton theorem [without proof] – Verification and computation of | 15 | Chalk & Talk |

| | | | |
|---|---|---|---|
| | inverse matrix | | |
| **IV** | n-th derivatives – Leibnitz theorem [without proof] and applications – Jacobians- Curvature and radius of curvature in Cartesian co-ordinates and polar co-ordinates | **15** | **Chalk & Talk** |
| **V** | Evaluation of double, triple integrals – Simple applications to area, volume, and centroid. | **15** | **Chalk & Talk** |

**Learning Outcome Based Education & Assessment (LOBE)**
**Formative Examination - Blue Print**
**Articulation Mapping – K Levels with Course Outcomes (COs)**

| Internal | Cos | K Level | Section A | | Section B Either or Choice | Section C Either or Choice |
|---|---|---|---|---|---|---|
| | | | MCQs | | | |
| | | | No. of. Questions | K - Level | | |
| CI AI | CO1 | K1 – K4 | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| | CO2 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| CI AII | CO3 | K1 – K4 | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| | CO4 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| Question Pattern CIA I & II | | No. of Questions to be asked | 4 | | 4 | 4 |
| | | No. of Questions to be answered | 4 | | 2 | 2 |
| | | Marks for each question | 1 | | 5 | 8 |
| | | Total Marks for each section | 4 | | 10 | 16 |

**Distribution of Marks with K Level CIA I & CIA II**

| | K Level | Section A (Multiple Choice Questions) | Section B (Either / Or Choice) | Section C (Either / Or Choice) | Total Marks | % of (Marks without choice) | Consolidate of % |
|---|---|---|---|---|---|---|---|
| CIA I | K1 | 2 | | | 2 | 3.6 | 25 |
| | K2 | 2 | 10 | | 12 | 21.4 | |
| | K3 | | 10 | 16 | 26 | 46.4 | 46.4 |
| | K4 | | | 16 | 16 | 28.6 | 28.6 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |
| CIA II | K1 | 2 | | | 2 | 3.6 | 7.2 |
| | K2 | 2 | 10 | | 2 | 3.6 | |
| | K3 | | 10 | 16 | 26 | 46.4 | 46.4 |
| | K4 | | | 16 | 26 | 46.4 | 46.4 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | Cos | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K - LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1 – K4 | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| 2 | CO2 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| 3 | CO3 | K1 – K4 | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| 4 | CO4 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| 5 | CO5 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| K Level | Section A (Multiple Choice Questions) | Section B (Either or Choice | Section C (Either/ or Choice) | Total Marks | % of (Marks without choice) | Consolidated % |
| K1 | 5 | | | 5 | 3.6 | 4 |
| K2 | 5 | 20 | | 25 | 17.8 | 18 |
| K3 | | 30 | 32 | 62 | 44.3 | 44 |
| K4 | | | 48 | 48 | 34.3 | 34 |
| Marks | 10 | 50 | 80 | 140 | 100 | 100 |
| NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels. | | | | | | |

## Summative Examinations - Question Paper – Format

| Q. No. | Unit | CO | K-level | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | | **PART – A** | **(10 x 1 = 10 Marks)** |
| 1. | **Unit - I** | **CO1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | **Unit - I** | **CO1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | **Unit - II** | **CO2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | **Unit - II** | **CO2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | **Unit - III** | **CO3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | **Unit - III** | **CO3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | **Unit - IV** | **CO4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | **Unit - IV** | **CO4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | **Unit - V** | **CO5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | **Unit - V** | **CO5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions | | **PART – B** | | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit - I** | **CO1** | **K2** | |
| | | **OR** | | |
| 11. b) | **Unit - I** | **CO1** | **K2** | |
| 12. a) | **Unit - II** | **CO2** | **K3** | |
| | | **OR** | | |
| 12. b) | **Unit - II** | **CO2** | **K3** | |
| 13. a) | **Unit - III** | **CO3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO3** | **K2** | |
| 14. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit - IV** | **CO4** | **K3** | |
| 15. a) | **Unit - V** | **CO5** | **K3** | |
| | | **OR** | | |
| 15. b) | **Unit - V** | **CO5** | **K3** | |

| Answer **ALL** the questions | | **PART – C** | | **(5 x 8 = 40 Marks)** |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO1** | **K3** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO1** | **K3** | |
| 17. a) | **Unit - II** | **CO2** | **K4** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO2** | **K4** | |
| 18. a) | **Unit - III** | **CO3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO3** | **K3** | |
| 19. a) | **Unit - IV** | **CO4** | **K4** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO4** | **K4** | |
| 20. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO5** | **K4** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | PHYSICS FOR EVERYDAY LIFE | | | |
| **Course Code** | 23UPHNM11 | **L** | **P** | **C** |
| **Category** | NON MAJOR ELECTIVES (NME) | **2** | **-** | **2** |

**COURSE OBJECTIVES:**

- To know where all physics principles have been put to use in daily life and appreciate the concepts with a better understanding also to know about Indian scientists who have made significant contributions to Physics

| | |
|---|---|
| **UNIT - I MECHANICAL OBJECTS** | **06** |
| Spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel. | |
| **UNIT - II OPTICAL INSTRUMENTS AND LASER** | **06** |
| Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – color photography – holography and laser. | |
| **UNIT - III PHYSICS OF HOME APPLIANCES** | **06** |
| Bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners | |
| **UNIT - IV SOLAR ENERGY** | **06** |
| Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells. | |
| **UNIT - V INDIAN PHYSICIST AND THEIR CONTRIBUTIONS** | **06** |
| C.V.Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology. | |
| **Total Lecture Hours** | **30** |

**BOOKS FOR STUDY:**

- The Physics in our Daily Lives, Umme Ammara, Gugucool Publishing, Hyderabad, 2019.
- For the love of physics, Walter Lawin, Free Press, New York, 2011.

**BOOKS FOR REFERENCES:**

- Physics Appliances in Everyday Life, S.S.Jayabalakrishnan, Shanlax Publications, Madurai, 2022

**WEB RESOURCES:**

- **https://byjus.com/question-answer/how-physics-affect-our-daily-life/**
- **https://www.orchidsinternationalschool.com/blog/child-learning/physics-in-everyday-life**
- **https://tws.edu.in/blog/application-of-physics-in-daily-life/**
- **https://sciencing.com/applications-physics-everyday-life-8637595.html**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | | No Changes Made | | New Course | ✓ | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Understand the concepts of bouncing balls, rockets, lenses, electric bulb and solar water heater | **K1 , K2** |
| **CO2** | Recollecting the principles of bicycles, photography, television and solar cells | **K1 , K2** |
| **CO3** | Comprehend basic concept of laser, vacuum cleaner, voltaic cell and space travel | **K1 , K2** |
| **CO4** | Articulate the knowledge about holography, air-conditioners and solar constant | **K1 , K2** |
| **CO5** | Interpret the real life solutions of UV protective glass, applications of solar energy and solar cells | **K1 , K2** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

| LESSON PLAN: | | | |
|---|---|---|---|
| **UNIT** | **PHYSICS FOR EVERYDAY LIFE** | **HRS** | **PEDAGOGY** |
| **I** | Spring scales – bouncing balls –roller coasters – bicycles –rockets and space travel. | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **II** | Vision corrective lenses – polaroid glasses – UV protective glass – polaroid camera – colour photography – holography and laser. | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **III** | Bulb – fan – hair drier – television – air conditioners – microwave ovens – vacuum cleaners | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | Solar constant – General applications of solar energy – Solar water heaters – Solar Photo – voltaic cells – General applications of solar cells. | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | C.V.Raman, Homi Jehangir Bhabha, Vikram Sarabhai, Subrahmanyan Chandrasekhar, Venkatraman Ramakrishnan, Dr. APJ Abdul Kalam and their contribution to science and technology. | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |

| **Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | |
| | | | **MCQs** | |
| | | | **No. of. Questions** | **K - Level** |
| **CI<br>AI** | **CO1** | **K1 – K2** | **25** | **K1,K2** |
| | **CO2** | **K1 – K2** | **25** | **K1,K2** |
| **CI<br>AII** | **CO3** | **K1 – K2** | **25** | **K1,K2** |
| | **CO4** | **K1 – K2** | **25** | **K1,K2** |
| **Question Pattern<br>CIA I & II** | | **No. of Questions to be asked** | **50** | |
| | | **No. of Questions to be answered** | **50** | |
| | | **Marks for each question** | **1** | |
| | | **Total Marks for each section** | **50** | |

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (I$^{st}$ Test-2 CO's & II$^{nd}$ Test-2 CO's) in equal weightage

| Distribution of Marks with K Level CIA I & CIA II | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |
| **CIA II** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | |
| | | | No. of Questions | K – Level |
| 1 | CO1 | K1-K2 | 15 | K1,K2 |
| 2 | CO2 | K1-K2 | 15 | K1,K2 |
| 3 | CO3 | K1-K2 | 15 | K1,K2 |
| 4 | CO4 | K1-K2 | 15 | K1,K2 |
| 5 | CO5 | K1-K2 | 15 | K1,K2 |
| No. of Questions to be Asked | | | 75 | |
| No. of Questions to be answered | | | 75 | |
| Marks for each question | | | 1 | |
| Total Marks for each section | | | 75 | |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | |

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| K Level | Section A (Multiple Choice Questions) | Total Marks | % of (Marks without choice) | Consolidated % |
| K1 | 40 | 40 | 53 | 100 |
| K2 | 35 | 35 | 47 | |
| K3 | | | | |
| K4 | | | | |
| Marks | | 75 | 100 | 100 |
| NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels. | | | | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | INTRODUCTORY PHYSICS | | | |
| **Course Code** | 23UPHFC11 | **L** | **P** | **C** |
| **Category** | FOUNDATION COURSE | **2** | **-** | **2** |

**COURSE OBJECTIVES:**

- To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme.

**UNIT - I** **06**

Vectors, scalars – examples for scalars and vectors from physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions – standard physics constants

**UNIT - II** **06**

Different types of forces – gravitational, electrostatic, magnetic, electromagnetic, nuclear – mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces

**UNIT - III** **06**

Different forms of energy – conservation laws of momentum, energy – types of collisions – angular momentum – alternate energy sources – real life examples

**UNIT - IV** **06**

Types of motion – linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion – comparison of light and sound waves – free, forced, damped oscillations

**UNIT - V** **06**

Surface tension – shape of liquid drop – angle of contact – viscosity – lubricants – capillary flow – diffusion - real life examples – properties and types of materials in daily use- conductors, insulators – thermal and electric

**Total Lecture Hours** **30**

**BOOKS FOR STUDY:**

- D.S. Mathur, 2010, Elements of Properties of Matter, S.Chand and Co
- Brij Lal and N. Subrahmanyam, 2003, Properties of Matter, S.Chand and Co.

**BOOKS FOR REFERENCES:**

- H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition, S.Chand and Co.

**WEB RESOURCES:**

- **http://hyperphysics.phy-astr.gsu.edu/hbase/permot2.htmlhttps://science.nasa.gov/ems/**
- **https://eesc.columbia.edu/courses/ees/climate/lectures/radiation_hays/**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | | No Changes Made | | New Course | ✓ | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Apply concept of vectors to understand concepts of Physics and solve problems | **K1 , K2** |
| **CO2** | Appreciate different forces present in Nature while learning about phenomena related to these different forces. | **K1 , K2** |
| **CO3** | Quantify energy in different process and relate momentum, velocity and energy | **K1 , K2** |
| **CO4** | Differentiate different types of motions they would encounter in various courses and understand their basis | **K1 , K2** |
| **CO5** | Relate various properties of matter with their behaviour and connect them with different physical parameters involved. | **K1 , K2** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTIO | | | | | |

| N TO POS | | | | | |
|---|---|---|---|---|---|

**LESSON PLAN:**

| UNIT | INTRODUCTORY PHYSICS | HRS | PEDAGOGY |
|---|---|---|---|
| I | Vectors, scalars –examples for scalars and vectors from physical quantities – addition, subtraction of vectors – resolution and resultant of vectors – units and dimensions– standard physics constants | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Different types of forces–gravitational, electrostatic, magnetic, electromagnetic, nuclear –mechanical forces like, centripetal, centrifugal, friction, tension, cohesive, adhesive forces | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| III | Different forms of energy– conservation laws of momentum, energy – types of collisions –angular momentum– alternate energy sources–real life examples | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| IV | Types of motion– linear, projectile, circular, angular, simple harmonic motions – satellite motion – banking of a curved roads – stream line and turbulent motions – wave motion –comparison of light and sound waves – free, forced, damped oscillations | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| V | Surface tension – shape of liquid drop – angle of contact – viscosity – lubricants – capillary flow – diffusion – real life examples– properties and types of materials in daily use- conductors, insulators – thermal and electric | 6 | Chalk & Talk, Videos, PPT and Demonstration |

**Learning Outcome Based Education & Assessment (LOBE)**
**Formative Examination - Blue Print**
**Articulation Mapping – K Levels with Course Outcomes (COs)**

| Internal | Cos | K Level | Section A | |
|---|---|---|---|---|
| | | | MCQs | |
| | | | No. of. Questions | K - Level |
| CI AI | CO1 | K1 – K2 | 25 | K1,K2 |
| | CO2 | K1 – K2 | 25 | K1,K2 |
| CI AII | CO3 | K1 – K2 | 25 | K1,K2 |
| | CO4 | K1 – K2 | 25 | K1,K2 |
| Question Pattern CIA I & II | | No. of Questions to be asked | 50 | |
| | | No. of Questions to be answered | 50 | |
| | | Marks for each question | 1 | |
| | | Total Marks for each section | 50 | |

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (I$^{st}$ Test-2 CO's & II$^{nd}$ Test-2 CO's) in equal weightage

| Distribution of Marks with K Level CIA I & CIA II | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |
| **CIA II** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | |
| | | | No. of Questions | K – Level |
| 1 | CO1 | K1-K2 | 15 | K1,K2 |
| 2 | CO2 | K1-K2 | 15 | K1,K2 |
| 3 | CO3 | K1-K2 | 15 | K1,K2 |
| 4 | CO4 | K1-K2 | 15 | K1,K2 |
| 5 | CO5 | K1-K2 | 15 | K1,K2 |
| No. of Questions to be Asked | | | 75 | |
| No. of Questions to be answered | | | 75 | |
| Marks for each question | | | 1 | |
| Total Marks for each section | | | 75 | |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | |

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| K Level | Section A (Multiple Choice Questions) | Total Marks | % of (Marks without choice) | Consolidated % |
| K1 | 40 | 40 | 53 | 100 |
| K2 | 35 | 35 | 47 | |
| K3 | | | | |
| K4 | | | | |
| Marks | | 75 | 100 | 100 |
| NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels. | | | | |


SECOND SEMESTER

| **Course Name** | HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS | | | |
|---|---|---|---|---|
| **Course Code** | 23UPHCC21 | **L** | **P** | **C** |
| **Category** | CORE PAPER | **5** | **-** | **5** |

**COURSE OBJECTIVES:**

- The course focuses to understand a basic in conversion of temperature in Celsius, Kelvin and Fahrenheit scales. Practical exhibition and explanation of transmission of heat in good and bad conductor. Relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation

**UNIT - I CALORIMETRY & LOW TEMPERATURE PHYSICS** **15**

Specific heat capacity – specific heat capacity of gases $C_P$ and $C_V$ – Meyer's relation – Joly's method for determination of $C_V$ – Regnault's method for determination of $C_P$
Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation.

**UNIT - II THERMODYNAMICS-I** **15**

Zeroth law and first law of thermodynamics – P-V diagram – heat engine – efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines.

**UNIT - III THERMODYNAMICS-II** **15**

Second law of thermodynamics – entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram – thermodynamical scale of temperature – Maxwell's thermodynamical relations – Clasius-Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death.

**UNIT - IV HEAT TRANSFER** **15**

***Modes of heat transfer:*** Conduction, convection and radiation.
***Conduction*****:** thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad conductor by Lee's disc method.
***Radiation*****:** black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law – Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law.

**UNIT - V STATISTICAL MECHANICS** **15**

Definition of phase-space – micro and macro states – ensembles – different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics –expression for distribution function – comparison of three statistics.

| **Total Lecture Hours** | **75** |
|---|---|

**BOOKS FOR STUDY:**

- BrijlalandN. Subramaniam, 2000, Heat and Thermodynamics, S.Chandand Co.
- NarayanamoorthyandKrishnaRao, 1969,Heat,Triveni Publishers, Chennai.
- V.R.KhannaandR.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish and Co, Meerut
- Brijlal and N. Subramanyam, 2001, Waves and Oscillations,Vikas Publishing House, New Delhi.
- Ghosh, 1996, Text Book of Sound, S.ChandandCo.
- R.MurugeshanandKiruthigaSivaprasath, Thermal Physics,
- S.Chandand Co.

**BOOKS FOR REFERENCES:**

- J.B.Rajam and C.L.Arora, 1976, Heat and Thermodynamics, 8th edition, S.Chandand Co. Ltd.
- D.S.Mathur, Heat and Thermodynamics, Sultan Chand and Sons.
- Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand and Co.
- Resnick, HallidayandWalker,2010, Fundamentals of Physics, 6th Edition.
- Sears, Zemansky, Hugh D. Young,Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson.

**WEB RESOURCES:**

- **https://youtu.be/M_5KYncYNyc**
- **https://www.youtube.com/watch?v=4M72kQulGKkandvl=en**
- **Lecture 1: Thermodynamics Part 1 | Video Lectures | Statistical Mechanics I: Statistical Mechanics of Particles | Physics | MIT OpenCourseWare**
- **http://www.freebookcentre.net/Physics/Physics-Books-Online.html**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | ✓ | SKILL ORIENTED | | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | **55** | No Changes Made | | New Course | | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Acquires knowledge on how to distinguish between temperature and heat. Introduce him/her to the field of thermometry and explain practical measurements of high temperature as well as low temperature physics. Student identifies the relationship between heat capacity, specific heat capacity. The study of Low temperature Physics sets the basis for the students to understand cryogenics, superconductivity, superfluidity and Condensed Matter Physics | **K1 to K4** |
| **CO2** | Derive the efficiency of Carnot's engine. Discuss the implications of the laws of Thermodynamics in diesel and petrol engines | **K1 to K4** |
| **CO3** | Able to analyze performance of thermodynamic systems viz efficiency by problems. Gets an insight into thermodynamic properties like enthalpy, entropy | **K1 to K4** |

| | | |
|---|---|---|
| **CO4** | Study the process of thermal conductivity and apply it to good and bad conductors. Quantify different parameters related to heat, relate them with various physical parameters and analyse them | **K1 to K4** |
| **CO5** | Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac . Apply to quantum particles such as photon and electron | **K1 to K4** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| CO5 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 3 | 1 | 3 | - | 2 |
| CO 4 | 3 | 1 | 3 | - | 2 |
| CO 5 | 3 | 1 | 3 | - | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | HEAT, THERMODYNAMICS AND STATISTICAL PHYSICS | HRS | PEDAGOGY |
|---|---|---|---|
| I | Specific heat capacity – specific heat capacity of gases $C_P$ and $C_V$ - Meyer's relation – Joly's method for determination of $C_V$ – Regnault' method for determination of $C_P$<br>Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect – Boyle temperature – temperature of inversion – liquefaction of gas by Linde's Process – adiabatic demagnetisation. | 15 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Zeroth law and first law of thermodynamics – P-V diagram – heat engine – efficiency of heat engine – Carnot's engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines. | 15 | Chalk & Talk, Videos, PPT and Demonstration |

| | | | |
|---|---|---|---|
| **III** | Second law of thermodynamics – entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram – thermodynamical scale of temperature – Maxwell's thermodynamical relations –Clasius-Clapeyron's equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death. | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | ***Modes of heat transfer:*** Conduction, convection and radiation.<br>***Conduction*****:** thermal conductivity – determination of thermal conductivity of a good conductor by Forbe's method – determination of thermal conductivity of a bad conductor by Lee's disc method.<br>***Radiation*****:** black body radiation (Ferry's method) – distribution of energy in black body radiation – Wien's law and Rayleigh Jean's law – Planck's law of radiation – Stefan's law – deduction of Newton's law of cooling from Stefan's law. | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Definition of phase-space – micro and macro states – ensembles – different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics – expression for distribution function – Bose-Einstein statistics – expression for distribution function – Fermi-Dirac statistics –expression for distribution function – comparison of three statistics. | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |

**Learning Outcome Based Education & Assessment (LOBE)**
**Formative Examination - Blue Print**
**Articulation Mapping – K Levels with Course Outcomes (COs)**

| Internal | Cos | K Level | Section A | | Section B Either or Choice | Section C Either or Choice |
|---|---|---|---|---|---|---|
| | | | MCQs | | | |
| | | | No. of. Questions | K - Level | | |
| CI AI | CO1 | K1 – K4 | 2 | K1, K2 | K1 OR K1 | K3 OR K3 |
| | CO2 | K1 – K4 | 2 | K1,K2 | K2 OR K2 | K4 OR K4 |
| CI AII | CO3 | K1 – K4 | 2 | K1, K2 | K2 OR K2 | K3 OR K3 |
| | CO4 | K1 – K4 | 2 | K1,K2 | K3 OR K3 | K4 OR K4 |
| Question Pattern CIA I & II | | No. of Questions to be asked | 4 | | 4 | 4 |
| | | No. of Questions to be answered | 4 | | 2 | 2 |
| | | Marks for each question | 1 | | 5 | 8 |
| | | Total Marks for each section | 4 | | 10 | 16 |

| Distribution of Marks with K Level CIA I & CIA II | | | | | | | |
|---|---|---|---|---|---|---|---|
| | K Level | Section A (Multiple Choice Questions) | Section B (Either / Or Choice) | Section C (Either / Or Choice) | Total Marks | % of (Marks without choice) | Consolidate of % |
| CIA I | K1 | 2 | 10 | - | 12 | 21.43 | - |
| | K2 | 2 | 10 | - | 12 | 21.43 | |
| | K3 | - | - | 16 | 16 | 28.57 | 42.86 |
| | K4 | - | - | 16 | 16 | 28.57 | 71.43 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |
| CIA II | K1 | 2 | | | 2 | 3.57 | - |
| | K2 | 2 | 10 | | 12 | 21.43 | |
| | K3 | | 10 | 16 | 26 | 46.43 | 25.00 |
| | K4 | | | 16 | 16 | 28.57 | 71.43 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K - LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1, K2 | 2 | K1, K2 | K1, K1 | K2, K2 |
| 2 | CO2 | K1, K2 | 2 | K1, K2 | K2, K2 | K2, K2 |
| 3 | CO3 | K1, K2 | 2 | K1, K2 | K2, K2 | K3, K3 |
| 4 | CO4 | K1, K2 | 2 | K1, K2 | K3, K3 | K3, K3 |
| 5 | CO5 | K1, K2 | 2 | K1, K2 | K4, K4 | K4, K4 |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Section B (Either or Choice** | **Section C (Either/ or Choice)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | **5** | **10** | | **15** | **10.72** | **-** |
| **K2** | **5** | **20** | **32** | **57** | **40.71** | **51.43** |
| **K3** | | **10** | **32** | **42** | **30.00** | **30.00** |
| **K4** | | **10** | **16** | **26** | **18.57** | **18.57** |
| **Marks** | **10** | **50** | **80** | **140** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | | | |

## Summative Examinations - Question Paper – Format

| **Q. No.** | **Unit** | **CO** | **K-level** | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | **PART – A** | | **(10 x 1 = 10 Marks)** |
| 1. | Unit - I | **CO1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | Unit - I | **CO1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | Unit - II | **CO2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | Unit - II | **CO2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | Unit - III | **CO3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | Unit - III | **CO3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | Unit - IV | **CO4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | Unit - IV | **CO4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | Unit - V | **CO5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | Unit - V | **CO5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions | | | **PART – B** | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit - I** | **CO1** | **K1** | |
| | | **OR** | | |
| 11. b) | **Unit - I** | **CO1** | **K1** | |
| 12. a) | **Unit - II** | **CO2** | **K2** | |
| | | **OR** | | |
| 12. b) | **Unit - II** | **CO2** | **K2** | |
| 13. a) | **Unit - III** | **CO3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO3** | **K2** | |
| 14. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit - IV** | **CO4** | **K3** | |
| 15. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 15. b) | **Unit - V** | **CO5** | **K4** | |

| Answer **ALL** the questions | | | **PART – C** | **(5 x 8 = 40 Marks)** |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO1** | **K2** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO1** | **K2** | |
| 17. a) | **Unit - II** | **CO2** | **K2** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO2** | **K2** | |
| 18. a) | **Unit - III** | **CO3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO3** | **K3** | |
| 19. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO4** | **K3** | |
| 20. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO5** | **K4** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | PHYSICS PRACTICAL 2 | | | |
| **Course Code** | 23UPHCP21 | **L** | **P** | **C** |
| **Category** | CORE PRACTICAL | **-** | **4** | **4** |

**COURSE OBJECTIVES:**

- Apply their knowledge gained about the concept of heat and sound waves, resonance, calculate frequency of ac mains set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results

**SEMESTER - II LIST OF EXPERIMENTS 45**

**Minimum of Eight Experiments from the list:**

1. Determination of specific heat by cooling – graphical method.
2. Determination of thermal conductivity of good conductor by Searle's method.
3. Determination of thermal conductivity of bad conductor by Lee's disc method.
4. Determination of thermal conductivity of bad conductor by Charlaton's method.
5. Determination of specific heat capacity of solid.
6. Determination of specific heat of liquid by Joule's electrical heating method (applying radiation correction by Barton's correction/graphical method),
7. Determination of Latent heat of a vaporization of a liquid.
8. Determination of Stefan's constant for Black body radiation.
9. Verification of Stefan's-Boltzmans law.
10. Determination of thermal conductivity of rubber tube.
11. Helmholtz resonator.
12. Velocity of sound through a wire using Sonometer.
13. Determination of velocity of sound using Kunds tube.
14. Determination of frequency of an electrically maintained tuning fork
15. To verify the laws of transverse vibration using sonometer.
16. To verify the laws of transverse vibration using Melde's apparatus.
17. To compare the mass per unit length of two strings using Melde's apparatus.
18. Frequency of AC by using sonometer.

**Total Lecture Hours 45**

**BOOKS FOR STUDY:**

- Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., A Text Book of Practical Physics, 2017 Edition, Sultan Chand & Sons

**BOOKS FOR REFERENCES:**

- Ouseph.C., Practical Physics and Electronics, 2013, S.Viswanathan.P.Ltd.

**WEB RESOURCES:**

- **https://nptel.ac.in/course.html/physics/experimental physics I, II and III**
- **https://nptel.ac.in/courses/115/105/115105110/**
- **https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | **80** | No Changes Made | | New Course | | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Remembering the Aim and apparatus used in the experiment | **K1** |
| **CO2** | Understanding of laws and formulas of the experiment | **K2** |
| **CO3** | Applying the knowledge to do the experiment | **K4** |
| **CO4** | Calculating and examining the aim of the experiment | **K3** |
| **CO5** | Interpreting the result of the experiment | **K2** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 2 | 3 | - | 2 |
| CO 2 | 3 | 2 | 3 | - | 2 |
| CO 3 | 3 | 2 | 3 | - | 2 |
| CO 4 | 3 | 2 | 3 | - | 2 |
| CO 5 | 3 | 2 | 3 | - | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| SEM | PRACTICAL 2 | HRS | PEDAGOGY |
|---|---|---|---|
| I | 1. Determination of thermal conductivity of bad conductor by Lee's disc method.<br>2. Determination of specific heat capacity of solid.<br>3. Determination of Stefan's constant for Black body radiation.<br>4. Determination of thermal conductivity of rubber tube.<br>5. Velocity of sound through a wire using Sonometer.<br>6. Determination of frequency of an electrically maintained tuning fork<br>7. To verify the laws of transverse vibration using sonometer.<br>8. Frequency of AC by using sonometer. | 45 | Demonstration and Video |

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **No. of. Questions** | **K - Level** |
| **CIA-I** | **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| **Question Pattern CIA - I** | | No. of Questions to be asked | **1** Question for Each Student | |
| | | No. of Questions to be answered | **1** | |
| | | Marks for each question | **30** | |
| | | Total Marks for each section | **30** | |

| Distribution of Marks with COs & K Level for Correction of CIA I | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO1** | Aim and apparatus | **K1** | **2.0** |
| | **CO2** | Formula and Tabular Column | **K2** | **5.0** |
| | **CO3** | Understanding and Observation | **K4** | **12.0** |
| | **CO4** | Calculation and Graph | **K3** | **8.0** |
| | **CO5** | Interpretation of result | **K2** | **3.0** |
| | **Total Marks** | | | **30** |

| Distribution of Marks with K Level CIA I | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Distribution of the work of the experiment** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | Aim and apparatus | 2 | 6.66 | - |
| | **K2** | Formula and Tabular Column Interpretation of result | 8 | 26.67 | |
| | **K3** | Understanding and Observation | 8 | 26.67 | **33.33** |
| | **K4** | Calculation and Graph | 12 | 40.00 | **60.00** |
| | **Marks** | | **30** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | |
|---|---|---|---|
| **COs** | **K - Level** | **No. of Questions** | **K – Level** |
| **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| No. of Questions to be Asked | | **1** Question for Each Student | |
| No. of Questions to be answered | | **1** | |
| Marks for each question | | **60** | |
| Total Marks for each section | | **60** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | |

| Distribution of Marks with COs & K Level for Correction of the Summative Exam | | | |
|---|---|---|---|
| **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CO1** | Aim and apparatus | **K1** | **5** |
| **CO2** | Formula and Tabular Column | **K2** | **10** |
| **CO3** | Understanding and Observation | **K4** | **25** |
| **CO4** | Calculation and Graph | **K3** | **15** |
| **CO5** | Interpretation of result | **K2** | **5** |
| **Total Marks** | | | **60** |

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| **K Level** | **Parameters for K-Level** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | Aim and apparatus | **5** | **8.33** | **-** |
| **K2** | Formula and Tabular Column, Interpretation of result | **15** | **25.00** | **8.33** |
| **K3** | Understanding and Observation | **25** | **41.67** | **33.33** |
| **K4** | Calculation and Graph | **15** | **25.00** | **75.00** |
| **Marks** | | **60** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

| **Course Name** | ALLIED MATHEMATICS - II | | | |
|---|---|---|---|---|
| **Course Code** | 23UMTEA21 | **L** | **P** | **C** |
| **Category** | ELECTIVE | 5 | - | 4 |

**COURSE OBJECTIVES:**

- This course is designed for the students to expose the topics such as expansions of trigonometric functions, partial differential equations, and integration.
- To gain knowledge of expansions of trigonometric functions.
- To acquire the knowledge of solving partial differential equations.
- Basic knowledge of vector calculus.
- To understand and carry out the calculations of a given set of data

**UNIT – I TRIGONOMETRY** **15**

Expansions of sin n θ, cos n θ, sinnθ, cosnθ, tannθ – Expansions of sinθ, cosθ, tanθ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers.

**UNIT – II PARTIAL DIFFERENTIAL EQUATION** **15**

Formation-complete integrals and general integrals-Four standard types-Lagrange's equation.

**UNIT - III VECTOR DIFFRENTIATIO** **15**

Vector functions- Derivative of a vector function- Scalar and vector point functions- Gradient of a scalar point function-Gradient- Directional derivatives –Unit vector normal to a surface– angle between the surfaces-divergence, curl.

**UNIT – IV VECTOR INTEGRATION** **15**

Green's theorem in the plane- Gauss divergence theorem- Stoke's theorem [without proofs].

**UNIT - V FINITE DIFFERENCE** **15**

Operator E, Relation between Δ ,∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation- Lagrange's interpolation formula for unequal intervals(without proof) .

**Total Lecture Hours** **75**

**BOOKS FOR STUDY:**

- P. Duraipandian and S. Udayabaskaran(1997), "Allied Mathematics", Vol I & II. Chennai: Muhil Publishers.

  Unit-I: Chapter 6 (6.1,6.1.1-6.1.3,6.2,6.2.1-6.2.3,6.3,6.4), Vol I,

  Unit-II: Chapter :6 (6.1,6.1.1,6.2,6.3,6.4), Vol II,

  Unit-III Chapter 8 - (8.1,8.1.1,8.2,8.3,8.3.1,8.3.2,8.4,8.4.1,8.4.2,8.4.3,8.4.4),Vol I,

  Unit-IV: Chapter 8 - (8.6.1 - 8.6.3), Vol I,

  Unit-V: Chapter 5 - (5.1,5.2) Vol II

**BOOKS FOR REFERENCES:**

- S.P.Rajagopalan and R.Sattanathan(2005), "Allied Mathematics", Vol I & II. New Delhi: Vikas Publications.
- S.J.Venkatesan, "Allied Mathematics - II", Sri Krishna Publications, Chennai.
- P. R. Vittal (2003), "Allied Mathematics", Margham Publications, Chennai.
- P.Kandhasamy, K. Thilagavathy (2003), "Allied Mathematics" Vol I & II, New Delhi: Tata McGraw Hill.
- P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences & Numerical Analysis,S. Chand & Company Ltd., New Delhi-55.

**WEB RESOURCES:**

- **https;//www.mathwarehous.com/**
- **https;//www.mathhelp.com/**
- **https;//www.mathsisfun.com/**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | | SKILL ORIENTED | | ✓ | ENTREPRENEURSHIP | | | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | ✓ | NATIONAL | | | GLOBAL | | | |
| **Changes Made in the Course** | Percentage of Change | | | No Changes Made | | | New Course | ✓ | | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Find out the expansions of trigonometric functions and carry out problems related to hyperbolic and inverse hyperbolic functions. | K1 to K4 |
| CO2 | Provide a basic knowledge of partial differential equations and develops knowledge on handling practical problems. Develop the skills of finding roots of simultaneous equations | K1 to K4 |
| CO3 | Demonstrate knowledge of solving problems involving vector and scalar functions. | K1 to K4 |
| CO4 | Carry out calculations of problems related to vector integration | K1 to K4 |
| CO5 | Evaluate finite differences using various interpolation methods | K1 to K4 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 3 | 2 | 3 | | | | |
| CO2 | 2 | 2 | 2 | 3 | 2 | 3 | | | | |
| CO3 | 3 | 2 | 2 | 3 | 1 | 1 | | | | |
| CO4 | 1 | 2 | 2 | 1 | 2 | 3 | | | | |
| CO5 | 3 | 2 | 2 | 1 | 2 | 3 | | | | |

S- STRONG M – MEDIUM L - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 2 | 1 | | |
| CO 2 | 3 | 2 | 1 | | |
| CO 3 | 3 | 2 | 1 | | |
| CO 4 | 3 | 2 | 1 | | |
| CO 5 | 3 | 2 | 1 | | |
| WEIGHTAGE | 15 | 10 | 5 | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | 3 | 2 | 1 | | |

**LESSON PLAN:**

| UNIT | ALLIED MATHEMATICS –II | HRS | PEDAGOGY |
|---|---|---|---|
| I | Expansions of sin n θ, cos n θ, sinnθ, cosnθ, tannθ – Expansions of sinθ, cosθ, tanθ in terms of θ – Hyperbolic and inverse hyperbolic functions – Logarithms of complex numbers. | 15 | Chalk & Talk |
| II | Formation-complete integrals and general integrals-Four standard types-Lagrange's equation | 15 | Chalk & Talk |

| | | | |
|---|---|---|---|
| **III** | Vector functions- Derivative of a vector function- Scalar and vector point functions- Gradient of a scalar point function-Gradient-Directional derivatives –Unit vector normal to a surface– angle between the surfaces-divergence, curl.. | **15** | **Chalk & Talk** |
| **IV** | Green's theorem in the plane- Gauss divergence theorem- Stoke's theorem [without proofs]. | **15** | **Chalk & Talk** |
| **V** | Operator E, Relation between Δ ,∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation- Lagrange's interpolation formula for unequal intervals(without proof) . | **15** | **Chalk & Talk** |

| **Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | | | |
|---|---|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | | **Section B Either or Choice** | **Section C Either or Choice** |
| | | | **MCQs** | | | |
| | | | **No. of. Questions** | **K - Level** | | |
| **CI AI** | **CO1** | **K1 – K4** | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| | **CO2** | **K1 – K4** | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| **CI AII** | **CO3** | **K1 – K4** | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| | **CO4** | **K1 – K4** | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| **Question Pattern CIA I & II** | | **No. of Questions to be asked** | 4 | | 4 | 4 |
| | | **No. of Questions to be answered** | 4 | | 2 | 2 |
| | | **Marks for each question** | 1 | | 5 | 8 |
| | | **Total Marks for each section** | 4 | | 10 | 16 |

| Distribution of Marks with K Level CIA I & CIA II | | | | | | | |
|---|---|---|---|---|---|---|---|
| | K Level | Section A (Multiple Choice Questions) | Section B (Either / Or Choice) | Section C (Either / Or Choice) | Total Marks | % of (Marks without choice) | Consolidate of % |
| CIA I | K1 | 2 | | | 2 | 3.6 | 25 |
| | K2 | 2 | 10 | | 12 | 21.4 | |
| | K3 | | 10 | 16 | 26 | 46.4 | 46.4 |
| | K4 | | | 16 | 16 | 28.6 | 28.6 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |
| CIA II | K1 | 2 | | | 2 | 3.6 | 7.2 |
| | K2 | 2 | 10 | | 2 | 3.6 | |
| | K3 | | 10 | 16 | 26 | 46.4 | 46.4 |
| | K4 | | | 16 | 26 | 46.4 | 46.4 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | Cos | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K - LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1 – K4 | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| 2 | CO2 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| 3 | CO3 | K1 – K4 | 2 | K1,K2 | 2(K2,K2) | 2(K3,K3) |
| 4 | CO4 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| 5 | CO5 | K1 – K4 | 2 | K1,K2 | 2(K3,K3) | 2(K4,K4) |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Section B (Either or Choice** | **Section C (Either/ or Choice)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | **5** | | | **5** | **3.6** | **4** |
| **K2** | **5** | **20** | | **25** | **17.8** | **18** |
| **K3** | | **30** | **32** | **62** | **44.3** | **44** |
| **K4** | | | **48** | **48** | **34.3** | **34** |
| **Marks** | **10** | **50** | **80** | **140** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | | | |

## Summative Examinations - Question Paper – Format

| **Q. No.** | **Unit** | **CO** | **K-level** | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | **PART – A** | **(10 x 1 = 10 Marks)** | |
| 1. | **Unit - I** | **CO1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | **Unit - I** | **CO1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | **Unit - II** | **CO2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | **Unit - II** | **CO2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | **Unit - III** | **CO3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | **Unit - III** | **CO3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | **Unit - IV** | **CO4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | **Unit - IV** | **CO4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | **Unit - V** | **CO5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | **Unit - V** | **CO5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions | | **PART – B** | | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit - I** | **CO1** | **K2** | |
| | | **OR** | | |
| 11. b) | **Unit - I** | **CO1** | **K2** | |
| 12. a) | **Unit - II** | **CO2** | **K3** | |
| | | **OR** | | |
| 12. b) | **Unit - II** | **CO2** | **K3** | |
| 13. a) | **Unit - III** | **CO3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO3** | **K2** | |
| 14. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit - IV** | **CO4** | **K3** | |
| 15. a) | **Unit - V** | **CO5** | **K3** | |
| | | **OR** | | |
| 15. b) | **Unit - V** | **CO5** | **K3** | |

| Answer **ALL** the questions | | **PART – C** | | **(5 x 8 = 40 Marks)** |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO1** | **K3** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO1** | **K3** | |
| 17. a) | **Unit - II** | **CO2** | **K4** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO2** | **K4** | |
| 18. a) | **Unit - III** | **CO3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO3** | **K3** | |
| 19. a) | **Unit - IV** | **CO4** | **K4** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO4** | **K4** | |
| 20. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO5** | **K4** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | PHYSICS OF MEDICAL INSTRUMENTS | | | |
| **Course Code** | 23UPHNM21 | **L** | **P** | **C** |
| **Category** | NON MAJOR ELECTIVES (NME) | **2** | - | 2 |

**COURSE OBJECTIVES:**

- The students will be exposed to instruments like ECG,EEG,EMG, medical imaging, diagnostic specialties, operation theater and its safety which will kindle interest to specialize in instrument servicing.

## UNIT - I BIO-POTENTIALS AND ELECTRODES 06

Transport of ions through cell membrane- resting and action potential - Characteristics of resting potential – bio-electric potential – design of medical instruments – components of bio-medical instrumentation – electrodes – electrode potential – metal microelectrode – depth and needle electrodes – types of surface electrode – the pH electrode.

## UNIT - II BIO-POTENTIAL BASED INSTRUMENTATION 06

Electrocardiography (ECG) – origin of cardiac action potential - ECG lead configuration –block diagram of ECG recording set up (qualitative) – Electroencephalography (EEG) – origin of EEG – action and evoked potentials - brain waves – block diagram of modern EEG set up – electromyography (EMG) – block diagram of EMG recording setup.

## UNIT - III OPERATION THEATRE AND SAFETY, RADIATION SAFETY 06

Diathermy – block diagram of the electrosurgical diathermy– shortwave, microwave, ultrasonic diathermy – ventilators – servo controlled systems

Units of radiation - pocket dosimeter – pocket type radiation alarm – thermo-luminescence dosimeter.

## UNIT - IV MEDICAL IMAGING 06

Nuclear imaging technique –computer tomography (CT) – principle – mathematical basis of image construction –block diagram of CT scanner – ultrasonic imaging systems – construction of transducer – display modes – MRI principle and instrumentation.

## UNIT - V DIAGNOSTICS AND SPECIALITIES, LASER IN MEDICINE 06

X-rays in radiography – fluoroscopy – comparison– image intensifiers – angiography – applications of X-ray examination (*problems*).

Laser interactions with biomolecules – advantages of laser surgery – endoscopy – types of endoscopes with their operation (qualitative).

| | |
|---|---|
| **Total Lecture Hours** | **30** |

**BOOKS FOR STUDY:**

- Biomedical Instrumentation and measurement, Leslie Cromwell, PHI, 2015
- Medical Instrumentation, M. Arumugam, Anuradha agencies, 1992
- Medical Electronics, M.J.Kumar Doss, Prathibha Publishers, 1987
- Medical Physics, John R. Cameron and James G. Skofronick, Thrift books, Atlanta, 1985
- Electronic Instruments and Instrumentation Technology, M. M.M.Anand, PHI, 2015

**BOOKS FOR REFERENCES:**

- Handbook of Biomedical Instrumentation, Dr R. S. Khandpur, 3rd Edition, McGraw Hill Education (India) Private Limited, 2014

**WEB RESOURCES:**

- **https://libguides.msoe.edu/biomedical-engineering-resources**
- **https://web.mei.edu/access?rackid=F801026&FilesData=Introduction-To-Biomedical-Instrumentation.pdf**
- **https://www.cambridge.org/highereducation/books/introduction-to-biomedical-instrumentation/F69C6825BABA2590E066CA68193BAC37/resources/instructor-resources/808B5A075C2A2AC10B8EC1F08B55D34F**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | | No Changes Made | | New Course | ✓ | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Remembering the concepts of cell membrane, components of bio medical instruments and radiography | **K1 , K2** |
| **CO2** | Understanding the principles of bio potential electrodes and radiation safety | **K1 , K2** |
| **CO3** | Applying the characteristics of bio electric potential, cardiac action potential, ultrasonic imaging systems and X- rays | **K1 , K2** |
| **CO4** | Analyzing the micro electrodes, electro surgical diathermy and CT scanner | **K1 , K2** |
| **CO5** | Interpret the real life solutions using pH electrode, EMG recording, thermo luminescence and MRI principle | **K1 , K2** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | PHYSICS OF MEDICAL INSTRUMENTS | HRS | PEDAGOGY |
|---|---|---|---|
| I | Transport of ions through cell membrane- resting and action potential - Characteristics of resting potential – bio-electric potential – design of medical instruments – components of bio-medical instrumentation – electrodes – electrode potential – metal microelectrode – depth and needle electrodes – types of surface electrode – the pH electrode. | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Electrocardiography (ECG) – origin of cardiac action potential - ECG lead configuration –block diagram of ECG recording set up (qualitative) – Electroencephalography (EEG) – origin of EEG – action and evoked potentials - brain waves – block diagram of modern EEG set up – electromyography (EMG) – block diagram of EMG recording setup. | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| III | Diathermy – block diagram of the electrosurgical diathermy– shortwave, microwave, ultrasonic diathermy – ventilators – servo controlled systems<br>Units of radiation - pocket dosimeter – pocket type radiation alarm – thermo-luminescence dosimeter. | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| IV | Nuclear imaging technique –computer tomography (CT) – principle – mathematical basis of image construction –block diagram of CT scanner – ultrasonic imaging systems – construction of transducer – display modes – MRI principle and instrumentation. | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| V | X-rays in radiography – fluoroscopy – comparison– image intensifiers – angiography – applications of X-ray examination (problems).<br>Laser interactions with biomolecules – advantages of laser surgery – endoscopy – types of endoscopes with their operation (qualitative). | 6 | Chalk & Talk, Videos, PPT and Demonstration |

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | |
| | | | **MCQs** | |
| | | | **No. of. Questions** | **K - Level** |
| **CI<br>AI** | **CO1** | **K1 – K2** | **25** | **K1,K2** |
| | **CO2** | **K1 – K2** | **25** | **K1,K2** |
| **CI<br>AII** | **CO3** | **K1 – K2** | **25** | **K1,K2** |
| | **CO4** | **K1 – K2** | **25** | **K1,K2** |
| **Question Pattern<br>CIA I & II** | | **No. of Questions to be asked** | **50** | |
| | | **No. of Questions to be answered** | **50** | |
| | | **Marks for each question** | **1** | |
| | | **Total Marks for each section** | **50** | |

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (I$^{st}$ Test-2 CO's & II$^{nd}$ Test-2 CO's) in equal weightage

| Distribution of Marks with K Level CIA I & CIA II | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |
| **CIA II** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

| **Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **S. No** | **COs** | **K - Level** | **Section A (MCQs)** | |
| | | | **No. of Questions** | **K – Level** |
| **1** | **CO1** | **K1-K2** | **15** | **K1,K2** |
| **2** | **CO2** | **K1-K2** | **15** | **K1,K2** |
| **3** | **CO3** | **K1-K2** | **15** | **K1,K2** |
| **4** | **CO4** | **K1-K2** | **15** | **K1,K2** |
| **5** | **CO5** | **K1-K2** | **15** | **K1,K2** |
| **No. of Questions to be Asked** | | | **75** | |
| **No. of Questions to be answered** | | | **75** | |
| **Marks for each question** | | | **1** | |
| **Total Marks for each section** | | | **75** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | | |

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

| **Distribution of Marks with K Level** | | | | |
|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | **40** | **40** | **53** | **100** |
| **K2** | **35** | **35** | **47** | |
| **K3** | | | | |
| **K4** | | | | |
| **Marks** | | **75** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | FUNDAMENTALS OF ASTROPHYSICS | | | |
| **Course Code** | 23UPHSC21 | **L** | **P** | **C** |
| **Category** | ABILITY ENHANCEMENT COMPULSORY COURSE (AECC) | **2** | **-** | **2** |

**COURSE OBJECTIVES: (TANSCHE)**

- This course intends to introduce principles of astrophysics describing the science of formation and evolution of stars and interpretation of various heavenly phenomena and provide an understanding of the physical nature of celestial bodies along with the instrumentation and techniques used in astronomical research

**UNIT - I MODERN ASTROPHYSICS** **06**

Birth of modern Astronomy - celestial sphere - Geo centric theory - Helio centric theory - Kepler's law of planetary motion - Newton;s law of gravitation - Planets - Asteroids - Comets - Meteors.

**UNIT - II ASTRONOMICAL INSTRUMENTS** **06**

Orientation of earth in space - Arc and Time units - Local time - Standard time - Elements of telescope - Properties of image - Kinds of optical telescope - reflecting and refracting telescope - Radio telescope - Spectrograph

**UNIT - III SOLAR PHYSICS** **06**

Physical properties of Sun - Structure of Sun - Sun spots - Sun spots - Auroras - Solar prominence and flares - space weather effects

**UNIT - IV STELLAR PHYSICS** **06**

Classification of stars under spectral classes - H-R diagram – luminosity of a star – stellar evolution - Chandrasekar limit – white dwarfs – black holes – supernovae.

**UNIT - V GALAXIES** **06**

Galaxy nomenclatures - types of galaxies – Milky way galaxy - star clusters – galactic clusters, Pulsars - Supernova explosion.

**Total Lecture Hours** **30**

**BOOKS FOR STUDY:**

- Introduction to Astrophysics, Dr.A.Mujiber Rahman, First Edition, KAMS Publication, India, 2018

**BOOKS FOR REFERENCES:**

- Baidyanath Basu, (2001). An introduction to Astrophysics, Second printing, Prentice – Hall of India (P) Ltd, New Delhi
- K.S.Krishnaswamy, (2002), Astrophysics – a modern perspective, New Age International (P) Ltd, New Delhi.
- Shylaja, B.S. and Madhusudan, H.R.,( 1999), Eclipse: A Celestial Shadow Play, Universities Press, Hydrabad, India.

**WEB RESOURCES:**

- https://byjus.com/question-answer/how-physics-affect-our-daily-life/
- https://www.orchidsinternationalschool.com/blog/child-learning/physics-in-everyday-life
- https://tws.edu.in/blog/application-of-physics-in-daily-life/
- https://sciencing.com/applications-physics-everyday-life-8637595.html

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | | No Changes Made | | New Course | ✓ | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Understand the concepts of bouncing balls, rockets, lenses, electric bulb and solar water heater | **K1 , K2** |
| **CO2** | Recollecting the principles of bicycles, photography, television and solar cells | **K1 , K2** |
| **CO3** | Comprehend basic concept of laser, vacuum cleaner, voltaic cell and space travel | **K1 , K2** |
| **CO4** | Articulate the knowledge about holography, air-conditioners and solar constant | **K1 , K2** |
| **CO5** | Interpret the real life solutions of UV protective glass, applications of solar energy and solar cells | **K1 , K2** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

| LESSON PLAN: | | | |
|---|---|---|---|
| **UNIT** | **FUNDAMENTALS OF ASTROPHYSICS** | **HRS** | **PEDAGOGY** |
| **I** | Birth of modern Astronomy - celestial sphere - Geo centric theory - Helio centric theory - Kepler's law of planetary motion - Newton;s law of gravitation - Planets - Asteroids - Comets - Meteors. | **6** | Chalk & Talk, Videos, PPT and Demonstration |
| **II** | Orientation of earth in space - Arc and Time units - Local time - Standard time - Elements of telescope - Properties of image - Kinds of optical telescope - reflecting and refracting telescope - Radio telescope - Spectrograph | **6** | Chalk & Talk, Videos, PPT and Demonstration |
| **III** | Physical properties of Sun - Structure of Sun - Sun spots - Sun spots - Auroras - Solar prominence and flares - space weather effects | **6** | Chalk & Talk, Videos, PPT and Demonstration |
| **IV** | Classification of stars under spectral classes - H-R diagram – luminosity of a star – stellar evolution - Chandrasekar limit – white dwarfs – black holes – supernovae. | **6** | Chalk & Talk, Videos, PPT and Demonstration |
| **V** | Galaxy nomenclatures - types of galaxies – Milky way galaxy - star clusters – galactic clusters, Pulsars - Supernova explosion. | **6** | Chalk & Talk, Videos, PPT and Demonstration |

| **Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | |
| | | | **MCQs** | |
| | | | **No. of. Questions** | **K - Level** |
| **CI<br>AI** | **CO1** | **K1 – K2** | **25** | **K1,K2** |
| | **CO2** | **K1 – K2** | **25** | **K1,K2** |
| **CI<br>AII** | **CO3** | **K1 – K2** | **25** | **K1,K2** |
| | **CO4** | **K1 – K2** | **25** | **K1,K2** |
| **Question Pattern<br>CIA I & II** | | **No. of Questions to be asked** | **50** | |
| | | **No. of Questions to be answered** | **50** | |
| | | **Marks for each question** | **1** | |
| | | **Total Marks for each section** | **50** | |

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (I$^{st}$ Test-2 CO's & II$^{nd}$ Test-2 CO's) in equal weightage

| Distribution of Marks with K Level CIA I & CIA II | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |
| **CIA II** | **K1** | **30** | **30** | **60** | **100** |
| | **K2** | **20** | **20** | **40** | |
| | **K3** | | | | |
| | **K4** | | | | |
| | **Marks** | **50** | **50** | **100** | **100** |

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| **S. No** | **COs** | **K - Level** | **Section A (MCQs)** | |
| | | | **No. of Questions** | **K – Level** |
| **1** | **CO1** | **K1-K2** | **15** | **K1,K2** |
| **2** | **CO2** | **K1-K2** | **15** | **K1,K2** |
| **3** | **CO3** | **K1-K2** | **15** | **K1,K2** |
| **4** | **CO4** | **K1-K2** | **15** | **K1,K2** |
| **5** | **CO5** | **K1-K2** | **15** | **K1,K2** |
| **No. of Questions to be Asked** | | | **75** | |
| **No. of Questions to be answered** | | | **75** | |
| **Marks for each question** | | | **1** | |
| **Total Marks for each section** | | | **75** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | | |

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | **40** | **40** | **53** | **100** |
| **K2** | **35** | **35** | **47** | |
| **K3** | | | | |
| **K4** | | | | |
| **Marks** | | **75** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

# B.Sc., PHYSICS

## Syllabus

## Program Code: UPH

## 2023 - Onwards

**MANNAR THIRUMALAI NAICKER COLLEGE**

**(AUTONOMOUS)**

**Re-accredited with "A" Grade by NAAC**

**PASUMALAI, MADURAI – 625 004**

# MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS), MADURAI – 625 004

## B.SC PHYSICS CURRICULUM

*(For the students admitted from the academic year 2023-2024 onwards)*

| Course Code | Title of the Course | Hrs | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|
| | | | | Int | Ext | Total |
| **THIRD SEMESTER** | | | | | | |
| **Part – I** | **Tamil / Alternative course** | | | | | |
| 23UTAGT31 | தமிழக வரலாறும் பண்பாடும் | 6 | 3 | 25 | 75 | 100 |
| **Part – II** | **English** | | | | | |
| 23UENGE31 | GENERAL ENGLISH - III | 6 | 3 | 25 | 75 | 100 |
| **Part - III** | **Core courses** | | | | | |
| 23UPHCC31 | GENERAL MECHANICS AND CLASSICAL MECHANICS | 5 | 5 | 25 | 75 | 100 |
| 23UPHCP31 | PHYSICS PRACTICAL 3 | 3 | 3 | 25 | 75 | 100 |
| **Part - III** | **Elective / Allied courses** | | | | | |
| 23UCHEA31 | CHEMISTRY FOR PHYSICAL SCIENCES - I | 4 | 3 | 25 | 75 | 100 |
| 23UCHEP31 | CHEMISTRY FOR PHYSICAL SCIENCES PRACTICAL - 1 | 2 | 2 | 25 | 75 | 100 |
| **Part - IV** | **Skill Based courses** | | | | | |
| 23UPHSC31 | COMMUNICATION PHYSICS | 1 | 1 | 25 | 75 | 100 |
| 23UPHSC32 | MEDICAL INSTRUMENTATION | 2 | 2 | 25 | 75 | 100 |
| **Part - IV** | **Mandatory course** | | | | | |
| 23UEVSG41 | ENVIRONMENTAL STUDIES | 1 | - | - | - | - |
| | **Total** | 30 | 22 | 200 | 600 | 800 |
| **FOURTH SEMESTER** | | | | | | |
| **Part – I** | **Tamil / Alternative course** | | | | | |
| 23UTAGT41 | தமிழும் அறிவியலும் | 6 | 3 | 25 | 75 | 100 |
| **Part – II** | **English** | | | | | |
| 23UENGE41 | GENERAL ENGLISH - IV | 6 | 3 | 25 | 75 | 100 |
| **Part - III** | **Core courses** | | | | | |
| 23UPHCC41 | OPTICS AND SPECTROSCOPY | 5 | 5 | 25 | 75 | 100 |
| 23UPHCP41 | PHYSICS PRACTICAL 4 | 3 | 3 | 25 | 75 | 100 |
| **Part - III** | **Elective Allied courses** | | | | | |
| 23UCHEA41 | CHEMISTRY FOR PHYSICAL SCIENCES -II | 4 | 3 | 25 | 75 | 100 |
| 23UCHEP41 | CHEMISTRY FOR PHYSICAL SCIENCES PRACTICAL - II | 2 | 2 | 25 | 75 | 100 |
| **Part - IV** | **Skill Based courses** | | | | | |
| 23UPHSC41 | MATERIALS SCIENCE | 2 | 2 | 25 | 75 | 100 |
| 23UPHSC42 | LASERS AND FIBER OPTICS | 1 | 1 | 25 | 75 | 100 |
| **Part - IV** | **Mandatory course** | | | | | |
| 23UEVSG41 | ENVIRONMENTAL STUDIES | 1 | 2 | 25 | 75 | 100 |
| | **Total** | 30 | 24 | 225 | 675 | 900 |


THIRD SEMESTER

| **Course Name** | GENERAL MECHANICS AND CLASSICAL MECHANICS | | | |
|---|---|---|---|---|
| **Course Code** | 23UPHCC31 | **L** | **P** | **C** |
| **Category** | CORE | 5 | - | 5 |

**COURSE OBJECTIVES:**

- This course allows the students: To have a basic understanding of the laws and principles of mechanics
- To apply the concepts of forces existing in the system
- To understand the forces of physics in everyday life
- To visualize conservation laws
- To apply Lagrangian equation to solve complex problems.

**UNIT - I LAWS OF MOTION** **15**

Newton's Laws– forces – equations of motion – frictional force

*Gravitation*: Classical theory of gravitation–Kepler's laws, Newton's law of gravitation – Determination of G by Boy's method – Earth-moon system – weightlessness — earth density – mass of the Sun – gravitational potential – velocity of escape

**UNIT - II CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM** **15**

**C**onservation of linear and angular momentum – Internal forces and momentum conservation – center of mass – examples – general elastic collision of particles of different masses – system with variable mass – examples – conservation of angular momentum – torque due to internal forces – torque due to gravity – angular momentum about center of mass (Any topic compulsory problem 5 mark).

**UNIT - III CONSERVATION LAWS OF ENERGY** **15**

Introduction – significance of conservation laws – law of conservation of energy concepts of work- power – energy – conservative forces – potential energy and conservation of energy in gravitational and electric field – examples –non-conservative forces

**UNIT - IV RIGID BODY DYNAMICS** **15**

**T**ranslational and rotational motion – angular momentum – moment of inertia – general theorems of moment of inertia (parallel& perpendicular)– examples – rotation about fixed axis(translational and rotational)– kinetic energy of rotation – examples – body rolling along a plane surface – body rolling down an inclined plane – (moment of inertia topic compulsory problem 5 mark)

**UNIT - V LAGRANGIAN MECHANICS** **15**

Generalized coordinates –degrees of freedom – constraints - principle of virtual work and D' Alembert's Principle –Lagrange's equation from D' Alembert's principle – application –simple pendulum – Atwood's machine.

**Total Lecture Hours** **75**

**BOOKS FOR STUDY:**

- J.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai.
- P.DuraiPandian, LaxmiDuraiPandian, MuthamizhJayapragasam,2005, Mechanics, 6th revised edition, S.Chand& Co.
- D. S.Mathur & P. S.Hemne, 2000, Mechanics, Revised Edition, S.Chand& Co.
- Narayanamurthi, M.&Nagarathnam. N, 1998, Dynamics. The National Publishing,Chennai.
- Narayanamurthi, M. and Nagarathnam, N, 1982, Statics, Hydrostatics and Hydrodynamics, The National Publishers, Chennai.
- Brijilal subramaniyam properties of matter & Mechanics.

**BOOKS FOR REFERENCES:**

- Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesely.
- Halliday, David & Robert, Resnick, 1995, Physics Vol.I. New Age, International, Chennai.
- Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi.

**WEB RESOURCES:**

- **https://www.sciencebuddies.org/blog/newton-laws-science-lessons (LAWS OF MOTION)**
- **http://www.physics2000.com/PDF/Text/Ch_7_CONSERVATION_OF_LINEAR_ANDANGULAR_MOMENTUM.pdf (CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM)**
- **https://onlinecourses.nptel.ac.in/noc20_mm20/preview (CONSERVATION LAWS OF ENERGY)**
- **https://onlinecourses.nptel.ac.in/noc21_me96/preview (RIGID BODY DYNAMICS)**
- **https://www.mooc-list.com/tags/lagrangian-mechanics (LAGRANGIAN MECHANICS)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | ✓ | SKILL ORIENTED | | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | **30** | No Changes Made | | New Course | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Understand the Newton's Law of motion, understand general theory of relativity, Kepler's laws and Realize the basic principles behind planetary motion | K1 to K4 |
| CO2 | Acquire the knowledge on the conservation laws | K1 to K4 |
| CO3 | Apply conservation law and calculate energy of various systems, understand and differentiate conservative and non-conservative forces | K1 to K4 |
| CO4 | Gain knowledge on rigid body dynamics and solve problems based on this concept | K1 to K4 |
| CO5 | Appreciate Lagrangian system of mechanics, apply D' Alemberts principle | K1 to K4 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| CO5 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 3 | 1 | 3 | - | 2 |
| CO 4 | 3 | 1 | 3 | - | 2 |
| CO 5 | 3 | 1 | 3 | - | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | GENERAL MECHANICS AND CLASSICAL MECHANICS | HRS | PEDAGOGY |
|---|---|---|---|
| I | Newton's Laws– forces – equations of motion – frictional force *Gravitation*: Classical theory of gravitation–Kepler's laws, Newton's law of gravitation – Determination of G by Boy's method – Earth-moon system – weightlessness — earth density – mass of the Sun – gravitational potential – velocity of escape | 15 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Conservation of linear and angular momentum – Internal forces and momentum conservation – center of mass – examples – general elastic collision of particles of different masses – system with variable mass – | 15 | Chalk & Talk, Videos, PPT and |

| | | | |
|---|---|---|---|
| | examples – conservation of angular momentum – torque due to internal forces – torque due to gravity – angular momentum about center of mass (Any topic compulsory problem 5 mark). | | **Demonstration** |
| **III** | Introduction – significance of conservation laws – law of conservation of energyconcepts of work- power – energy – conservative forces – potential energy and conservation of energy in gravitational and electric field – examples –non-conservative forces | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | **T**ranslational and rotational motion – angular momentum – moment of inertia – general theorems of moment of inertia (parallel& perpendicular)– examples – rotation about fixed axis(translational and rotational)– kinetic energy of rotation – examples – body rolling along a plane surface – body rolling down an inclined plane(moment of inertia topic compulsory problem 5 mark) | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Generalized coordinates –degrees of freedom – constraints - principle of virtual work and D' Alembert's Principle –Lagrange's equation from D' Alembert's principle – application –simple pendulum – Atwood's machine | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |

**Learning Outcome Based Education & Assessment (LOBE)**
**Formative Examination - Blue Print**
**Articulation Mapping – K Levels with Course Outcomes (COs)**

| Internal | Cos | K Level | Section A | | Section B Either or Choice | Section C Either or Choice |
|---|---|---|---|---|---|---|
| | | | MCQs | | | |
| | | | No. of. Questions | K - Level | | |
| CI AI | CO1 | K1 – K4 | 2 | K1, K2 | K1 OR K1 | K3 OR K3 |
| | CO2 | K1 – K4 | 2 | K1,K2 | K2 OR K2 | K4 OR K4 |
| CI AII | CO3 | K1 – K4 | 2 | K1, K2 | K2 OR K2 | K3 OR K3 |
| | CO4 | K1 – K4 | 2 | K1,K2 | K3 OR K3 | K4 OR K4 |
| Question Pattern CIA I & II | | No. of Questions to be asked | 4 | | 4 | 4 |
| | | No. of Questions to be answered | 4 | | 2 | 2 |
| | | Marks for each question | 1 | | 5 | 8 |
| | | Total Marks for each section | 4 | | 10 | 16 |

| Distribution of Marks with K Level CIA I & CIA II | | | | | | | |
|---|---|---|---|---|---|---|---|
| | K Level | Section A (Multiple Choice Questions) | Section B (Either / Or Choice) | Section C (Either / Or Choice) | Total Marks | % of (Marks without choice) | Consolidate of % |
| CIA I | K1 | 2 | 10 | - | 12 | 21.43 | - |
| | K2 | 2 | 10 | - | 12 | 21.43 | |
| | K3 | - | - | 16 | 16 | 28.57 | 42.86 |
| | K4 | - | - | 16 | 16 | 28.57 | 71.43 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |
| CIA II | K1 | 2 | | | 2 | 3.57 | - |
| | K2 | 2 | 10 | | 12 | 21.43 | |
| | K3 | | 10 | 16 | 26 | 46.43 | 25.00 |
| | K4 | | | 16 | 16 | 28.57 | 71.43 |
| | Marks | 4 | 20 | 32 | 56 | 100 | 100 |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | Cos | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K – LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1 – K4 | 2 | K1, K2 | K1, K1 | K2, K2 |
| 2 | CO2 | K1 – K4 | 2 | K1, K2 | K2, K2 | K2, K2 |
| 3 | CO3 | K1 – K4 | 2 | K1, K2 | K2, K2 | K3, K3 |
| 4 | CO4 | K1 – K4 | 2 | K1, K2 | K3, K3 | K3, K3 |
| 5 | CO5 | K1 – K4 | 2 | K1, K2 | K4, K4 | K4, K4 |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Section B (Either or Choice** | **Section C (Either/ or Choice)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | 5 | 10 | | 15 | **10.72** | **-** |
| **K2** | 5 | 20 | 32 | 57 | **40.71** | **51.43** |
| **K3** | | 10 | 32 | 42 | **30.00** | **30.00** |
| **K4** | | 10 | 16 | 26 | **18.57** | **18.57** |
| **Marks** | **10** | **50** | **80** | **140** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | | | |

## Summative Examinations - Question Paper – Format

| **Q. No.** | **Unit** | **CO** | **K-level** | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | | **PART – A** | **(10 x 1 = 10 Marks)** |
| 1. | **Unit - I** | **CO1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | **Unit - I** | **CO1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | **Unit - II** | **CO2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | **Unit - II** | **CO2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | **Unit - III** | **CO3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | **Unit - III** | **CO3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | **Unit - IV** | **CO4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | **Unit - IV** | **CO4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | **Unit - V** | **CO5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | **Unit - V** | **CO5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions | | **PART – B** | | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit - I** | **CO1** | **K1** | |
| | | **OR** | | |
| 11. b) | **Unit - I** | **CO1** | **K1** | |
| 12. a) | **Unit - II** | **CO2** | **K2** | |
| | | **OR** | | |
| 12. b) | **Unit - II** | **CO2** | **K2** | |
| 13. a) | **Unit - III** | **CO3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO3** | **K2** | |
| 14. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit - IV** | **CO4** | **K3** | |
| 15. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 15. b) | **Unit - V** | **CO5** | **K4** | |

| Answer **ALL** the questions | | **PART – C** | | **(5 x 8 = 40 Marks)** |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO1** | **K2** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO1** | **K2** | |
| 17. a) | **Unit - II** | **CO2** | **K2** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO2** | **K2** | |
| 18. a) | **Unit - III** | **CO3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO3** | **K3** | |
| 19. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO4** | **K3** | |
| 20. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO5** | **K4** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | PHYSICS PRACTICAL 3 | | | |
| **Course Code** | 23UPHCP31 | **L** | **P** | **C** |
| **Category** | CORE PRACTICAL | - | 3 | 3 |

**COURSE OBJECTIVES:**

- Construct circuits to learn about the concept of electricity, current, resistance in the path of current, different parameters that affect a circuit. Set up experiments, observe, analyse and assimilate the concept

**ELECTRICITY (ANY EIGHT EXPERIMENTS)** **HOURS**

1. Calibration of low range and high range voltmeter using potentiometer
2. Calibration of ammeter using potentiometer.
3. Measurement of low resistances using potentiometer.
4. Determination of field along the axis of a current carrying circular coil.
5. Determination of earth's magnetic field using field along axis of current carrying coil.
6. Determination of specific resistance of the material of the wire usingPO box.
7. Determination of resistance and specific resistance using Carey Foster's bridge.
8. Determination of internal resistance of a cell using potentiometer.
9. Determination of specific conductance of an electrolyte.
10. Determination of e.m.f of thermo couple using potentiometer
11. Determination of capacitance using Desauty's bridge and B.G./Spot galvanometer/head phone.
12. Determination of figure of merit of BG or spot galvanometer.
13. Comparison of EMF of two cells using BG.
14. Comparison of capacitance using BG.

| | |
|---|---|
| **Total Lecture Hours** | **75** |

**BOOKS FOR STUDY:**

- Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., A Text Book of Practical Physics, 2017 Edition, Sultan Chand & Sons.

**BOOKS FOR REFERENCES:**

- Ouseph.C., Practical Physics and Electronics, 2013, S.Viswanathan.P.Ltd..

**WEB RESOURCES:**

- **https://www.youtube.com/watch?v=kUdeAHMPb9M (Calibration of low range and high range voltmeter using potentiometer)**
- **https://vlab.amrita.edu/?sub=1&brch=192&sim=972&cnt=1 (Determination of field along the axis of a current carrying circular coil)**
- **https://dkpandey.weebly.com/uploads/1/3/5/3/13534845/examples_dev.pdf (Determination of capacitance using Desauty's bridge and B.G./Spot galvanometer/head phone.)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | **30** | No Changes Made | | New Course | | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Remembering the Aim and apparatus used in the experiment | **K1 to K4** |
| **CO2** | Understanding of laws and formulas of the experiment | **K1 to K4** |
| **CO3** | Applying the knowledge to do the experiment | **K1 to K4** |
| **CO4** | Calculating and examining the aim of the experiment | **K1 to K4** |
| **CO5** | Interpreting the result of the experiment | **K1 to K4** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 2 | 3 | - | 2 |
| CO 2 | 3 | 2 | 3 | - | 2 |
| CO 3 | 3 | 2 | 3 | - | 2 |
| CO 4 | 3 | 2 | 3 | - | 2 |
| CO 5 | 3 | 2 | 3 | - | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

| LESSON PLAN: | | | |
|---|---|---|---|
| **SEM** | **PHYSICS PRACTICAL 3** | **HRS** | **PEDAGOGY** |
| **III** | 1.Calibration of low range and high range voltmeter using potentiometer<br>2.Calibration of ammeter using potentiometer.<br>3.Determination of earth's magnetic field using field along axis of current carrying coil.<br>4.Determination of resistance and specific resistance using Carey Foster's bridge.<br>5.Determination of capacitance using Desauty's bridge and head phone.<br>6.Determination of figure of merit of BG or spot galvanometer.<br>7.Comparison of EMF of two cells using BG.<br>8.Comparison of capacitance using BG. | **45** | **Demonstration and Video** |

| **Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **No. of. Questions** | **K – Level** |
| **CIA-I** | **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| **Question Pattern CIA - I** | | No. of Questions to be asked | **1** Question for Each Student | |
| | | No. of Questions to be answered | **1** | |
| | | Marks for each question | **30** | |
| | | Total Marks for each section | **30** | |

| **Distribution of Marks with COs &K Level for Correction of CIA I** | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO1** | Aim and apparatus | **K1** | **2.0** |
| | **CO2** | Formula and Tabular Column | **K2** | **5** |
| | **CO3** | Understanding and Observation | **K4** | **12.0** |
| | **CO4** | Calculation and Graph | **K3** | **8.0** |
| | **CO5** | Interpretation of result | **K2** | **3.0** |
| | **Total Marks** | | | **30** |

| Distribution of Marks with K Level CIA I | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Distribution of the work of the experiment** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | Aim and apparatus | 2 | 6.66 | - |
| | **K2** | Formula and Tabular Column Interpretation of result | 8 | 26.67 | |
| **CIA I** | **K1** | Aim and apparatus | 2 | 6.66 | - |
| | **K2** | Formula and Tabular Column Interpretation of result | 8 | 26.67 | |
| | **K3** | Understanding and Observation | 8 | 26.67 | **33.33** |
| | **K4** | Calculation and Graph | 12 | 40.00 | **60.00** |
| | **Marks** | | **30** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | |
|---|---|---|---|
| **COs** | **K - Level** | **No. of Questions** | **K – Level** |
| **CO1- CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| No. of Questions to be Asked | | **1** Question for Each Student | |
| No. of Questions to be answered | | **1** | |
| Marks for each question | | **60** | |
| Total Marks for each section | | **60** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | |

| Distribution of Marks with COs &K Level for Correction of the Summative Exam | | | |
|---|---|---|---|
| **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CO1** | Aim and apparatus | **K1** | **5** |
| **CO2** | Formula and Tabular Column | **K2** | **10** |
| **CO3** | Understanding and Observation | **K4** | **25** |
| **CO4** | Calculation and Graph | **K3** | **15** |
| **CO5** | Interpretation of result | **K2** | **5** |
| **Total Marks** | | | **60** |

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| **K Level** | **Parameters for K-Level** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | Aim and apparatus | **5** | **8.33** | **-** |
| **K2** | Formula and Tabular Column, Interpretation of result | **15** | **25.00** | **8.33** |
| **K3** | Understanding and Observation | **25** | **41.67** | **33.33** |
| **K4** | Calculation and Graph | **15** | **25.00** | **75.00** |
| **Marks** | | **60** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | CHEMISTRY FOR PHYSICAL SCIENCES - I | | | |
| **Course Code** | 23UCHEA31 | **L** | **P** | **C** |
| **Category** | GENERIC ELECTIVE | **4** | - | **3** |

**COURSE OBJECTIVES:**

**This course aims to provide knowledge on the**

- basics of atomic orbitals, chemical bonds, hybridization
- concepts of thermodynamics and its applications.
- concepts of nuclear chemistry
- importance of chemical industries
- Qualitative and analytical methods.

**UNIT - I Chemical Bonding and Nuclear Chemistry 12**

Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.

Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating and medicinal applications.

**UNIT - II Industrial Chemistry 12**

Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones.
Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple Superphosphate.

**UNIT - III Fundamental Concepts in Organic Chemistry 12**

Hybridization: Orbital overlap, hybridization and geometry of CH4, C2H4, C2H2 and C6H6. Electronic effects: Inductive effect and consequences on Ka and Kb of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.
Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, Friedel- Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine**.**

| UNIT - IV Thermodynamics and Phase Equilibria | 12 |
|---|---|
| Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation).<br>Conditions for spontaneity in terms of entropy and Gibbs free energy. Relationship between Gibbs free energy and entropy.<br>Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag). | |
| **UNIT - V Analytical Chemistry** | **12** |
| Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and Purification techniques – extraction, distillation and crystallization.<br>Chromatography: principle and application of column, paper and thin layer chromatography. | |
| **Total Lecture Hours** | **60** |

**BOOKS FOR STUDY:**

- V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009.
- S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006.
- S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012.
- P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

**BOOKS FOR REFERENCES:**

- P.L.Soni, MohanKatyal, Textbook of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
- B.R.Puri, L.R.Sharma, M.S.Pathania, TextbookPhysical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
- B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

**WEB RESOURCES:**

- **https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-cy36/**
- **https://onlinecourses.nptel.ac.in/noc23_me76/preview**
- **https://onlinecourses.nptel.ac.in/noc20_cy18/preview**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | ✓ | SKILL ORIENTED | | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | ✓ | GLOBAL | |
| **Changes Made in the Course** | Percentage of Change | ✓ | No Changes Made | | New Course | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications. | **K1 to K4** |
| **CO2** | evaluate the efficiencies and uses of various fuels and fertilizers | **K1 to K4** |
| **CO3** | explain the type of hybridization, electronic effect and mechanism involved in the organic reactions. | **K1 to K4** |
| **CO4** | apply various thermodynamic principles, systems and phase rule. | **K1 to K4** |
| **CO5** | explain various methods to identify an appropriate method for the separation of chemical components | **K1 to K4** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | S | S | M |
| CO2 | M | S | S | S | M | S | S | M |
| CO3 | S | S | S | M | S | S | S | M |
| CO4 | S | S | S | S | S | S | S | M |
| CO5 | S | M | S | S | S | S | S | M |

**S- STRONG** **M – MEDIUM** **L – LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 3 | 3 | 3 |
| CO 2 | 3 | 3 | 3 | 3 | 3 |
| CO 3 | 3 | 3 | 3 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 3 | 3 | 3 |
| WEIGHTAGE | 15 | 15 | 15 | 15 | 15 |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| LESSON PLAN: | | | |
|---|---|---|---|
| **UNIT** | **Chemistry For Physical Sciences - I** | **HRS** | **PEDAGOGY** |
| **I** | Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties. | **6** | **Chalk & talk, ppt** |
| **I** | Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating and medicinal applications. | **6** | **Chalk & talk, ppt** |
| **II** | Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Silicones: Synthesis, properties and uses of silicones. | **6** | **Chalk & talk, ppt** |
| **II** | Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple Superphosphate. | **6** | **Chalk & talk, ppt** |
| **III** | Hybridization: Orbital overlap, hybridization and geometry of CH4, C2H4, C2H2 and C6H6. Electronic effects: Inductive effect and consequences on Ka and Kb of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples. | **6** | **Chalk & talk, ppt** |
| **III** | Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine**.** | **6** | **Chalk & talk, ppt** |
| **IV** | Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation). Conditions for spontaneity in terms of entropy and Gibbs free energy. Relationship between Gibbs free energy and entropy. | **6** | **Chalk & talk, ppt** |
| **IV** | Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag). | **6** | **Chalk & talk, ppt** |
| **V** | Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and Purification techniques – extraction, distillation and crystallization.<br>Chromatography: principle and application of column, paper and thin layer chromatography. | **12** | **Chalk & talk, ppt** |

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | | **Section B Either or Choice** | **Section C Either or Choice** |
| | | | **MCQs** | | | |
| | | | **No. of. Questions** | **K - Level** | | |
| **CI AI** | **CO1** | **K1 – K4** | 2 | K1 | 2 (K2,K2) | 2(K3,K3) |
| | **CO2** | **K1 – K4** | 2 | K2 | 2(K3,K3) | 2(K4,K4) |
| **CI AII** | **CO3** | **K1 – K4** | 2 | K1 | 2(K2,K2) | 2(K3,K3) |
| | **CO4** | **K1 – K4** | 2 | K2 | 2(K3,K3) | 2(K4,K4) |
| **Question Pattern CIA I & II** | | **No. of Questions to be asked** | 4 | | 4 | 4 |
| | | **No. of Questions to be answered** | 4 | | 2 | 2 |
| | | **Marks for each question** | 1 | | 5 | 8 |
| | | **Total Marks for each section** | 4 | | 10 | 16 |

| Distribution of Marks with K Level CIA I & CIA II | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Section B (Either / Or Choice)** | **Section C (Either / Or Choice)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | 2 | - | - | 2 | **3.57** | **25** |
| | **K2** | 2 | 10 | - | 12 | **21.43** | |
| | **K3** | - | 10 | 16 | 26 | **46.43** | **46.43** |
| | **K4** | - | - | 16 | 16 | **28.57** | **28.57** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |
| **CIA II** | **K1** | 2 | - | - | 2 | **3.57** | **25** |
| | **K2** | 2 | 10 | - | 12 | **21.43** | |
| | **K3** | - | 10 | 16 | 26 | **46.43** | **46.43** |
| | **K4** | - | - | 16 | 16 | **28.57** | **28.57** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | Cos | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K – LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1 – K4 | 2 | K1&K2 | 2 (K2) | 2 (K3) |
| 2 | CO2 | K1 – K4 | 2 | K1&K2 | 2 (K3) | 2 (K4) |
| 3 | CO3 | K1 – K4 | 2 | K1&K2 | 2 (K2) | 2 (K3) |
| 4 | CO4 | K1 – K4 | 2 | K1&K2 | 2 (K3) | 2 (K4) |
| 5 | CO5 | K1 – K4 | 2 | K1&K2 | 2 (K4) | 2 (K3) |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| K Level | Section A (Multiple Choice Questions) | Section B (Either or Choice | Section C (Either/ or Choice) | Total Marks | % of (Marks without choice) | Consolidated % |
| K1 | 5 | - | - | 5 | 3.57 | 21.43 |
| K2 | 5 | 20 | - | 25 | 17.86 | 20 |
| K3 | - | 20 | 48 | 68 | 48.57 | 48.57 |
| K4 | - | 10 | 32 | 42 | 30 | 30 |
| Marks | 10 | 50 | 80 | 140 | 100 | 100 |
| NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels. | | | | | | |

## Summative Examinations - Question Paper – Format

| Q. No. | Unit | CO | K-level | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | | **PART – A** | **(10 x 1 = 10 Marks)** |
| 1. | **Unit - I** | **CO1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | **Unit - I** | **CO1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | **Unit - II** | **CO2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | **Unit - II** | **CO2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | **Unit - III** | **CO3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | **Unit - III** | **CO3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | **Unit - IV** | **CO4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | **Unit - IV** | **CO4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | **Unit - V** | **CO5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | **Unit - V** | **CO5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions | | **PART – B** | | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit - I** | **CO1** | **K2** | |
| | | **OR** | | |
| 11. b) | **Unit - I** | **CO1** | **K2** | |
| 12. a) | **Unit - II** | **CO2** | **K3** | |
| | | **OR** | | |
| 12. b) | **Unit - II** | **CO2** | **K3** | |
| 13. a) | **Unit - III** | **CO3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO3** | **K2** | |
| 14. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit - IV** | **CO4** | **K3** | |
| 15. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 15. b) | **Unit - V** | **CO5** | **K4** | |

| Answer **ALL** the questions | | **PART – C** | | **(5 x 8 = 40 Marks)** |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO1** | **K3** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO1** | **K3** | |
| 17. a) | **Unit - II** | **CO2** | **K4** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO2** | **K4** | |
| 18. a) | **Unit - III** | **CO3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO3** | **K3** | |
| 19. a) | **Unit - IV** | **CO4** | **K4** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO4** | **K4** | |
| 20. a) | **Unit - V** | **CO5** | **K3** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO5** | **K3** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES - I | | | |
| **Course Code** | 23UCHEP31 | **L** | **P** | **C** |
| **Category** | GENERIC ELECTIVE | - | 2 | 2 |

**COURSE OBJECTIVES:**

**This course aims to provide knowledge on the**

- Basics of preparation of solutions.
- Neutralisation reactions
- Basis of redox reactions
- principles of indicators
- practical experience of volumetric analysis

**VOLUMETRIC ANALYSIS**

1. Estimation of sodium hydroxide using standard sodium carbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium hydroxide.
6. Estimation of magnesium using EDTA.
7. Estimation of ferrous ion using diphenyl amine as indicator.

| | |
|---|---|
| **Total Lecture Hours** | **30** |

**BOOKS FOR REFERENCES:**

- V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

**WEB RESOURCES:**

- **https://archive.nptel.ac.in/courses/104/106/104106121/**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | ✓ | GLOBAL | |
| **Changes Made in the Course** | Percentage of Change | **20** | No Changes Made | | New Course | | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | gain an understanding of the use of standard flask and volumetric pipettes, burette. | **K1 to K4** |
| **CO2** | design, carry out, record and interpret the results of volumetric titration. | **K1 to K4** |
| **CO3** | apply their skill in the analysis of water/hardness. | **K1 to K4** |
| **CO4** | analyze the chemical constituents in allied chemical products | **K1 to K4** |
| **CO5** | estimate the amount of metals, acid and alkali in water bodies. | **K1 to K4** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | S | S | M | | |
| CO2 | M | S | S | S | M | S | S | M | | |
| CO3 | S | S | S | M | S | S | S | M | | |
| CO4 | S | S | S | S | S | S | S | M | | |
| CO5 | S | M | S | S | S | S | S | M | | |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 3 | 3 | 3 |
| CO 2 | 3 | 3 | 3 | 3 | 3 |
| CO 3 | 3 | 3 | 3 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 3 | 3 | 3 |
| WEITAGE | 15 | 15 | 15 | 15 | 15 |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| LESSON PLAN: | | | |
|---|---|---|---|
| **UNIT** | **CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES - I** | **HRS** | **PEDAGOGY** |
| | **QUALITATIVE INORGANIC ANALYSIS** | | |
| | **Theory on Volumetric analysis** | **5** | **Chalk & talk** |
| | **Experiments** | **25** | **Demonstration and training** |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | 75 | 100 |

Internal Assesment : Observation & attendance -10 mark
Model examination - 15 mark
**Total CIA - 25 mark**

**Model examination should be conducted for 30 mark and it has to be converted to 15 mark**

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **No. of. Questions** | **K - Level** |
| **CIA-I** | **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| **Question Pattern CIA - I** | | No. of Questions to be asked | **1** Question for Each Student | |
| | | No. of Questions to be answered | **1** | |
| | | Marks for each question | **30** | |
| | | Total Marks for each section | **30** | |

| Distribution of Marks with COs & K Level for Correction of CIA I | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO1** | Aim and apparatus | **K1** | **2.0** |
| | **CO3** | Short Procedure | **K2** | **10.0** |
| | **CO2** | Tabulation | **K4** | **8.0** |
| | **CO4** | Experiment & calculation | **K3** | **5.0** |
| | **CO5** | Result (nil)<br>(1 mark will be reduced for each 2% deviation) minimum mark 1 | **K1** | **5.0** |
| | **Total Marks** | | | **30** |

Summative Examination: Duly completed Record: 15 mark

End Semester Exam: 60 marks

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | |
|---|---|---|---|
| **COs** | **K - Level** | **No. of Questions** | **K – Level** |
| **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| No. of Questions to be Asked | | **1** Question for Each Student | |
| No. of Questions to be answered | | **1** | |
| Marks for each question | | **60** | |
| Total Marks for each section | | **60** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | |

| Distribution of Marks with COs & K Level for Correction of CIA I | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO1** | Aim and apparatus | **K1** | **4.0** |
| | **CO3** | Short Procedure | **K2** | **20.0** |
| | **CO2** | Tabulation | **K4** | **16.0** |
| | **CO4** | Experiment & calculation | **K3** | **10.0** |
| | **CO5** | Result (nil)<br>(2 mark will be reduced for each 2% deviation) minimum mark 2) | **K1** | **10.0** |
| | **Total Marks** | | | **60** |

| **Course Name** | COMMUNICATION PHYSICS | | | |
|---|---|---|---|---|
| **Course Code** | 23UPHSC31 | **L** | **P** | **C** |
| **Category** | SKILLED | 1 | - | 1 |

**COURSE OBJECTIVES:**

- To get the understanding of the conventional and non-conventional energy sources, their conservation and storage systems.

| **UNIT - I** | **RADIO TRANSMISSION AND RECEPTION:** | **3** |
|---|---|---|

Modulation types of modulation – amplitude modulation – limitations of amplitude modulation – frequency modulation – comparison of FM and AM – demodulation- essentials in demodulation – receivers: AM radio receivers

| **UNIT - II** | **FIBER OPTIC COMMUNICATION:** | **3** |
|---|---|---|

Introduction – basic principle of fiber optics – advantages – construction of optical fiber – classification based on the refractive index profile – classification based on the number of modes of propagation – Application.

| **UNIT - III** | **RADAR COMMUNICATION:** | **3** |
|---|---|---|

**RADAR COMMUNICATION: i**ntroduction - basic radar system –radar range – antenna scanning – pulsed radar system – search radar –tracking radar – moving target indicator Doppler effect

| **UNIT - IV** | **SATELLITE COMMUNICATION** | **3** |
|---|---|---|

introduction history of satellites – satellite communication system – satellite orbits – basic components of satellite communication system – commonly used frequency in satellite– satellite communication in India.

| **UNIT - V** | **MOBILE COMMUNICATION** | **3** |
|---|---|---|

introduction – concept of cell –basic cellular mobile radio system – cell phone – VSAT (very small aperture terminals) modem IPTV (internet protocol television) -Wi-Fi-4G (basic ideas)

| **Total Lecture Hours** | **15** |
|---|---|

**BOOKS FOR STUDY:**

- V.K.Metha, Principles of Electronics, S. Chand &CoLtd., 2013
- Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand& Co, 2013
- 2008, 3rd Edn.

**BOOKS FOR REFERENCES:**

- J.S. Chitode, Digital Communications, 2020, Unicorn publications
- Senior John. M, Optical Fiber Communications: Principles and Practice, 2009, Pearson Education.

**WEB RESOURCES:**

- **https://5g.systemsapproach.org/radio.html (RADIO TRANSMISSION AND RECEPTION)**
- **https://www.geeksforgeeks.org/fiber-optics-and-types/ (FIBER OPTIC COMMUNICATION)**
- **https://mrcet.com/downloads/digital_notes/ECE/IV%20Year/Radar%20Systems.pdf (RADAR COMMUNICATION )**
- **https://www.swpc.noaa.gov/impacts/satellite-communications (SATELLITE COMMUNICATION )**
- **https://www.sciencedirect.com/topics/social-sciences/mobile-communication (MOBILE COMMUNICATION)**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | | SKILL ORIENTED | ✓ | | ENTREPRENEURSHIP | | | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | ✓ | GLOBAL | | | | |
| **Changes Made in the Course** | Percentage of Change | | | No Changes Made | | | New Course | ✓ | | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Remembering the concepts of Radio Transmission And Reception | K1 & K2 |
| CO2 | Understanding the principles of Fiber Optic Communication | K1 & K2 |
| CO3 | Recalling the principle of Radar Communication | K1 & K2 |
| CO4 | To know about the Satellite Communication | K1 & K2 |
| CO5 | Understanding the Mobile Communication | K1 & K2 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | COMMUNICATION PHYSICS | HRS | PEDAGOGY |
|---|---|---|---|
| I | Modulation types of modulation – amplitude modulation – limitations of amplitude modulation – frequency modulation – comparison of FM and AM – demodulation- essentials in demodulation – receivers: AM radio receivers | 3 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Introduction – basic principle of fiber optics – advantages – construction of optical fiber – classification based on the refractive index profile – classification based on the number of modes of propagation – Application. | 3 | Chalk & Talk, Videos, PPT and Demonstration |
| III | Introduction - basic radar system –radar range – antenna scanning – pulsed radar system – search radar –tracking radar – moving target | | |

| | | | |
|---|---|---|---|
| | indicator Doppler effect | | |
| **IV** | Introduction history of satellites – satellite communication system – satellite orbits – basic components of satellite communication system – commonly used frequency in satellite– satellite communication in India | **3** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Introduction – concept of cell –basic cellular mobile radio system – cell phone – VSAT (very small aperture terminals) modem IPTV (internet protocol television) -Wi-Fi-4G (basic ideas) | **3** | **Chalk & Talk, Videos, PPT and Demonstration** |

| **Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | |
| | | | **MCQs** | |
| | | | **No. of. Questions** | **K - Level** |
| **CI<br>AI** | **CO1** | **K1 – K2** | **25** | **K1,K2** |
| | **CO2** | **K1 – K2** | **25** | **K1,K2** |
| **CI<br>AII** | **CO3** | **K1 – K2** | **25** | **K1,K2** |
| | **CO4** | **K1 – K2** | **25** | **K1,K2** |
| **Question Pattern<br>CIA I & II** | | **No. of Questions to be asked** | **50** | |
| | | **No. of Questions to be answered** | **50** | |
| | | **Marks for each question** | **1** | |
| | | **Total Marks for each section** | **50** | |

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (I$^{st}$ Test-2 CO's & II$^{nd}$ Test-2 CO's) in equal weightage

| Distribution of Marks with K Level CIA I & CIA II | | | | | |
|---|---|---|---|---|---|
| | K Level | Section A (Multiple Choice Questions) | Total Marks | % of (Marks without choice) | Consolidate of % |
| CIA I | K1 | 30 | 30 | 60 | 100 |
| | K2 | 20 | 20 | 40 | |
| | K3 | | | | |
| | K4 | | | | |
| | Marks | 50 | 50 | 100 | 100 |
| CIA II | K1 | 30 | 30 | 60 | 100 |
| | K2 | 20 | 20 | 40 | |
| | K3 | | | | |
| | K4 | | | | |
| | Marks | 50 | 50 | 100 | 100 |

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | |
| | | | No. of Questions | K – Level |
| 1 | CO1 | K1-K2 | 15 | K1,K2 |
| 2 | CO2 | K1-K2 | 15 | K1,K2 |
| 3 | CO3 | K1-K2 | 15 | K1,K2 |
| 4 | CO4 | K1-K2 | 15 | K1,K2 |
| 5 | CO5 | K1-K2 | 15 | K1,K2 |
| No. of Questions to be Asked | | | 75 | |
| No. of Questions to be answered | | | 75 | |
| Marks for each question | | | 1 | |
| Total Marks for each section | | | 75 | |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | |

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | **40** | **40** | **53** | **100** |
| **K2** | **35** | **35** | **47** | |
| **K3** | | | | |
| **K4** | | | | |
| **Marks** | | **75** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

| **Course Name** | MEDICAL INSTRUMENTATION | | | |
|---|---|---|---|---|
| **Course Code** | 23UPHSC32 | **L** | **P** | **C** |
| **Category** | SKILLED | 2 | - | 2 |

**COURSE OBJECTIVES:**

- This course aims to provide background of the Physics principles in medical instrumentation technologies through theoretical & practical learning.

| | | |
|---|---|---|
| **UNIT - I** | **BIOMETRICS** | **6** |

Introduction to man-instrument system and its components –problems encountered in measuring living systems – transducers– force, motion, pressure transducers.

| | | |
|---|---|---|
| **UNIT - II** | **BIOELECTRIC POTENTIALS AND ELECTRODES** | **6** |

Biomedical signals –types of electrodes ( Depth and Needle, Surface and Chemical)sources of bioelectric potentials – resting, action and propagation of bioelectric potentials –bio-potential electrodes – skin surface, needle electrodes- EEG, ECG, EMG & EOG (study of recording system and applications only)

| | | |
|---|---|---|
| **UNIT - III** | **DIAGNOSTIC RADIOLOGY,COMPUTED TOMOGRAPHY AND RADIOISOTOPES AND NUCLEAR MEDICINE6** | **6** |

**R**adiography – primary radiological image – contrast agents, filters– beam restrictor, grid –image quality Linear tomography – computed tomography –positron emission tomography.

| | | |
|---|---|---|
| **UNIT - IV** | **ULTRASOUND IMAGING AND MAGNETIC RESONANCE IMAGING** | **6** |

Ultrasound transducer – ultrasound imaging– Doppler ultrasound – ultrasound image quality – radiofrequency and resonance – MRI signal – relaxation time – MRI instrumentation – imaging sequences – biosafety

| | | |
|---|---|---|
| **UNIT - V** | **PROJECT ASSIGNMENT** | **6** |

Clinical practice of *one* of the following:electro cardiogram, electro encephalogram, electro myogram, electro oculogram, computed tomography, positron emission tomography, ultrasound

| | |
|---|---|
| **Total Lecture Hours** | **30** |

**BOOKS FOR STUDY:**

- Leslie Cromwell, Fred Weibell, Erich Pfieffer(2002) Biomedical Instrumentation & Measurements Prentice Hall of India, New Delhi.
- R. S. Khandpur (2003)Handbook of Biomedical Instrumentation 2nd Edn. Tata McGraw Hill, New Delhi.
- KuppusamyThayalan (2017), Basic Radiological Physics 2nd Edn. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi
- M.Arumugam, Biomedical Instrumentation , Anuradha Publications 2nd Edition Reprint 2019,Chennai

**BOOKS FOR REFERENCES:**

- John Webster (2004) Bioinstrumentation John Wiley and Sons, Singapore.
- John Enderle, Susan Blanchard, Joseph Bronzino (2005) Introduction to Biomedical Engineering, 2nd ed. Elsevier, San Deigo
- William Hendee, Geoffrey Ibbott, Eric Hendee (2005) Radiation therapy Physics 3rd ed. Wiley-Liss, New Jersey.

**WEB RESOURCES:**

- **https://archive.nptel.ac.in/courses/106/104/106104119/ (BIOMETRICS**
- **https://www.biomedicalinstrumentationsystems.com/bioelectric-potentials-and-electrodes-questions-and-answers/ (BIOELECTRIC POTENTIALS AND ELECTRODES)**
- **https://www.castleconnolly.com/topics/diagnostic-radiology/what-is-diagn RADIOLOGY,COMPUTED TOMOGRAPHY AND RADIOISOTOPES) AND NUCLEAR MEDICINE**
- **https://www.youtube.com/watch?v=Rqk9j_kry4A (ULTRASOUND IMAGING AND MAGNETIC RESONANCE IMAGING)**
- **https://my.clevelandclinic.org/health/diagnostics/16953-electrocardiogram-ekg (PROJECT ASSIGNMENT)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | | ENTREPRENEURSHIP | ✓ | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | **50** | No Changes Made | | New Course | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Remembering the physical components of bio medical systems | K1 & K2 |
| CO2 | Understanding the principles of Electrodes | K1 & K2 |
| CO3 | Recalling the characteristics of types of scan systems | K1 & K2 |
| CO4 | To know about the Ultrasound Imaging And Magnetic Resonance Imaging | K1 & K2 |
| CO5 | Understanding the various types of recording graphical methods | K1 & K2 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | MEDICAL INSTRUMENTATION | HRS | PEDAGOGY |
|---|---|---|---|
| I | Introduction to man-instrument system and its components –problems encountered in measuring living systems – transducers– force, motion, pressure transducers. | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Biomedical signals –types of electrodes ( Depth and Needle, Surface and Chemical)sources of bioelectric potentials – resting, action and propagation of bioelectric potentials –bio-potential electrodes – skin surface, needle electrodes- EEG, ECG, EMG & EOG (study of recording system and applications only) | 6 | Chalk & Talk, Videos, PPT and Demonstration |

| | | | |
|---|---|---|---|
| **III** | **R**adiography – primary radiological image – contrast agents, filters– beam restrictor, grid –image quality<br>Linear tomography – computed tomography –positron emission tomography . | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | Ultrasound transducer – ultrasound imaging– Doppler ultrasound – ultrasound image quality – radiofrequency and resonance – MRI signal – relaxation time – MRI instrumentation – imaging sequences – biosafety | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Clinical practice of *one* of the following:electro cardiogram, electro encephalogram, electro myogram, electro oculogram, computed tomography, positron emission tomography, ultrasound | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |

| **Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | |
| | | | **MCQs** | |
| | | | **No. of. Questions** | **K - Level** |
| **CI<br>AI** | **CO1** | **K1 – K2** | **25** | **K1,K2** |
| | **CO2** | **K1 – K2** | **25** | **K1,K2** |
| **CI<br>AII** | **CO3** | **K1 – K2** | **25** | **K1,K2** |
| | **CO4** | **K1 – K2** | **25** | **K1,K2** |
| **Question Pattern<br>CIA I & II** | | **No. of Questions to be asked** | **50** | |
| | | **No. of Questions to be answered** | **50** | |
| | | **Marks for each question** | **1** | |
| | | **Total Marks for each section** | **50** | |

***** Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. (I$^{st}$ Test-2 CO's & II$^{nd}$ Test-2 CO's) in equal weightage

| Distribution of Marks with K Level CIA I & CIA II | | | | | |
|---|---|---|---|---|---|
| | K Level | Section A (Multiple Choice Questions) | Total Marks | % of (Marks without choice) | Consolidate of % |
| CIA I | K1 | 30 | 30 | 60 | 100 |
| | K2 | 20 | 20 | 40 | |
| | K3 | | | | |
| | K4 | | | | |
| | Marks | 50 | 50 | 100 | 100 |
| CIA II | K1 | 30 | 30 | 60 | 100 |
| | K2 | 20 | 20 | 40 | |
| | K3 | | | | |
| | K4 | | | | |
| | Marks | 50 | 50 | 100 | 100 |

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

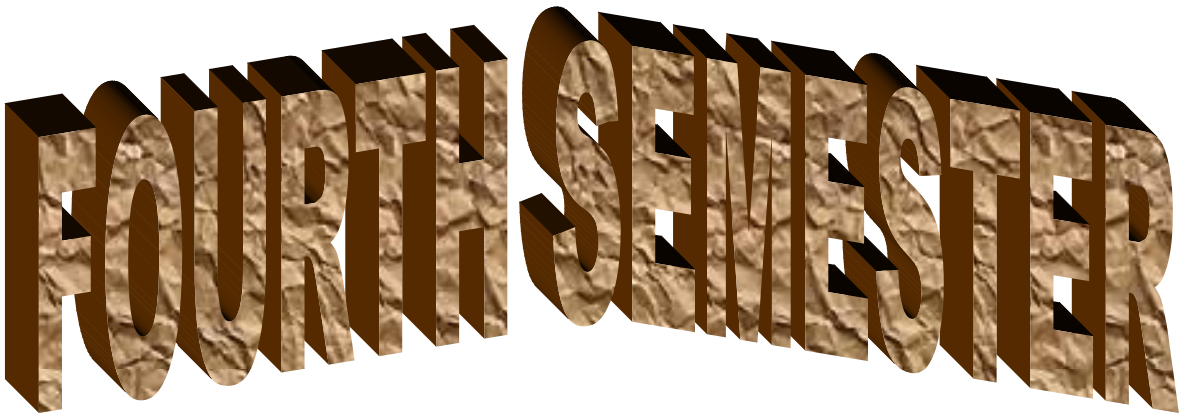
**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | |
| | | | No. of Questions | K – Level |
| 1 | CO1 | K1-K2 | 15 | K1,K2 |
| 2 | CO2 | K1-K2 | 15 | K1,K2 |
| 3 | CO3 | K1-K2 | 15 | K1,K2 |
| 4 | CO4 | K1-K2 | 15 | K1,K2 |
| 5 | CO5 | K1-K2 | 15 | K1,K2 |
| No. of Questions to be Asked | | | 75 | |
| No. of Questions to be answered | | | 75 | |
| Marks for each question | | | 1 | |
| Total Marks for each section | | | 75 | |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | |

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | **40** | **40** | **53** | **100** |
| **K2** | **35** | **35** | **47** | |
| **K3** | | | | |
| **K4** | | | | |
| **Marks** | | **75** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |


FOURTH SEMESTER

| | | | | |
|---|---|---|---|---|
| **Course Name** | OPTICS AND SPECTROSCOPY | | | |
| **Course Code** | 23UPHCC41 | **L** | **P** | **C** |
| **Category** | CORE | 5 | - | 5 |

**COURSE OBJECTIVES:**

- To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics
- To explain the behaviour of light in different mediums
- To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in day to day life
- To understand the design of optical systems and methods to minims aberrations
- To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations.

**UNIT – I LENS AND PRISMS** **15**

*Prism*: dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope.
*Eyepieces*: advantage of an eyepiece over a simple lens – Huygen's and Ramsden's eyepieces, construction and working –merits and demerits of the eyepiece.
*Resolving power*: Rayleigh's criterion for resolution – limit of resolution for the eye – resolving power of, (i) Prism (ii) grating

**UNIT - II INTERFERENCE** **15**

Division of wave front, Fresnel's biprism – fringes with white light – division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light – colours of thin films applications – air wedge – Newton's rings.
*Interferometers* : Michelson's interferometer – applications, ( i) determination of the wavelength of a monochromatic source of light.(Compulsory problems in thin films and Michelson's interferometer- 5 mark)

**UNIT - III DIFFRACTION** **15**

Fresnel's assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens –Fresnel type of diffraction–Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine wavelengths – width of principal maxima.

**UNIT - IV POLARISATION** **15**

Polarizer and analyser–double refraction – optic axis, principal plane – Huygens's explanation of double refraction in uniaxial crystals –polaroids and applications – circularly and elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel's explanation- optical activity – optically active crystals – specific rotation – Laurent half shade polarimeter– experiment to determine specific rotatory power.(Compulsory problems in QWP,HWP and optical activity - 5 mark)

**UNIT - V SPECTROSCOPY** **15**

infra-red spectroscopy near infra-red and far infra-red – properties –origin of IRspectra– applications of IR spectra – scattering of light – Raman effect –classical theory –quantum theory –mutual exclusion principle – Raman spectrometer- characteristics of Raman lines –applications – spectrophotometer.

**Total Lecture Hours** **75**

**BOOKS FOR STUDY:**


- Subramaniam. N&Brijlal, 2014,Optics, 25th edition,S.Chand&Co.
- S.L.Gupta,V.Kumar& R.C.Sharma,1997,Elements of Spectroscopy, 13th Edition, PragatiPrakashan, Meerut.
- G.Aruldhass,2000,MolecularStructure and Spectroscopy,IIedition.PHIPvt Ltd, New Delhi.
- P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi.
- K.Rajagopal, 2008, Engineering Physics, PHIPvt Ltd, New Delhi.
- V.Rajendran, 2012, Engineering Physics, Tata McGraw Hill
- R.Murugeshan and Kiruthiga Sivaprasath , Optics and Spectroscopy, 8 th Revised Edition-Reprint 2013


**BOOKS FOR REFERENCES:**


- Agarwal B.S, 2011,Optics, KedernathRamnath Publishers, Meerut.
- Sathyaprakash, 1990,Optics,VIIedition, RatanPrakashanMandhir, New Delhi.
- C.N.Banewell, 2006, Introduction to Molecular Spectroscopy,IVedition,TMHPublishing Co,New Delhi.
- AjoyGhatak, 2009,Optics, 4thedition, PHIPvt Ltd, New Delhi.
- Singh &Agarwal,2002,Optics and Atomic Physics, 9thedition, PragatiPrakashan Meerut.
- D.Halliday,R.Resnick and J. Walker, 2001, Fundamentals of Physics,6th edition, Willey, New York.
- JenkinsA.Francis& White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., NewDelhi


**WEB RESOURCES:**

- **https://archive.nptel.ac.in/courses/115/105/115105120/- LENS AND PRISMS**
- **https://archive.nptel.ac.in/courses/115/107/115107131/- INTERFERENCE**
- **https://nptel.ac.in/courses/112106227- DIFFRACTION**
- **https://www.youtube.com/watch?v=LPIXENvuCUk- POLARISATION**
- **https://onlinecourses.nptel.ac.in/noc20_cy08/preview- SPECTROSCOPY**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | ✓ | SKILL ORIENTED | | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | GLOBAL | ✓ |
| **Changes Made in the Course** | Percentage of Change | **50** | No Changes Made | | New Course | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Outline basic knowledge of methods of rectifying different defects in lenses, articulate technological applications of eyepieces | K1 to K4 |
| CO2 | Discuss the principle of superposition of wave, use these ideas to understand the wave nature of light through working of interferometer | K1 to K4 |
| CO3 | Extend the knowledge about nature of light through diffraction techniques; apply mathematical principles to analyse the optical instruments | K1 to K4 |
| CO4 | Interpret basic formulation of polarization and gain knowledge about polarimeter, appraise its usage in industries | K1 to K4 |
| CO5 | Relate the principles of optics to various fields of IR, Raman and UV spectroscopy and understand their instrumentation and application in industries | K1 to K4 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 |
| CO5 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 3 | 1 | 3 | - | 2 |
| CO 4 | 3 | 1 | 3 | - | 2 |
| CO 5 | 3 | 1 | 3 | - | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | OPTICS AND SPECTROSCOPY | HRS | PEDAGOGY |
|---|---|---|---|
| I | *Prism*: dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope.<br>*Eyepieces*: advantage of an eyepiece over a simple lens – Huygen's and Ramsden's eyepieces, construction and working –merits and demerits of the eyepiece. | 15 | Chalk & Talk, Videos, PPT and Demonstration |

| | | | |
|---|---|---|---|
| | *Resolving power*: Rayleigh's criterion for resolution – limit of resolution for the eye – resolving power of,<br>(i) Prism (ii) grating | | |
| **II** | Division of wave front, Fresnel's biprism – fringes with white light – division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light – colours of thin films applications – air wedge – Newton's rings.<br>*Interferometers* : Michelson's interferometer – applications, ( i) determination of the wavelength of a monochromatic source of light.<br>.(Compulsory problems in thin films and Michelson's interferometer- 5 mark) | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **III** | Fresnel's assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens –Fresnel type of diffraction–Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine wavelengths – width of principal maxima. | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | Polarizer and analyser–double refraction – optic axis, principal plane – Huygens's explanation of double refraction in uniaxial crystals –polaroids and applications – circularly and elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel's explanation- optical activity – optically active crystals – specific rotation – Laurent half shade polarimeter– experiment to determine specific rotatory power.<br>.(Compulsory problems in QWP,HWP and optical activity - 5 mark) | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Infra-red spectroscopy near infra-red and far infra-red – properties –origin of IRspectra– applications of IR spectra – scattering of light – Raman effect –classical theory –quantum theory –mutual exclusion principle – Raman spectrometer- characteristics of Raman lines –applications – spectrophotometer. | **15** | **Chalk & Talk, Videos, PPT and Demonstration** |

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | | **Section B Either or Choice** | **Section C Either or Choice** |
| | | | **MCQs** | | | |
| | | | **No. of. Questions** | **K - Level** | | |
| **CI AI** | **CO1** | **K1 – K4** | **2** | **K1, K2** | **K1 OR K1** | **K3 OR K3** |
| | **CO2** | **K1 – K4** | **2** | **K1,K2** | **K2 OR K2** | **K4 OR K4** |
| **CI AII** | **CO3** | **K1 – K4** | **2** | **K1, K2** | **K2 OR K2** | **K3 OR K3** |
| | **CO4** | **K1 – K4** | **2** | **K1,K2** | **K3 OR K3** | **K4 OR K4** |
| **Question Pattern CIA I & II** | | **No. of Questions to be asked** | **4** | | **4** | **4** |
| | | **No. of Questions to be answered** | **4** | | **2** | **2** |
| | | **Marks for each question** | **1** | | **5** | **8** |
| | | **Total Marks for each section** | **4** | | **10** | **16** |

| Distribution of Marks with K Level CIA I & CIA II | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Section B (Either / Or Choice)** | **Section C (Either / Or Choice)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | 2 | 10 | - | 12 | **21.43** | - |
| | **K2** | 2 | 10 | - | 12 | **21.43** | |
| | **K3** | - | - | 16 | 16 | **28.57** | **42.86** |
| | **K4** | - | - | 16 | 16 | **28.57** | **71.43** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |
| **CIA II** | **K1** | 2 | | | 2 | **3.57** | - |
| | **K2** | 2 | 10 | | 12 | **21.43** | |
| | **K3** | | 10 | 16 | 26 | **46.43** | **25.00** |
| | **K4** | | | 16 | 16 | **28.57** | **71.43** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | Cos | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K – LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1 – K4 | 2 | K1, K2 | K1, K1 | K2, K2 |
| 2 | CO2 | K1 – K4 | 2 | K1, K2 | K2, K2 | K2, K2 |
| 3 | CO3 | K1 – K4 | 2 | K1, K2 | K2, K2 | K3, K3 |
| 4 | CO4 | K1 – K4 | 2 | K1, K2 | K3, K3 | K3, K3 |
| 5 | CO5 | K1 – K4 | 2 | K1, K2 | K4, K4 | K4, K4 |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| K Level | Section A (Multiple Choice Questions) | Section B (Either or Choice | Section C (Either/ or Choice) | Total Marks | % of (Marks without choice) | Consolidated % |
| K1 | 5 | 10 | | 15 | 10.72 | - |
| K2 | 5 | 20 | 32 | 57 | 40.71 | 51.43 |
| K3 | | 10 | 32 | 42 | 30.00 | 30.00 |
| K4 | | 10 | 16 | 26 | 18.57 | 18.57 |
| Marks | 10 | 50 | 80 | 140 | 100 | 100 |
| NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels. | | | | | | |

## Summative Examinations - Question Paper – Format

| Q. No. | Unit | CO | K-level | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | | **PART – A** | **(10 x 1 = 10 Marks)** |
| 1. | **Unit - I** | **CO1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | **Unit - I** | **CO1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | **Unit - II** | **CO2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | **Unit - II** | **CO2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | **Unit - III** | **CO3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | **Unit - III** | **CO3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | **Unit - IV** | **CO4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | **Unit - IV** | **CO4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | **Unit - V** | **CO5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | **Unit - V** | **CO5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions **PART – B** | | | | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit – I** | **CO1** | **K1** | |
| | | **OR** | | |
| 11. b) | **Unit – I** | **CO1** | **K1** | |
| 12. a) | **Unit – II** | **CO2** | **K2** | |
| | | **OR** | | |
| 12. b) | **Unit – II** | **CO2** | **K2** | |
| 13. a) | **Unit - III** | **CO3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO3** | **K2** | |
| 14. a) | **Unit – IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit – IV** | **CO4** | **K3** | |
| 15. a) | **Unit – V** | **CO5** | **K4** | |
| | | **OR** | | |
| 15. b) | **Unit – V** | **CO5** | **K4** | |

| Answer **ALL** the questions **PART – C(5 x 8 = 40 Marks)** | | | | |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO1** | **K2** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO1** | **K2** | |
| 17. a) | **Unit - II** | **CO2** | **K2** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO2** | **K2** | |
| 18. a) | **Unit - III** | **CO3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO3** | **K3** | |
| 19. a) | **Unit - IV** | **CO4** | **K3** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO4** | **K3** | |
| 20. a) | **Unit - V** | **CO5** | **K4** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO5** | **K4** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | PHYSICS PRACTICAL 4 | | | |
| **Course Code** | 23UPHCP41 | **L** | **P** | **C** |
| **Category** | CORE PRACTICAL | - | 3 | 3 |

**COURSE OBJECTIVES:**

- Construct circuits to learn about the concept of electricity, current, resistance in the path of current, different parameters that affect a circuit. Set up experiments, observe, analyse and assimilate the concept

| **ELECTRICITY (ANY EIGHT EXPERIMENTS)** | **HOURS** |
|---|---|
| 1.Determination of refractive index of prism using spectrometer. | |
| 2.Determination of refractive index of liquid using hollow prism and spectrometer | |
| 3.Determination of dispersive power of a prism. | |
| 4.Determination of radius of curvature of lens by forming Newton's rings. | |
| 5.Determination of thickness of a wire using air wedge. | |
| 6.Determination of Cauchy's Constants. | |
| 7.Determination of resolving power of grating | |
| 8.Determination of resolving power of telescope | |
| 9.Comparison of intensities using Lummer Brodhum Photometer. | |
| 10.Determination of range of motion using Searles goniometer. | |
| 11.Verification of Newton's formula for a lens separated by a distance. | |
| 12.Determination of refractive index of a given liquid by forming liquid lens | |
| 13.Determination of refractive index using Laser. | |
| 14.Determination of wavelengths, particle size using Laser/Monochromatic source. | |
| 15.Determination of resolving power of Diffraction grating using Laser | |
| 16.Determination of wire using Laser. | |
| **Total Lecture Hours** | **45** |

**BOOKS FOR STUDY:**

- Srinivasan.M.N., Balasubramanian.S., Ranganathan.R., A Text Book of Practical Physics, 2017 Edition, Sultan Chand & Sons.

**BOOKS FOR REFERENCES:**

- Ouseph.C., Practical Physics and Electronics, 2013, S.Viswanathan.P.Ltd.

**WEB RESOURCES:**

- **https://v1.nitj.ac.in/physics/Downloads/LabManual6330.pdf (Determination of refractive index of prism using spectrometer.)**
- **https://vlab.amrita.edu/?sub=1&brch=189&sim=335&cnt=2 (Determination of radius of curvature of lens by forming Newton's rings.)**
- **https://crescent.education/wp-content/uploads/2018/03/PHYSICSLAB_MANUAL2017.pdf (Determination of wavelengths, particle size using Laser/Monochromatic source)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | ✓ | GLOBAL | |
| **Changes Made in the Course** | Percentage of Change | **20** | No Changes Made | | New Course | | | |
| *** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.** | | | | | | | | |

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | Remembering the Aim and apparatus used in the experiment | **K1 to K4** |
| **CO2** | Understanding of laws and formulas of the experiment | **K1 to K4** |
| **CO3** | Applying the knowledge to do the experiment | **K1 to K4** |
| **CO4** | Calculating and examining the aim of the experiment | **K1 to K4** |
| **CO5** | Interpreting the result of the experiment | **K1 to K4** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 2 | 3 | - | 2 |
| CO 2 | 3 | 2 | 3 | - | 2 |
| CO 3 | 3 | 2 | 3 | - | 2 |
| CO 4 | 3 | 2 | 3 | - | 2 |
| CO 5 | 3 | 2 | 3 | - | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

| LESSON PLAN: | | | |
|---|---|---|---|
| **SEM** | **PRACTICAL 4** | **HRS** | **PEDAGOGY** |
| **IV** | 1.Determination of refractive index of prism using spectrometer.<br>2.Determination of dispersive power of a prism.<br>3.Determination of radius of curvature of lens by forming Newton's rings.<br>4.Determination of thickness of a wire using air wedge.<br>5.Determination of Cauchy's Constants.<br>6.Determination of resolving power of grating<br>7.Determination of refractive index using Laser.<br>8.Determination of wavelengths, particle size using Laser source. | **45** | **Demonstration and Video** |

| **Learning Outcome Based Education & Assessment (LOBE)**<br>**Formative Examination - Blue Print**<br>**Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **No. of. Questions** | **K – Level** |
| **CIA-I** | **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| **Question Pattern CIA - I** | | No. of Questions to be asked | **1** Question for Each Student | |
| | | No. of Questions to be answered | **1** | |
| | | Marks for each question | **30** | |
| | | Total Marks for each section | **30** | |

| **Distribution of Marks with COs &K Level for Correction of CIA I** | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO1** | Aim and apparatus | **K1** | **2.0** |
| | **CO2** | Formula and Tabular Column | **K2** | **5** |
| | **CO3** | Understanding and Observation | **K4** | **12.0** |
| | **CO4** | Calculation and Graph | **K3** | **8.0** |
| | **CO5** | Interpretation of result | **K2** | **3.0** |
| | **Total Marks** | | | **30** |

| Distribution of Marks with K Level CIA I | | | | | |
|---|---|---|---|---|---|
| | **K Level** | **Distribution of the work of the experiment** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | Aim and apparatus | 2 | 6.66 | - |
| | **K2** | Formula and Tabular Column Interpretation of result | 8 | 26.67 | |
| **CIA I** | **K1** | Aim and apparatus | 2 | 6.66 | - |
| | **K2** | Formula and Tabular Column Interpretation of result | 8 | 26.67 | |
| | **K3** | Understanding and Observation | 8 | 26.67 | **33.33** |
| | **K4** | Calculation and Graph | 12 | 40.00 | **60.00** |
| | **Marks** | | **30** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | |
|---|---|---|---|
| **COs** | **K - Level** | **No. of Questions** | **K – Level** |
| **CO1- CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| No. of Questions to be Asked | | **1** Question for Each Student | |
| No. of Questions to be answered | | **1** | |
| Marks for each question | | **60** | |
| Total Marks for each section | | **60** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | |

| Distribution of Marks with COs &K Level for Correction of the Summative Exam | | | |
|---|---|---|---|
| **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CO1** | Aim and apparatus | **K1** | **5** |
| **CO2** | Formula and Tabular Column | **K2** | **10** |
| **CO3** | Understanding and Observation | **K4** | **25** |
| **CO4** | Calculation and Graph | **K3** | **15** |
| **CO5** | Interpretation of result | **K2** | **5** |
| **Total Marks** | | | **60** |

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| **K Level** | **Parameters for K-Level** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | Aim and apparatus | **5** | **8.33** | **-** |
| **K2** | Formula and Tabular Column, Interpretation of result | **15** | **25.00** | **8.33** |
| **K3** | Understanding and Observation | **25** | **41.67** | **33.33** |
| **K4** | Calculation and Graph | **15** | **25.00** | **75.00** |
| **Marks** | | **60** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | CHEMISTRY FOR PHYSICAL SCIENCES – II | | | |
| **Course Code** | 23UCHEA41 | L | P | C |
| **Category** | GENERIC ELECTIVE | **4** | - | **3** |

**COURSE OBJECTIVES:**

This course aims to provide knowledge on the

- Co-ordination Chemistry and Water Technology
- Carbohydrates and Amino acids
- basics and applications of electrochemistry
- basics and applications of kinetics and catalysis
- Various photochemical phenomenon

**UNIT - I Co-ordination Chemistry and Water Technology 12**

Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to [Ni(CO)4], [Ni(CN)4]2-,[Co(CN)6]3- Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques- BOD, COD.

**UNIT - II Carbohydrates and Amino acids 12**

Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose.

Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).

**UNIT - III Electrochemistry 12**

Galvanic cells –Three electrode system (basic idea)- Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Batteries –Li ion, Na ion, LiS - Types of cells -fuel cells- corrosion and its prevention.

| UNIT - IV Kinetics and Catalysis | 12 |
|---|---|
| Order and molecularity. Integrated rate expression for I and II (2A □ Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation. | |
| **UNIT - V Photochemistry** | **12** |
| Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples). | |
| **Total Lecture Hours** | **60** |

**BOOKS FOR STUDY:**

- V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009.
- S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006.
- S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012.

**BOOKS FOR REFERENCES:**

- P.L.Soni, MohanKatyal, Textbook of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
- B.R.Puri, L.R.Sharma, M.S.Pathania, TextbookPhysical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
- B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

**WEB RESOURCES:**

- **https://onlinecourses.nptel.ac.in/noc19_cy19/preview**
- **https://archive.nptel.ac.in/courses/103/102/103102012/**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | ✓ | SKILL ORIENTED | | | ENTREPRENEURSHIP | | | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | | ✓ | GLOBAL | | | | |
| **Changes Made in the Course** | Percentage of Change | | ✓ | No Changes Made | | | New Course | | | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology | K1 to K4 |
| CO2 | explain the preparation and property of carbohydrate, amino acids and nucleic acids. | K1 to K4 |
| CO3 | apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells. | K1 to K4 |
| CO4 | identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst. | K1 to K4 |
| CO5 | outline the various type of photochemical process. | K1 to K4 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | S | S | M | S | S |
| CO2 | M | S | S | S | M | S | S | M | M | S |
| CO3 | S | S | S | M | S | S | S | M | S | S |
| CO4 | S | S | S | S | S | S | S | M | S | S |
| CO5 | S | M | S | S | S | S | S | M | S | M |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 3 | 3 | 3 |
| CO 2 | 3 | 3 | 3 | 3 | 3 |
| CO 3 | 3 | 3 | 3 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 3 | 3 | 3 |
| WEITAGE | 15 | 15 | 15 | 15 | 15 |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

**LESSON PLAN:**

| UNIT | CHEMISTRY FOR PHYSICAL SCIENCES – II | HRS | PEDAGOGY |
|---|---|---|---|
| I | Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to [Ni(CO)4], [Ni(CN)4]2-,[Co(CN)6]3- Chelation - Biological role of Haemoglobin and Chlorophyll (elementary idea) – Applications in qualitative and quantitative analysis.<br><br>Water Technology: Hardness of water, determination of hardness of | 12 | Chalk & Talk, ppt |

| | | | |
|---|---|---|---|
| | water using EDTA method, zeolite method-Purification techniques-BOD, COD. | | |
| **II** | Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose.<br><br>Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only). | **12** | **Chalk & Talk, ppt** |
| **III** | Galvanic cells –Three electrode system (basic idea)- Standard hydrogen electrode - calomel electrode - standard electrode potentials - electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Batteries –Li ion, Na ion, LiS - Types of cells -fuel cells-corrosion and its prevention. | **12** | **Group discussion** |
| **IV** | Order and molecularity. Integrated rate expression for I and II (2A □ Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation. | **12** | **Chalk & Talk, ppt** |
| **V** | Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples). | **12** | **Chalk & Talk, ppt** |

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | | **Section B Either or Choice** | **Section C Either or Choice** |
| | | | **MCQs** | | | |
| | | | **No. of. Questions** | **K - Level** | | |
| **CI AI** | **CO1** | **K1 – K4** | **2** | **K1** | **2 (K2,K2)** | **2(K3,K3)** |
| | **CO2** | **K1 – K4** | **2** | **K2** | **2(K3,K3)** | **2(K4,K4)** |
| **CI AII** | **CO3** | **K1 – K4** | **2** | **K1** | **2(K2,K2)** | **2(K3,K3)** |
| | **CO4** | **K1 – K4** | **2** | **K2** | **2(K3,K3)** | **2(K4,K4)** |
| **Question Pattern CIA I & II** | | No. of Questions to be asked | **4** | | **4** | **4** |
| | | No. of Questions to be answered | **4** | | **2** | **2** |
| | | Marks for each question | **1** | | **5** | **8** |
| | | Total Marks for each section | **4** | | **10** | **16** |

| Distribution of Marks with K Level CIA I & CIA II | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **K Level** | **Section A (Multiple Choice Questions)** | **Section B (Either / Or Choice)** | **Section C (Either / Or Choice)** | **Total Marks** | **% of (Marks without choice)** | **Consolidate of %** |
| **CIA I** | **K1** | 2 | - | - | 2 | **3.57** | **25** |
| | **K2** | 2 | 10 | - | 12 | **21.43** | |
| | **K3** | - | 10 | 16 | 26 | **46.43** | **46.43** |
| | **K4** | - | - | 16 | 16 | **28.57** | **28.57** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |
| **CIA II** | **K1** | 2 | - | - | 2 | **3.57** | **25** |
| | **K2** | 2 | 10 | - | 12 | **21.43** | |
| | **K3** | - | 10 | 16 | 26 | **46.43** | **46.43** |
| | **K4** | - | - | 16 | 16 | **28.57** | **28.57** |
| | **Marks** | **4** | **20** | **32** | **56** | **100** | **100** |

**K1**- Remembering and recalling facts with specific answers

**K2**- Basic understanding of facts and stating main ideas with general answers

**K3**- Application oriented- Solving Problems

**K4**- Examining, analyzing, presentation and make inferences with evidences

**CO5 - will be allotted for individual Assignment which carries five marks as part of CIA component.**

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | | | |
|---|---|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | | Section B (Either / or Choice) With K - LEVEL | Section C (Either / or Choice) With K - LEVEL |
| | | | No. of Questions | K – Level | | |
| 1 | CO1 | K1-K4 | 2 | K1&K2 | 2 (K2) | 2 (K3) |
| 2 | CO2 | K1-K4 | 2 | K1&K2 | 2 (K3) | 2 (K4) |
| 3 | CO3 | K1-K4 | 2 | K1&K2 | 2 (K2) | 2 (K3) |
| 4 | CO4 | K1-K4 | 2 | K1&K2 | 2 (K3) | 2 (K4) |
| 5 | CO5 | K1-K4 | 2 | K1&K2 | 2 (K4) | 2 (K3) |
| No. of Questions to be Asked | | | 10 | | 10 | 10 |
| No. of Questions to be answered | | | 10 | | 5 | 5 |
| Marks for each question | | | 1 | | 5 | 8 |
| Total Marks for each section | | | 10 | | 25 | 40 |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | | | |

| Distribution of Marks with K Level | | | | | | |
|---|---|---|---|---|---|---|
| K Level | Section A (Multiple Choice Questions) | Section B (Either or Choice | Section C (Either/ or Choice) | Total Marks | % of (Marks without choice) | Consolidated % |
| K1 | 5 | - | - | 5 | 3.57 | 21.43 |
| K2 | 5 | 20 | - | 25 | 17.86 | |
| K3 | - | 20 | 48 | 68 | 48.57 | 48.57 |
| K4 | - | 10 | 32 | 42 | 30 | 30 |
| Marks | 10 | 50 | 80 | 140 | 100 | 100 |
| NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels. | | | | | | |

## Summative Examinations - Question Paper – Format

| Q. No. | Unit | CO | K-level | | |
|---|---|---|---|---|---|
| Answer **ALL** the questions | | | | **PART – A** | **(10 x 1 = 10 Marks)** |
| 1. | **Unit - I** | **CO 1** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 2. | **Unit - I** | **CO 1** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 3. | **Unit - II** | **CO 2** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 4. | **Unit - II** | **CO 2** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 5. | **Unit - III** | **CO 3** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 6. | **Unit - III** | **CO 3** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 7. | **Unit - IV** | **CO 4** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 8. | **Unit - IV** | **CO 4** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 9. | **Unit - V** | **CO 5** | **K1** | | |
| | | | | a) | b) |
| | | | | c) | d) |
| 10. | **Unit - V** | **CO 5** | **K2** | | |
| | | | | a) | b) |
| | | | | c) | d) |

| Answer **ALL** the questions | | **PART – B** | | **(5 x 5 = 25 Marks)** |
|---|---|---|---|---|
| 11. a) | **Unit - I** | **CO 1** | **K2** | |
| | | **OR** | | |
| 11. b) | **Unit - I** | **CO 1** | **K2** | |
| 12. a) | **Unit - II** | **CO 2** | **K3** | |
| | | **OR** | | |
| 12. b) | **Unit - II** | **CO 2** | **K3** | |
| 13. a) | **Unit - III** | **CO 3** | **K2** | |
| | | **OR** | | |
| 13. b) | **Unit - III** | **CO 3** | **K2** | |
| 14. a) | **Unit - IV** | **CO 4** | **K3** | |
| | | **OR** | | |
| 14. b) | **Unit - IV** | **CO 4** | **K3** | |
| 15. a) | **Unit - V** | **CO 5** | **K4** | |
| | | **OR** | | |
| 15. b) | **Unit - V** | **CO 5** | **K4** | |

| Answer **ALL** the questions | | **PART – C** | | **(5 x 8 = 40 Marks)** |
|---|---|---|---|---|
| 16. a) | **Unit - I** | **CO 1** | **K3** | |
| | | **OR** | | |
| 16. b) | **Unit - I** | **CO 1** | **K3** | |
| 17. a) | **Unit - II** | **CO 2** | **K4** | |
| | | **OR** | | |
| 17. b) | **Unit - II** | **CO 2** | **K4** | |
| 18. a) | **Unit - III** | **CO 3** | **K3** | |
| | | **OR** | | |
| 18. b) | **Unit - III** | **CO 3** | **K3** | |
| | | | **K4** | |
| 19. a) | **Unit - IV** | **CO 4** | **K4** | |
| | | **OR** | | |
| 19. b) | **Unit - IV** | **CO 4** | **K4** | |
| 20. a) | **Unit - V** | **CO 5** | **K3** | |
| | | **OR** | | |
| 20. b) | **Unit - V** | **CO 5** | **K3** | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | CHEMISTRY PRACTICAL FOR PHYSICAL SCIENCES - II | | | |
| **Course Code** | 23UCHEP41 | **L** | **P** | **C** |
| **Category** | GENERIC ELECTIVE | - | 2 | 2 |

**COURSE OBJECTIVES:**

**This course aims to provide knowledge on the**

- identification of organic functional groups
- different types of organic compounds
- properties of organic compound.
- determination of elements in organic compounds.
- Confirmatory test of functional groups

**SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS**

The analysis must be carried out as follows:

(a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehyde and glucose].

(b) Detection of elements (N, S, Halogens).

(c) To distinguish between aliphatic and aromatic compounds.

(d) To distinguish – Saturated and unsaturated compounds.

| | |
|---|---|
| **Total Lecture Hours** | **30** |

**BOOKS FOR REFERENCES:**

- V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.

**WEB RESOURCES:**

- **https://archive.nptel.ac.in/courses/104/106/104106121/**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | SKILL ORIENTED | ✓ | ENTREPRENEURSHIP | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | NATIONAL | ✓ | GLOBAL | |
| **Changes Made in the Course** | Percentage of Change | | No Changes Made | ✓ | New Course | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| **COURSE OUTCOMES:** | | **K LEVEL** |
|---|---|---|
| **After studying this course, the students will be able to:** | | |
| **CO1** | gain an understanding of the use of test tube and analysis. | **K1 to K4** |
| **CO2** | design, carry out, record and interpret the results of qualitative analysis. | **K1 to K4** |
| **CO3** | apply their skill in the qualitative analysis of organic componds. | **K1 to K4** |
| **CO4** | analyze the chemical constituents in allied chemical products | **K1 to K4** |
| **CO5** | estimate the functional groups present in industrial effluents | **K1 to K4** |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | S | S | S | S | S | S | S | M | | |
| CO2 | M | S | S | S | M | S | S | M | | |
| CO3 | S | S | S | M | S | S | S | M | | |
| CO4 | S | S | S | S | S | S | S | M | | |
| CO5 | S | M | S | S | S | S | S | M | | |

**3 - STRONG** **2 – MEDIUM** **1 - LOW**

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 3 | 3 | 3 |
| CO 2 | 3 | 3 | 3 | 3 | 3 |
| CO 3 | 3 | 3 | 3 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 3 | 3 | 3 |
| WEITAGE | 15 | 15 | 15 | 15 | 15 |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

| LESSON PLAN: | | | |
|---|---|---|---|
| **UNIT** | **PHYSICAL CHEMISTRY PRACTICAL – I** | **HRS** | **PEDAGOGY** |
| | **QUALITATIVE INORGANIC ANALYSIS** | | |
| | Organic Analysis Experiments | **25** | **Demonstration & experiment** |

**METHOD OF EVALUATION:**

| Continuous Internal Assessment | End Semester Examination | Total |
|---|---|---|
| 25 | 75 | 100 |

Internal Assesment : Observation & attendance -10 mark
Model examination - 15 mark
**Total CIA - 25 mark**

**Model examination should be conducted for 60 mark and it has to be converted to 15 mark**

| Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **No. of. Questions** | **K - Level** |
| **CIA-I** | **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| **Question Pattern CIA - I** | | No. of Questions to be asked | **1** Question for Each Student | |
| | | No. of Questions to be answered | **1** | |
| | | Marks for each question | **60** | |
| | | Total Marks for each section | **60** | |

| Distribution of Marks with COs & K Level for Correction of CIA I | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO3** | Preliminary tests | **K1** | **8** |
| | **CO2** | Identification of aromaticity & saturation | **K2** | **8** |
| | **CO4** | Special Elements present | **K4** | **4** |
| | **CO5** | Functional Group confirmatory test | **K3** | **10** |
| | **CO1** | Procedure | **K1** | **30** |
| | **Total Marks** | | | **60** |

**Summative Examination: Duly completed Record: 15 mark**

**End Semester Exam: 60 marks**

| **Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)** | | | |
|---|---|---|---|
| **COs** | **K - Level** | **No. of Questions** | **K – Level** |
| **CO1 - CO5** | **K1 – K4** | **1** Question for Each Student | **K1 – K4** |
| No. of Questions to be Asked | | **1** Question for Each Student | |
| No. of Questions to be answered | | **1** | |
| Marks for each question | | **60** | |
| Total Marks for each section | | **60** | |
| **(Figures in parenthesis denotes, questions should be asked with the given K level)** | | | |

| **Distribution of Marks with COs & K Level for Correction of Summative exam** | | | | |
|---|---|---|---|---|
| | **COs** | **Distribution of the work of the experiment** | **K - Level** | **MARKS** |
| **CIA I** | **CO3** | Preliminary tests | **K1** | **8** |
| | **CO2** | Identification of aromaticity & saturation | **K2** | **8** |
| | **CO4** | Special Elements present | **K4** | **4** |
| | **CO5** | Functional Group confirmatory test | **K3** | **10** |
| | **CO1** | Procedure | **K1** | **30** |
| | **Total Marks** | | | **60** |

| | | | | |
|---|---|---|---|---|
| **Course Name** | MATERIALS SCIENCE | | | |
| **Course Code** | 23UPHSC41 | **L** | **P** | **C** |
| **Category** | SKILL | 2 | - | 2 |

**COURSE OBJECTIVES:**

- To learn imperfections in crystals, deformation of materials and testing of materials.
- To get knowledge on behavior of a material, under the action of light and their applications.
- To know the applications of crystal defects.

**UNIT - I CRYSTAL IMPERFECTIONS** **6**

Introduction – point defects: vacancies, interstitials, impurities, electronic defects – equilibrium concentration of point imperfections –application of point defects –line defects: edge dislocation, screw dislocation – surface defects: extrinsic defects – intrinsic defects: grain boundaries, tilt &twist boundaries, twin boundaries, stacking faults – volume defects – effect of imperfections.

**UNIT - II MATERIAL DEFORMATION** **6**

**I**ntroduction – elastic behavior of materials – atomic model of elastic behavior –modulus as a parameter in design – rubber like elasticity – inelastic behavior of materials – relaxation process – viscoelastic behavior of materials – spring.

**UNIT - III PERMANENT DEFORMATION AND STRENGTHENING METHODS OF MATERIALS** **6**

Introduction–plastic deformation: tensile stress-strain curve – plastic deformation by slip – creep: mechanism of creep – creep resistant materials – strengthening methods.

**UNIT - IV OPTICAL MATERIALS** **6**

Introduction – optical absorption in metals, semiconductors and insulators – NLO materials and their applications – display devices and display materials: fluorescence and phosphorescence – light emitting diodes –liquid crystal displays.

**UNIT - V MECHANICAL TESTING** **6**

Destructive testing: tensile test,compression test, hardness test – nondestructive testing (NDT): radiographic methods, ultrasonic methods.

**Total Lecture Hours** **30**

**BOOKS FOR STUDY:**

- Material science and Engineering, Raghavan V, Prentice Hall of India, Sixth Edition, 2015
- Materials science, V. Rajendran, McGraw Hill publications2011

**BOOKS FOR REFERENCES:**

- William D. Callister, Jr., Material Science & Engineering – An Introduction, 8th Edition, John Wiley & Sons, Inc., 2007
- W. Bolton, "Engineering materials technology", 3rd Edition, Butterworth & Heinemann, 2001.
- Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", 5th Edition, Thomson Learning, First Indian Reprint, 2007.
- William F. Smith, "Structure and Properties of Engineering Alloys", Mc-Graw-Hill Inc., U.S.A, 2nd edition, 1993.

**WEB RESOURCES:**

- **https://www.youtube.com/watch?v=045Zy1hBENg-** **CRYSTAL IMPERFECTIONS**
- **https://onlinecourses.nptel.ac.in/noc21_mm27/preview**-- **MATERIAL DEFORMATION**
- **https://archive.nptel.ac.in/courses/113/106/113106101/**- **PERMANENT DEFORMATION AND STRENGTHENING METHODS OF MATERIALS**
- **https://archive.nptel.ac.in/content/storage2/courses/112108150/pdf/PPTs/MTS_06_m.pdf**- **OPTICAL MATERIALS**
- **https://onlinecourses.nptel.ac.in/noc24_me10/preview-** **MECHANICAL TESTING**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | ✓ | SKILL ORIENTED | | | ENTREPRENEURSHIP | | | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | ✓ | NATIONAL | | | GLOBAL | | | |
| **Changes Made in the Course** | Percentage of Change | | | No Changes Made | | | New Course | | ✓ | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Remembering the concepts of crystal imperfections | K1 & K2 |
| CO2 | Understanding the principles of material deformation | K1 & K2 |
| CO3 | Recalling the characteristics of permanent deformation and strengthening methods of materials | K1 & K2 |
| CO4 | To know about the different kinds of optical materials | K1 & K2 |
| CO5 | Understanding the various types of mechanical testing process | K1 & K2 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | MATERIALS SCIENCE | HRS | PEDAGOGY |
|---|---|---|---|
| I | Introduction – point defects: vacancies(problems), interstitials, impurities, electronic defects – equilibrium concentration of point imperfections (problems)–application of point defects –line defects: edge dislocation(problems), screw dislocation – surface defects: extrinsic defects – intrinsic defects: grain boundaries, tilt &twist boundaries,twin boundaries, stacking faults – volume defects – effect of imperfection | 6 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Introduction – elastic behavior of materials – atomic model of elastic behavior –modulus as a parameter in design – rubber like elasticity – | 6 | Chalk & Talk, Videos, PPT |

| | | | |
|---|---|---|---|
| | inelastic behavior of materials – relaxation process – viscoelastic behavior of materials – spring-Dash pot models of viscoelastic behavior of materials. | | **and Demonstration** |
| **III** | Introduction–plastic deformation: tensile stress-strain curve – plastic deformation by slip – creep: mechanism of creep – creep resistant materials – strengthening methods: strain hardening, grain refinement – solid solution strengthening – precipitation strengthening. | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | Introduction – optical absorption in metals, semiconductors and insulators – NLO materials and their applications – display devices and display materials: fluorescence and phosphorescence – light emitting diodes –liquid crystal displays | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Destructive testing: tensile test,compression test, hardness test – nondestructive testing (NDT): radiographic methods, ultrasonic methods – thermal methods of NDT: thermography – equipment used for NDT: metallurgical microscope | **6** | **Chalk & Talk, Videos, PPT and Demonstration** |

| **Learning Outcome Based Education & Assessment (LOBE)<br>Formative Examination - Blue Print<br>Articulation Mapping – K Levels with Course Outcomes (COs)** | | | | |
|---|---|---|---|---|
| **Internal** | **Cos** | **K Level** | **Section A** | |
| | | | **MCQs** | |
| | | | **No. of. Questions** | **K - Level** |
| **CI AI** | **CO1** | **K1 – K2** | **25** | **K1,K2** |
| | **CO2** | **K1 – K2** | **25** | **K1,K2** |
| **CI AII** | **CO3** | **K1 – K2** | **25** | **K1,K2** |
| | **CO4** | **K1 – K2** | **25** | **K1,K2** |
| **Question Pattern CIA I & II** | | **No. of Questions to be asked** | **50** | |
| | | **No. of Questions to be answered** | **50** | |
| | | **Marks for each question** | **1** | |
| | | **Total Marks for each section** | **50** | |

* Two Formative examinations will be conducted as a part of Continuous Internal Assessment under which, 50 MCQ's will be asked [50X1=50 marks] from any 4 CO's. ($I^{st}$ Test-2 CO's & $II^{nd}$ Test-2 CO's) in equal weightage

| Distribution of Marks with K Level CIA I & CIA II | | | | | |
|---|---|---|---|---|---|
| | K Level | Section A (Multiple Choice Questions) | Total Marks | % of (Marks without choice) | Consolidate of % |
| CIA I | K1 | 30 | 30 | 60 | 100 |
| | K2 | 20 | 20 | 40 | |
| | K3 | | | | |
| | K4 | | | | |
| | Marks | 50 | 50 | 100 | 100 |
| CIA II | K1 | 30 | 30 | 60 | 100 |
| | K2 | 20 | 20 | 40 | |
| | K3 | | | | |
| | K4 | | | | |
| | Marks | 50 | 50 | 100 | 100 |

**K1-** Remembering and recalling facts with specific answers

**K2-** Basic understanding of facts and stating main ideas with general answers

**K3-** Application oriented- Solving Problems

**K4-** Examining, analyzing, presentation and make inferences with evidences

**CO5** will be allotted for individual Assignment which carries five marks as part of CIA component.

| Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs) | | | | |
|---|---|---|---|---|
| S. No | COs | K - Level | Section A (MCQs) | |
| | | | No. of Questions | K – Level |
| 1 | CO1 | K1-K2 | 15 | K1,K2 |
| 2 | CO2 | K1-K2 | 15 | K1,K2 |
| 3 | CO3 | K1-K2 | 15 | K1,K2 |
| 4 | CO4 | K1-K2 | 15 | K1,K2 |
| 5 | CO5 | K1-K2 | 15 | K1,K2 |
| No. of Questions to be Asked | | | 75 | |
| No. of Questions to be answered | | | 75 | |
| Marks for each question | | | 1 | |
| Total Marks for each section | | | 75 | |
| (Figures in parenthesis denotes, questions should be asked with the given K level) | | | | |

In summative examinations, 75 MCQ's will be asked [75X1=75 marks] from all 5 CO's in equal weightage.

| Distribution of Marks with K Level | | | | |
|---|---|---|---|---|
| **K Level** | **Section A (Multiple Choice Questions)** | **Total Marks** | **% of (Marks without choice)** | **Consolidated %** |
| **K1** | **40** | **40** | **53** | **100** |
| **K2** | **35** | **35** | **47** | |
| **K3** | | | | |
| **K4** | | | | |
| **Marks** | | **75** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |

| | | | | |
|---|---|---|---|---|
| **Course Name** | LASERS AND FIBER OPTICS | | | |
| **Course Code** | 23UPHSC42 | **L** | **P** | **C** |
| **Category** | SKILL | 1 | - | 1 |

**COURSE OBJECTIVES:**

- The students will learn the fundamentals, types of lasers, laser instrumentation and their applications also the inter connect between optics with lasers.

**UNIT - I FUNDAMENTALSOFLASER 3**

Basic principles: spontaneous and stimulated emission – Einstein's coefficient – pumping mechanism: optical, electrical and laser pumping – population inversion – two and three level laser system – resonator configuration – quality factor – threshold condition – concept of Qswitching–Theory of mode locking– cavity dumping.

**UNIT - II TYPES OF LASER 3**

**S**olid state laser: ruby laser, Nd:YAG laser, Nd: Glass laser– semiconductor laser: intrinsic semiconductor laser, doped semiconductorlaser, injection laser – dye laser – chemical laser: HCL laser, DF- $CO_2$, CO chemical laser. Gas laser:neutral atom gas laser (He-Ne laser), $CO_2$laser, Copper vapour laser.(solid, gas, semiconductor)

**UNIT - III APPLICATIONS OF LASER 3**

Application of laser in metrology – optical communication – material processing: laser instrumentation of material processing, powder feeder, laser heating, laser welding, laser melting – medical application – Laser instrumentation for surgeries–laser in astronomy.

**UNIT - IV FIBEROPTICS 3**

Basic components of optical fiber communication – principles of light propagation through fiber – total internal reflection – optical fiber — types of fiber: single mode and multi-mode fiber – step index and graded index fiber – fiber optic sensors – application of fiber optics.

**UNIT - V CHARACTERISTICS AND FABRICATION OF OPTICAL FIBER 3**

Fiber characteristics: mechanical and transmission characteristics – absorption loss and scattering loss measurements – dispersion – connectors and splicers (block diagram) – fiber termination – optical time domain reflectometer(OTDR) and its uses – fiber material – fiber fabrication

**Total Lecture Hours 15**

**BOOKS FOR STUDY:**

- B.B. Laud - Laser and Non-linear Optics, New Age International Publications Third Edition, NewDelhi.
- An Introduction to laser, theoryand applications by Avadhunulu, M.N.S.,Chand&Co,NewDelhi
- J.WilsonandJ.F.B. Hawkes.'IntroductiontoOptoElectronics', PearsonEducation, 2018.

**BOOKS FOR REFERENCES:**

- A.Sennaroglu,"PhotonicsandLaserEngineering:Principles,DevicesandApplications"McGraw-HillEducation,2010.
- K.R.Nambiar,"Lasers:Principles,TypesandApplications",NewAgeInternational,2004.
- Optic, AjoyGhatak, McGraw-HillEducation(India)Pvt,Ltd, 6$^{th}$Edn., 2017.

**WEB RESOURCES:**

- **https://archive.nptel.ac.in/courses/104/104/104104085/- FUNDAMENTALS OF LASER**
- **https://www.youtube.com/watch?v=2bGjil4znWA- TYPES OF LASER**
- **https://archive.nptel.ac.in/courses/104/104/104104085/- APPLICATIONSOFLASER**
- **https://www.digimat.in/nptel/courses/video/115102124/L09.html- FIBEROPTICS**
- **https://archive.nptel.ac.in/courses/108/106/108106167/- CHARACTERISTICSANDFABRICATIONOFOPTICALFIBER**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nature of Course** | EMPLOYABILITY | | | SKILL ORIENTED | | | ENTREPRENEURSHIP | | ✓ | | | |
| **Curriculum Relevance** | LOCAL | | REGIONAL | | ✓ | NATIONAL | | GLOBAL | | | | |
| **Changes Made in the Course** | Percentage of Change | | **10** | No Changes Made | | | New Course | | | | | |

*** Treat 20% as each unit (20*5=100%) and calculate the percentage of change for the course.**

| COURSE OUTCOMES: | | K LEVEL |
|---|---|---|
| After studying this course, the students will be able to: | | |
| CO1 | Understand the concepts of fundamentals of laser | K1 & K2 |
| CO2 | Recollecting the principles,construction and working of types of laser | K1 & K2 |
| CO3 | Comprehend basic concept of applications of laser in various fields | K1 & K2 |
| CO4 | Recalling the knowledge of fiberoptics | K1 & K2 |
| CO5 | Understand the characteristics and fabrication of opticalfiber | K1 & K2 |

**MAPPING WITH PROGRAM OUTCOMES:**

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

3 - STRONG 2 – MEDIUM 1 - LOW

**CO / PO MAPPING:**

| COS | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | 3 | 1 | 3 | - | 2 |
| CO 2 | 3 | 1 | 3 | - | 2 |
| CO 3 | 2 | 1 | 3 | - | 2 |
| CO 4 | 2 | 1 | 3 | - | 3 |
| CO 5 | 2 | 1 | 3 | | 2 |
| WEITAGE | | | | | |
| WEIGHTED PERCENTAGE OF COURSE CONTRIBUTION TO POS | | | | | |

**LESSON PLAN:**

| UNIT | LASERS AND FIBER OPTICS | HRS | PEDAGOGY |
|---|---|---|---|
| I | Basic principles: spontaneous and stimulated emission – Einstein'scoefficient – pumping mechanism: optical, electrical and laser pumping – population inversion – two and three level laser system – resonatorconfiguration – quality factor – threshold condition – concept of Qswitching–Theoryofmodelocking– cavitydumping. | 3 | Chalk & Talk, Videos, PPT and Demonstration |
| II | Solidstatelaser: rubylaser, Nd:YAGlaser,Nd:Glasslaser– semiconductor laser: intrinsic semiconductor laser, doped semiconductorlaser, injection laser – dye laser – chemical laser: HCL laser, DF- $CO_2$, COchemicallaser. Gaslaser:neutral atom gas laser (He-Ne laser), $CO_2$laser, Copper vapour | 3 | Chalk & Talk, Videos, PPT and Demonstration |

| | | | |
|---|---|---|---|
| | laser.(solid, gas, semiconductor) | | |
| **III** | Application of laser in metrology – optical communication – materialprocessing: laser instrumentation of material processing, powder feeder, laser heating, laser welding, laser melting – medical application – Laserinstrumentationforsurgeries–laserinastronomy | **3** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **IV** | Basic components of optical fiber communication – principles of lightpropagation through fiber – total internal reflection – optical fiber – – types of fiber: single mode andmulti-mode fiber – step index and graded index fiber – fiber optic sensors – application of fiber optics. | **3** | **Chalk & Talk, Videos, PPT and Demonstration** |
| **V** | Fiber characteristics: mechanical and transmission characteristics – absorption loss and scattering loss measurements – dispersion – connectors and splicers(block diagram) – fiber termination – optical time domain reflectometer(OTDR) and its uses – fiber material – fiber fabrication . | **3** | **Chalk & Talk, Videos, PPT and Demonstration** |

**Learning Outcome Based Education & Assessment (LOBE)**
**Formative Examination - Blue Print**
**Articulation Mapping – K Levels with Course Outcomes (COs)**

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| No. of Questions to be answered | | | 75 | |
| Marks for each question | | | 1 | |
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| **K3** | | | | |
| **K4** | | | | |
| **Marks** | | **75** | **100** | **100** |
| **NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.** | | | | |