# KONGUNADU ARTS AND SCIENCE COLLEGE
# (AUTONOMOUS)
# COIMBATORE -641029



## DEPARTMENT OF PHYSICS (UG)

## CURRICULUM AND SCHEME OF EXAMINATIONS (CBCS)
## (2024-2025)

**KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)**
**COIMBATORE-641029**

**DEPARTMENT OF PHYSICS**

**Vision**

The goal of the Department of Physics is to bring eminence and excellence in teaching learning process and to fetch ours as one of the Benchmark Department with "Potential for Academic excellence"

**Mission**

To execute the teaching profession to bring the students as an asset for a productive and fascinating career, successful in their life and to realize learning with real world experience.

## PROGRAMME OUTCOME (PO)

Upon successful completion of the programme, the students will be able to

PO1:   Gain basic ideas of various branches of Physics

PO2:   Have the knowledge of theories involved in Physics

PO3:   Understand the fundamental ideas of experimental Physics and inculcate strong laboratory skills

PO4:   Understand the applications of basic concepts of Physics in Technology

PO5:   Realize the role of Physics in day-to-day life

PO6:   Be able to transfer their theoretical knowledge to experimental levels in laboratories

PO7:   Develop written and oral communication skills

PO8:   Acquire various technical skills

## PROGRAMME SPECIFIC OUTCOME (PSO)

Students will

1. Understand the applications of basic concepts of Physics in Technology

2. Realize the role of Physics in day-to-day life

3. Be able to transfer their theoretical knowledge to experimental levels in laboratories

4. Develop written and oral communication skills

5. Acquire various technical skills

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**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS),**
**COIMBATORE - 641 029**
**Programme Name: B. Sc. PHYSICS**
**Curriculum and Scheme of Examination under CBCS**
(Applicable to the students admitted during the Academic Year 2024-2025 and onwards)

| Semester | Part | Subject code | Title of the Paper | Instruction hours / cycle | CIA | ESE | Total | Duration of Exam. Hrs. | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Exam. Marks | | | | |
| I | I | 24TML101@ | **Language I** @ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 24ENG101 | English I | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 24UPH101 | **Core Paper 1 -** Properties of Matter and Sound | 6 | 25 | 75 | 100 | 3 | 4 |
| | | - | **Core Practical 1-** General Experiments | 3 | - | - | - | - | - |
| | | 24UMA1A1 | **Allied Paper 1 -** Mathematics I | 7 | 25 | 75 | 100 | 3 | 5 |
| | IV | 24EVS101 | Environmental Studies** | 2 | - | 50 | 50 | 3 | 2 |
| | | | | 30 | - | - | 450 | - | 17 |
| II | I | 24TML202@ | **Language II** @ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 24ENG202 | English II | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 24UPH202 | **Core Paper 2 -** Heat and Thermodynamics | 6 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH2CL | **Core Practical 1-** General Experiments | 3 | 40 | 60 | 100 | 3 | 3 |
| | | 24UMA2A2 | **Allied Paper 1 -** Mathematics II | 7 | 25 | 75 | 100 | 3 | 5 |
| | IV | 24VED201 | **Value Education –** Moral and Ethics** | 2 | - | 50 | 50 | 3 | 2 |
| | | | | 30 | - | - | 550 | - | 20 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| III | I | 24TML303 @ | **Language III** @ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 24ENG303 | English III | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 24UPH303 | **Core Paper 3** – Mechanics | 4 | 25 | 75 | 100 | 3 | 4 |
| | | - | **Core Practical 2** – General Experiments | 3 | - | - | - | - | - |
| | | 24UCH3A3 | **Allied Paper 2 -** Chemistry I | 4 | 20 | 55 | 75 | 3 | 4 |
| | | - | **Allied Practical**- Chemistry Practicals | 3 | - | - | - | - | - |
| | IV | 24UGC3S1 | **Skill based Subject 1 -** Cyber Security | 2 | 100 | - | 100 | 3 | 3 |
| | | 24TBT301/ 24TAT301/ 24UHR3N1 | Basic Tamil * / Advanced Tamil** / Non-Major Elective - I ** | 2 | - | 75 | 75 | 3 | 2 |
| | | | | **30** | **-** | **-** | **550** | **-** | **19** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| IV | I | 24TML404 @ | **Language IV** @ | 6 | 25 | 75 | 100 | 3 | 3 |
| | II | 24ENG404 | English IV | 6 | 25 | 75 | 100 | 3 | 3 |
| | III | 24UPH404 | **Core Paper 4 -** Electricity and Magnetism | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH4CM | **Core Practical 2 –** General Experiments | 3 | 40 | 60 | 100 | 3 | 3 |
| | | 24UCH4A4 | **Allied Paper 2** - Chemistry II | 4 | 20 | 55 | 75 | 3 | 4 |
| | | 24UCH4AL | **Allied Practical -** Chemistry Practical | 3 | 20 | 30 | 50 | 3 | 2 |
| | IV | 24UPH4S2 | **Skill based Subject 2 -** Scientific Computing- Python | 2 | 25 | 75 | 100 | 3 | 3 |
| | | 24TBT402/ 24TAT402/ 24UWR4N2 | Basic Tamil * / Advanced Tamil ** / Non-Major Elective - II** | 2 | - | 75 | 75 | 3 | 2 |
| | | | | **30** | **-** | **-** | **700** | **-** | **24** |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| V | III | 24UPH505 | **Core Paper 5** - Mathematical Physics | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH506 | **Core Paper 6** – Optics | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH507 | **Core Paper 7 -** Principles of Electronic Devices and Circuits | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH508 | **Core Paper 8 -** Basics of Quantum Mechanics | 4 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH5E1 | **Major Elective 1** | 4 | 25 | 75 | 100 | 3 | 5 |
| | | - | **Core Practical 3 –** General Experiments | 3 | - | - | - | - | - |
| | | - | **Core Practical 4** - Electronics | 3 | - | - | - | - | - |
| | | - | **Core Practical 5** - Digital Electronics and Microprocessor | 2 | - | - | - | - | - |
| | IV | 24UPH5X1 | **EDC** | 2 | 100 | | 100 | 3 | 3 |
| | - | 24UPH5IT | Internship Training / Mini Project **** | | | Grade | | | |
| | | | | **30** | **-** | **-** | **600** | **-** | **24** |
| VI | III | 24UPH609 | **Core Paper 9 -** Atomic andSolid State Physics | 5 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH610 | **Core Paper 10 -** Fundamentalsof Digital Electronics | 5 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH611 | **Core Paper 11 -** Nuclear Physics | 5 | 25 | 75 | 100 | 3 | 4 |
| | | 24UPH6CN | **Core Practical 3 –** General Experiments | 3 | 50 | 50 | 100 | 3 | 4 |
| | | 24UPH6CO | **Core Practical 4** - Electronics | 3 | 50 | 50 | 100 | 3 | 3 |
| | | 24UPH6CP | **Core Practical 5** - Digital Electronics and Microprocessor | 3 | 50 | 50 | 100 | 3 | 3 |
| | | 24UPH6E2 | **Major Elective 2** | 4 | 25 | 75 | 100 | 3 | 5 |
| | | 24UPH6Z1 | **Project and Viva Voce *** | - | 20 | 80 | 100 | - | 5 |
| | | 24UBI6S3 | **Skill Based Subject 3 -** Basics of IPR | 2 | 25 | 75 | 100 | 3 | 3 |
| | | | | **30** | **-** | **-** | **900** | **-** | **35** |
| | V | 24 NCC $ /NSS/ YRC/ PYE/ECC/ RRC/WEC 101# | **Co-curricular Activities *** | - | 50 | - | 50 | - | 1 |
| | | | **Grand Total** | **-** | **-** | **-** | **3800** | **-** | **140** |

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<u>**Note :**</u>

CBCS – Choice Based Credit system, CIA– Continuous Internal Assessment, ESE– End of Semester Examinations

**$** For those students who opt NCC under Co-curricular activities will be studying the prescribed syllabi of the UGC which will include Theory, Practical & Camp components. Such students who qualify the prescribed requirements will earn an additional 24 credits.

**@** Hindi/Malayalam/ French/ Sanskrit – 24HIN/MLM/FRN/SAN101 - 404

**\*** - No End-of-Semester Examinations. Only Continuous Internal Assessment (CIA)

**\*\***- No Continuous Internal Assessment (CIA). Only End-of-Semester Examinations (ESE)

\*\*\* Project Report – 60 marks; Viva-voce – 20 marks; Internal-20 marks

\*\*\*\* The students shall undergo Internship training / field work for a minimum period of 14 working days at the end of the <u>fourth</u> semester during summer vacation and submit the report in the <u>fifth</u> semester which will be evaluated for 100 marks by the concerned guide and followed by an Internal Viva-voce by the respective faculty or HOD as decided by the department. According to their marks, the grades will be awarded as given below.

| Marks % | Grade |
|---------|-------|
| 85 – 100 | O |
| 70 – 84 | D |
| 60 – 69 | A |
| 50 – 59 | B |
| 40 – 49 | C |
| < 40 | U (Reappear) |

## Major Elective Papers
(2 papers are to be chosen from the following 6 papers)
1. Laser Physics and Fiber Optics
2. Principles of Communication Systems
3. Introduction to Biophysics
4. Materials Science
5. Object orientation programming in C++
6. Introduction to Microprocessors

## Non - Major Elective Papers
1. Human Rights
2. Women's Rights
3. Consumer Affairs

## Sub. Code & Title of the Extra Departmental Course (EDC):
24UPH5X1 - Physics in everyday life

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**Certificate Courses**
1. Certificate course in Astrophysics
2. Certificate course in Non-Conventional Energy
3. Certificate course in Electronic Instrumentation

**Add on Courses**
1. Job Oriented Course - Electrical Appliances: Maintenance and Servicing
2. Advanced Learners Course - Experimental Techniques and Data analysis

**# List of Cocurricular Activities:**
1. National Cadet Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)

**Note:** In core/allied subjects, no. of papers both theory and practical are included wherever applicable. However, the total credits and marks for core /allied subjects remain the same as stated below.

**Tally Table:**

| S.No. | Part | Subject | Marks | Credits |
|-------|------|---------|-------|---------|
| 1 | I | Language – Tamil/Hindi/Malayalam/ French/ Sanskrit | 400 | 12 |
| 2 | II | English | 400 | 12 |
| 3 | III | Core – Theory/Practical | 1600 | 60 |
| | III | Allied | 400 | 20 |
| | | Electives/Project | 300 | 15 |
| 4 | IV | Basic Tamil / Advanced Tamil (OR) Non-Major Electives | 150 | 4 |
| | | Skill Based subject | 300 | 9 |
| | | EDC | 100 | 3 |
| | | Environmental Studies | 50 | 2 |
| | | Value Education | 50 | 2 |
| 5 | V | Co-curricular Activities | 50 | 1 |
| | | **Total** | **3800** | **140** |

➢ 25 % CIA is applicable to all subjects except JOC, ALC, COP and SWAYAM courses which are considered as extra credit courses.

➢ 100 % CIA for Cyber Security and EDC paper

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➢ The students to complete any **MOOC On learning platforms like SWAYAM, NPTEL, Course era, IIT Bombay Spoken Tutorial etc.,** before the completion of the 5th semester and the course completion certificate should be submitted through the HOD to the Controller of Examinations. Extra credits will be given to the candidates who have successfully completed.

➢ An **Onsite Training** preferably relevant to the course may be undertaken as per the discretion of the HOD.

➢ Students who successfully complete **Naan Mudhalvan** courses in 3rd and 5th semester will be given 2 extra credits for each course. They are asked to submit the marks to Controller of Examinations through and undersigned by the HOD.

| Semester | Naan Mudhalvan Course Title |
|---|---|
| III | Digital skills for employability |
| V | Data analytics with advanced tools |

**Components of Continuous Internal Assessment (CIA)**

| Components | | Marks | Total |
|---|---|---|---|
| **Theory** | | | |
| CIA I | 75 | (75+75 = 150/10) | |
| CIA II | 75 | 15 | 25 |
| Assignment/Seminar | | 5 | |
| Attendance | | 5 | |
| **Practical** | | | |
| CIA Practical | | 25 | |
| Observation Notebook | | 10 | 40 |
| Attendance | | 5 | |
| **Project** | | | |
| Review | | 15 | |
| Regularity | | 5 | 20 |
| Components | | Marks | |
| **Theory (Allied) (External : 55 marks)** | | | |
| CIA I | 55 | (55+55) | |
| CIA II | 55 | Converted to 10 | 20 |
| Assignment/Seminar | | 5 | |
| Attendance | | 5 | |
| **Practical (Allied) (External : 30 marks)** | | | |
| CIA Practical | | 10 | |
| Observation Notebook | | 5 | 20 |
| Attendance | | 5 | |

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## BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

**K1**-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

**1. ESE Theory Examination (Part I, II, III & Certificate Courses)**

i) **CIA I & CIA** II and ESE: 75 Marks

| Knowledge Level | Section | Marks | Description | Total |
|---|---|---|---|---|
| K1 Q1 to 10 | A (Answer all) | 10 x 1 = 10 | MCQ | |
| K1 – K5 Q11 to 15 | B (Either or pattern) | 5 x 5 = 25 | Short Answers | 75 |
| K2 – K5 Q16 to 20 | C (Either or pattern) | 5 x 8 = 40 | Descriptive / Detailed | |

ii) **CIA I & CIA II and ESE: 55 Marks  (Allied)**

| Knowledge Level | Section | Marks | Description | Total |
|---|---|---|---|---|
| K1 Q1 to 10 | A (Answer all) | 10 x 1= 10 | MCQ | |
| K1 – K5 Q11 to 15 | B (Either or pattern) | 5 x 3 = 15 | Short Answers | 55 |
| K2 – K5 Q16 to 20 | C (Either or pattern) | 5 x 6 = 30 | Descriptive / Detailed | |

2. **ESE Practical Examination:**

| Knowledge Level | Section | Marks | Total |
|---|---|---|---|
| K3 | Experiments | 50 | |
| K4 | Record Work | 10 | 60 |
| K5 | | | |

| (For Allied papers) | | | |
|---|---|---|---|
| Knowledge Level | Section | Marks | Total |
| K3 | Experiments | 20 | |
| K4 | Record Work | 05 | 30 |
| K5 | | | |

3.  **ESE Project Viva Voce: (Part III & Certificate Courses)**

| Knowledge Level | Section | Marks | Total |
|---|---|---|---|
| K3 | Project Report | 60 | 80 |
| K4 | Viva-voce | 20 | |
| K5 | | | |

**4. JOC and ALC: External only**

Section A - Multiple Choice    $(10 \times 1 = 10$ marks)
Section B - Either or type       $(5 \times 6 = 30$ marks)
Section C - Either or type       $(5 \times 12 = 60$ marks)

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# UPH

| Programme Code: 03 | | | B.Sc. Physics | | | |
|---|---|---|---|---|---|---|
| **Title of the Paper** | | | **Core Paper 1 - Properties of Matter and Sound** | | | |
| **Batch 2024-2025** | **Semester I** | **Hours/Week 6** | **Total Hours 90** | **Credits 4** | **Entrepreneurship** | |

## Course Objectives

To enable the learners to
1. Understand the basic concepts of gravitation.
2. Get exposure to the properties of liquids & solids.
3. Understand the properties of sound and applications.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Understand the action of gravitational fields and potentials on different objects |
|---|---|---|
| **K1 to K5** | CO2 | Gain knowledge on elastic behavior of beams, rods and wires through the bending and torsional behaviors of the objects |
| | CO3 | Compare the properties of liquids by surface tension |
| | CO4 | Compare the properties of liquids by viscosity experiments |
| | CO5 | Production and application of ultrasonics and acoustics in different types of Buildings |

## Syllabus

### UNIT I                                                                      18 hrs
**Gravitation fields and potentials**

Nature of motion under central forces - Kepler's law - Newton's law of gravitation - Gravitational potential and field - Gravitational potential and field due to i) spherical shell, ii) solid sphere and i) hollow sphere - Boy's Method and Heyl's Method of determining 'G'. Gravitational field of Earth – equation of motion of elementary volume – escape velocity.

### UNIT II                                                                     18 hrs
**Elasticity**

Elastic constants – Relations connecting them – Poisson's ratio - Bending of beams - uniform and non - uniform bending – Cantilever – static and dynamic methods - Torsion in a wire – Rigidity modulus - determination by static and dynamic methods.

### UNIT III                                                                    18 hrs
**Surface Tension**

Surface tension and Surface energy– pressure in a curved surface of a liquid–Shape of Liquid Meniscus in a Capillary tube – Angle of contact – Measurement of angle of contact – Rise of a liquid in a capillary tube – Experimental determination of Surface Tension: Searle's Torsion Balance Method, drop-weight method, Quincke's method – Variation of surface tension with temperature – Jaeger's method.

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**UNIT IV**                                                                    **18 hrs**
 **Viscosity**

Streamline flow, Turbulent flow – Energy of a liquid – Bernoulli's theorem and its applications – Coefficient of viscosity – Poiseuille's formula to find η of low viscous liquid – Stoke's method, Searle's viscometer method to find η of a high viscous liquid – Comparison of viscosities – Ostwald Viscometer – Viscosity of Gas – Meyer's formula – Rankine's method – Searle's method.

**UNIT V**                                                                      **18 hrs**
**Acoustics and Ultrasound**

**Acoustics**–Basic principle–Reverberation– Sabine's reverberation formula – Determination of absorption coefficient– Factors affecting the acoustics of buildings– Sound distribution in an auditorium– Requisites for good acoustics.
**Ultrasonics** – Production of ultrasonic waves: Magnetostriction oscillator and piezoelectric oscillator– Detection of ultrasonic waves – **Application of ultrasonics**\*.

**\* Self study**

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion
 / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1.  D.S.Mathur, (2018), Elements of Properties of Matter-Shyamlal Charitable Trust, New Delhi.
2.  Brijlal and N.Subramaniam, (1999), Properties of Matter- S.Chand & Co., New Delhi.
3.  R.L.Saihgal, (1982), A Textbook of Sound- S.Chand & Co., New Delhi.

**Reference Books:**
1.  Brijlal and N.Subramaniam, (2018), A Textbook of Sound- S.Chand & Co. New Delhi.
2.  D.S.Mathur, (2019), Mechanics - S.Chand & Co., New Delhi.
3.  R.Murugesan, (2018), Properties of Matter, S.Chand & C.o, New Delhi.
4.  Alex A.Kaufman, (2007), Principles of the Gravitational method, Elsevier

**e-Resources:**
1.  http://orca.phys.uvic.ca/~tatum/celmechs/celm5.pdf
2.  https://en.wikipedia.org/wiki/Elasticity_(physics)
3.  https://youtu.be/HALbtyDUjp0
4.  https://byjus.com/physics/viscosity/
5.  https://yohttps://www.vedantu.com/physics/acousticsutu.be/DCAV51nkxDE

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### Mapping

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1 | S | H | S | H | H |
| CO 2 | H | S | H | S | S |
| CO 3 | S | S | H | H | S |
| CO 4 | H | H | S | S | S |
| CO 5 | H | S | H | S | H |

**S- Strong**                    **H-High**                    **M-Medium**                    **L – Low**

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Core Paper 2 - Heat and Thermodynamics | | | |
| Batch 2024-2025 | Semester II | Hours/Week 6 | Total Hours 90 | Credits 4 | Entrepreneurship |

## Course Objectives

To enable the learners to understand

1. The concept of heat and temperature and specific heat
2. Mechanism of petrol and diesel engine
3. Quantum theory of radiation and three types of thermodynamical statistics.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Understand the concept of Zero and First law of thermodynamics |
|---|---|---|
| | CO2 | Gain knowledge on second law of thermodynamics and engines |
| K1 to K5 | CO3 | Understand gas laws and its behavior, Einstein's theory and Debye's theory of specific heat |
| | CO4 | Understand radiative heat transfer and radiation laws |
| | CO5 | Analyze the concepts of microstate, macrostate of a model system, classical and quantum statistics. |

## Syllabus

### UNIT I

**Concept of Temperature** 18 hrs

Zeroth law of thermodynamics-Concept of heat-Comparison of heat and work-First law of thermodynamics-Isothermal Process- Adiabatic Process-Isochoric Process- Isobaric Process-Gas equation during a Process -Slopes of adiabatic and isothermals process-Work done during Adiabatic and Isothermal Process-Relation between isothermal and adiabatic elasticities.

### UNIT II 18 hrs

**Second Law of Thermodynamics**

Irreversible Process- Reversible Process-Second law of thermodynamics- Carnot reversible engine - Carnot Cycle-efficiency-Otto Cycle-Petrol engine -Diesel engine- Clausius- Clapeyron's latent heat equation-Applications-Thermodynamic potentials-Maxwell's thermodynamic relation.

### UNIT III 18 hrs

**Gas equations**

Van der waals equation of a state – Estimation of Critical constants – Constants of Van der waals equation – Critical co-efficient of a gas – Limitations of Van der waals equation.

**Quantum theory of specific heat**

Dulong and Petit's law and the deduction; failure of Dulong and Petit's law – Einstein's theory and its limitation – Debye's theory – **Specific heat of diatomic gases\***.

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**UNIT IV**                                                                                                    **18 hrs**

### Thermal radiation

Quantum theory of radiation; Planck's hypothesis – average energy of Planck's oscillator– Planck's radiation law and its experimental verification – Wien's law and Rayleigh – Jean's law in relation to Planck's law– Stefan's constant and Wien's constant from Planck's law

**UNIT V**                                                                                                    **18 hrs**

### Thermodynamics

Statistical equilibrium– probability theorem in statistical thermodynamics; Maxwell - Boltzmann distribution law; Maxwell – Boltzmann distribution in terms of temperature – Maxwell's quantum statistics – phase space – Fermi- Dirac distribution law – Bose-Einstein distribution law (Qualitative study only) – **comparison of three statistics**\*

**\*Self-study**

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**

1.  Brijlal and N.Subrahmaniam, P.S.Hemne (2018), Heat, Thermodynamics and Statistical Physics- S.Chand & Co., New Delhi

**Reference Book:**

1. R.Murugeshan, Sivaprasath, (2004), Thermal Physics- S.Chand & Co., New Delhi.
2. Zemansky and R.H. Dcltanann, TMH, (2017), Heat and Thermodynamics, McGraw Hill Education

**E- Resources:**

1. https://www.askiitians.com/revision-notes/physics/heat-transfer/
2. https://www.askiitians.com/revision-notes/physics/kinetic-theory-of-gases/
3. https://www.youtube.com/watch?v=TnDCxw0y6YM
4. https://www.youtube.com/watch?v=n1go03oIyos
5. https://www.youtube.com/watch?v=Fi9Z5DxVsu0

## Mapping

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1 | S | S | H | S | H |
| CO 2 | H | H | S | S | S |
| CO 3 | S | S | H | H | H |
| CO 4 | H | S | S | H | S |
| CO 5 | H | S | H | S | S |

**S- Strong**              **H-High**              **M-Medium**              **L – Low**

# UPH

| Programme Code: 03 | | | B.Sc. Physics | | | |
|---|---|---|---|---|---|---|
| Title of the Paper | | | Core Paper 3 - Mechanics | | | |
| Batch 2024-2025 | Semester 3 | Hours/Week 4 | Total Hours 60 | Credits 4 | Employability | |

## Course Objectives

To enable the learners to

1. Understand the principles of rigid body dynamics
2. Understand the fundamental ideas of projectile motions
3. Understand the statics, hydrostatics and hydrodynamics

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Understanding the behavior of various bodies due to kinematic and dynamic forces acting on the body |
|---|---|---|
| **K1 to K5** | CO2 | The study of projectiles enables the students to apply the knowledge of mathematics, fundamental sciences to obtain solution of complex mechanical problems |
| | CO3 | Study of statics promotes analysis and interpretation of numerical problems |
| | CO4 | Gain knowledge on hydrostatics |
| | CO5 | Understand the theory of relativity |

## Syllabus

**UNIT I**      **12 hrs**

### Rigid body dynamics

Rigid body – rotational and vibrational motion –Torque – moment of inertia – radius of gyration – kinetic energy of rotation – M.I. of a fly wheel – experimental determination – precession – **gyrostat – gyrostatic application \*** – M.I. of a diatomic molecule and its rotational energy states.

**UNIT II**      **12 hrs**

### Projectiles

Projectiles – Range – Expression for the range of projectile on an inclined plane – path of a projectile – Impulse – direct and oblique impact – expression for velocity after direct impact – loss of energy during direct and oblique impact.

**UNIT III**      **12 hrs**

### Statics

Centre of gravity – Position of G for simple rigid bodies – rigid solid cone – thin hollow hemisphere – solid hemisphere – Centre of gravity of a body composed of two parts – Equilibrium of bodies – suspended and supported – types of equilibrium.Force of friction –Limiting friction – Laws of friction – Angle of friction and resultant reaction – Cone of friction.

**UNIT IV**      **12 hrs**

### Hydrostatics Fluid thrust

Thrust on a plane surface – the center of pressure – position of the center of pressure – Rectangular lamina – Triangular lamina – Thrust on curved surfaces.

**Flotation :**Laws of flotation – Metacenter – Metacentric height – Metacentric height of a ship.

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**UNIT V**                                                                                                    **12 hrs**
**Relativity**

Frames of reference – inertial frames of reference – Galilean transformation – Michelson Morley experiment and explanation of negative results - Postulates of special theory of relativity – Lorentz's transformation equation – length contraction – time dilation – Meson decay – relativity of simultaneity – addition of velocities – variation of mass with velocity – **mass energy equivalence\*** – General theory of relativity.

**\* Self study**
 **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
  1. D.S.Mathur and P.S.Hemme (2021), Mechanics, S.Chand & Co., New Delhi.

**Reference Books:**
  1.M.Narayanamurthy, N.Nagarathianam, (2005), Statics, Hydrostatics and Hydrodynamics- The National Publishing Company, Chennai.
  2. D.Halliday, R.Resnick and J.Walker (2018), Fundamentals of Physics - 11th Edition, John Wiley & Sons, India

  **e-Resources:**
  1. https://nucleoniitjeekota.com/topic-notes.php?topic=RIGID%20BODY%20DYNAMICS
  2. https://byjus.com/physics/projectile-motion/
  3. https://engineeringstatics.org/Chapter_07-center-of-gravity.html
  4. https://byjus.com/physics/buoyant-force/
  5. https://byjus.com/physics/fluid-dynamics/

**Mapping**

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1     | S     | H     | S     | H     | H     |
| CO 2     | H     | S     | H     | S     | S     |
| CO 3     | S     | S     | H     | H     | S     |
| CO 4     | H     | H     | S     | S     | S     |
| CO 5     | H     | S     | H     | S     | H     |

**S- Strong**                 **H-High**                 **M-Medium**                 **L – Low**

# UPH

| Programme Code: 03 | | | | | B.Sc. Physics | |
|---|---|---|---|---|---|---|
| **Title of the Paper** | | | | | **Core Paper 4 - Electricity and Magnetism** | |
| **Batch 2024-2025** | **Semester 3** | **Hours/Week 4** | **Total Hours 60** | **Credits 4** | **Employability** | |

## Course Objectives

To enable the learners to
1. Acquire basic knowledge of electrostatics and thermoelectricity
2. Study about magnetic properties of materials
3. Learn motion of charges and alternating current and its circuits

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Acquire knowledge about electrostatics |
|---|---|---|
| **K1 to K5** | CO2 | Understand the magnetic properties of materials and magnetic effect of electric current |
| | CO3 | Gain knowledge on thermo electricity |
| | CO4 | Apply knowledge on fabrication of different types of capacitors, transformer, choke coil and thermoelectric power generators. |
| | CO5 | Analyze the trouble shooting of ac circuits (LCR series and LCR parallel mode) andalso analyze the thermoelectric diagrams |

## Syllabus

**UNIT I** 12 hrs

**Electrostatics**

**Gauss theorem and its applications:** Gauss theorem, application of Gauss theorem – Electric intensity at a point immediately adjacent to a charged conductor –energy stored in unit volume of an electric field.

**Capacitance and capacitors:** Spherical capacitor – cylindrical capacitor – force of attraction between charged plates of a capacitor – change in the energy of a parallel plate capacitor when the distance between the plates is altered and when a dielectric slab is introduced between the plates – types of capacitors – Guard ring capacitor – electrolytic capacitor – variable capacitor.

**Dielectrics:** Polarization in dielectric material – parallel plate capacitor and dielectric slab – boundary condition – depolarization factor.

**UNIT II** 12 hrs

**Magnetic properties of materials**

Magnetic vector potential – electron theory of magnetism – Dia, Para and Ferromagnetism– magnetic field (B) – magnetization (M) – magnetic field intensity (H) – magnetic susceptibility and magnetic permeability – magnetic materials and magnetization – magnetic hysteresis – area of the hysteresis loop – Ferro magnets, determination of susceptibility – curie balance method – **Guoy's method\* .**

**Magnetic effect of electric current**

Moving coil Ballistic Galvanometer – Figure of merit of B.G. – Absolute capacitance of a capacitor.

**UNIT III** 12 hrs

**Thermoelectricity:**

Seebeck effect – laws of thermo e.m.f – Measurement of thermo e.m.f - Peltier effect – PeltierCo-efficient, determination of Peltier co- efficient at a junction – thermo dynamical consideration of Peltier effect – Thomson effect – Thomson co – efficient – e.m.f. generated in a thermocouple takingboth Peltier effect at the junctions and Thomson effect in the metals –application of thermodynamics to thermocouple – thermoelectric power diagrams and their uses.

# UPH

**UNIT IV**                                              **12 hrs**
### Alternating Current
Mutual and Self Inductance-EMF induced in a coil rotating in a magnetic field – AC circuits containing resistance, inductance andcapacitance in series – series resonant circuit – acceptor circuit – voltage magnification – the Q-factor
– Parallel resonant circuit – Power in AC circuit containing resistance, capacitance and inductance – wattless current – choke coil – transformer.

**UNIT V**                                                **12 hrs**
### Transient currents
Growth and decay of current in an inductance – resistance circuit – charging and discharging of a capacitance through a resistance – Measurement of resistance by leakage – charging and discharging of a capacitance through an inductance and a resistor
### Motion of charged particles
Motion of charged particles in uniform longitudinal and transverse Electric field – Motion of charged particles in a uniform constant magnetic field* - e/m by Magnetron method - e/m by Thomson method.

**\* Self study**
  **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1.  R.Murugesan, (2019), Electricity and Magnetism - S.Chand & Co., New Delhi.
2.  Brijlal and Subramaniam, (2000), Electricity and Magnetism- Ratan Prakashan Mandir.

**Reference Books:**
1.  K.K. Tewari, (2007), Electricity and Magnetism with Electronics- S.Chand & Co., New Delhi.
2.  D.N.Vasudeva, (2007), Fundamentals of Electricity and Magnetism - McGraw Hill, India

**e-Resources:**
1. https://www.youtube.com/watch?v=MLvCPath35I
2. https://www.youtube.com/watch?v=VC1OTpL8qVI
3. https://www.youtube.com/watch?v=9EsOFiP1J2E
4. https://www.youtube.com/watch?v=bfR0k0BJeBE
5. https://www.youtube.com/watch?v=psdWQddVXd4

**Mapping**

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1      | S     | H     | S     | H     | H     |
| CO 2      | H     | S     | H     | S     | S     |
| CO 3      | S     | S     | H     | H     | S     |
| CO 4      | H     | H     | S     | S     | S     |
| CO 5      | H     | S     | H     | S     | H     |

**S- Strong**      **H-High**      **M-Medium**   **L - Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Core Paper 5 - Mathematical Physics** | | | |
| **Batch 2024-2025** | **Semester 5** | **Hours/Week 4** | **Total Hours 60** | **Credits 4** | **Skill Development** |

## Course Objectives

To enable the learners to

1. Apply Fourier series, transformation and vector analysis to physical problems
2. Know about the basic concepts of complex variables
3. Apply vectors to physical systems.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | To understand differential operators in vectors |
|---|---|---|
| | CO2 | To apply vectors for physical examples |
| **K1 to K5** | CO3 | To understand physical examples of Fourier series |
| | CO4 | To understand and apply Fourier's transformation |
| | CO5 | To understand complex variables |

## Syllabus

**UNIT I**
**Differential Operators in Vectors**                                             **12 hrs**
Orthogonal curvilinear coordinates - Differential operators: Gradient – divergence – Laplacian - curl-Spherical polar coordinates: Differential operators – Gradient – divergence – Laplacian – curl - Cylindrical Co-ordinates: Differential operators – Gradient - divergence.

**UNIT II**
**Application of Vectors**                                                        **12 hrs**
Hydrodynamics - Equation of continuity - Cartesian form - Incompressible fluid - Euler's equation of motion - Bernoulli's equation - Fourier's Heat flow equation (One dimension)- Gravitational Potential and Intensity - Poisson's equation - Gauss' law of gravitation

**UNIT III**
**Fourier series**                                                               **12 hrs**
Even and odd functions - Dirichlet's theorem and conditions - Fourier series for function such as x sinx, $x+x^2$, $e^x$, $x^2$ - Physical examples of Fourier series - Half wave rectifier - Full wave rectifier - Square wave - Saw tooth wave - Triangular wave.

**UNIT IV**
**Fourier's Transformation**                                                     **12 hrs**
Fourier Transform - Sine and Cosine Transforms - Properties of Fourier's Transform: Addition theorem - Similarity theorem - Complex Conjugate - Shifting property - Modulation theorem - Convolution theorem - Parseval's theorem - Self convolution Integral - Derivative of Fourier Transform - Fourier Transform of a derivative - Fourier sine and cosine transform of derivatives - Fourier transform of $1/\varepsilon$ and $Ne^{-\alpha x^2}$

**UNIT V**
**Complex Variables** **12 hrs**

Complex numbers - Review of Algebraic Operations of Complex Numbers - Complex Conjugates - Modulus and Argument of a complex number - Properties of Modulii and Arguments - Graphical representation on Argand diagram and Trignometric form - Vector representation of Complex numbers - Some definitions underlying complex analysis - **Functions of a Complex variable - Limit, Continuity and Differentiability\***.

**\* Self study**

**Teaching Methods:** Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class

**Text Books:**
1. Satya Prakash, (2021), Mathematical Physics- S.Chand & Co., New Delhi.
2. HK Dass and Rama Verma (2010), Mathematical Physics- S.Chand & Co., New Delhi.

**Reference Books:**
1. P.K.Chattopadhyay, (2022), Mathematical Physics-New Age International, New Delhi.
2. B.D. Gupta, (2022), Mathematical Physics-Vikas publishing house, New Delhi.
3. P. Kandasamy, K. Thilagavathy, K.Gunavathy, (2010), Engineering Mathematics – S.Chand & Co., New Delhi.

**e-Resources:**
1. https://www.youtube.com/watch?v=hsGhvle5Krw
2. https://www.youtube.com/watch?v=qbTTLNzW-JI&list=RDCMUCVtCdIa5rA8PwQbz4hixtpQ&index=3
3. https://www.youtube.com/watch?v=_87AM0wyMp0&list=RDCMUCVtCdIa5rA8PwQbz4hixtpQ&index=1
4. https://www.youtube.com/watch?v=-QVENB3aEvY

**Mapping**

| CO  PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---------|-------|-------|-------|-------|-------|
| CO 1 | H | S | S | H | H |
| CO 2 | S | H | H | H | S |
| CO 3 | H | S | H | S | H |
| CO 4 | S | H | H | S | H |
| CO 5 | H | S | H | S | H |

**S- Strong        H-High        M-Medium    L – Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Core Paper 6 - Optics** | | | |
| **Batch 2024-2025** | **Semester 5** | **Hours/Week 4** | **Total Hours 60** | **Credits 4** | **Employability** |

## Course Objectives

To enable the learners to

1. Acquire knowledge in ray optics
2. Understand mechanism of energy transfer in the form of waves
3. Understand the basic principles of optical instruments

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| **K1 to K5** | **CO1** | Learn to use geometric approximation, the ray equations, understand the aberrations with an emphasis on image forming systems and how they can be reduced |
| | **CO2** | Understand wave optics and interference |
| | **CO3** | Be acquainted with Fresnel and Fraunhofer diffraction |
| | **CO4** | Gain knowledge on polarization |
| | **CO5** | Understand principle, construction and working of optical instruments |

## Syllabus

**UNIT I**                                                                                  **12 hrs**

**Geometrical optics: Aberrations and dispersion**

Aberrations : Spherical aberrations in a lens – coma – aplanatic lens – astigmatism – curvature of the field – distortions – chromatic aberration– dispersion by a prism – irrational dispersion– angular and chromatic dispersions – Cauchy's dispersion formula – dispersive power, achromatism in prisms – dispersion without deviation – deviation without dispersion - chromatic aberration in a lens– **circle of least confusion**\*, achromatic lenses – condition for achromatism of two thin lenses separated by a finite distance.

**UNIT II**                                                                                 **12 hrs**

**Interference**

Fresnel's bi prism – interference in thin films due to reflected and transmitted light – fringes due to wedge shaped thin film – Newton's rings – refractive index of a liquid – Michelson's interferometer – determination of wavelength of monochromatic light – difference in wave length between two neighboring spectral lines – Fabry perot interferometer - visibility of fringes – sharpness of fringes– resolving power – Airy's formula.

**UNIT III**                                                                               **12 hrs**

**Diffraction**

Fresnel's assumptions – rectilinear propagation of light – half period zone – zone plate – action and construction – comparison with the convex lens – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction at a single slit – diffraction grating – resolving power and dispersive power of a grating.

# UPH

**UNIT IV**                                                          **12 hrs**

### Polarization

Double refraction – Huygen's explanation in uniaxial crystals – Quarter wave plate – Half wave plate Babinet's compensator - production and detection of plane, circularly and elliptically polarized light optical activity – Fresnel's explanation – specific rotation – Laurentz's half shade Polarimeter.

**UNIT V**                                                           **12 hrs**

### Optical instruments

Objective lens and eye piece: Huygen's eyepiece – Ramsden eyepiece – compound microscope – astronomical telescope (refracting) – Constant deviation spectrometer - Kerr cell method - Anderson's method.

**\* Self study**

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1. Brijlal, M.N.Avadhanulu, N. Subrahmanyam, (2019), A Text Book of Optics- S.Chand & Co., New Delhi

**Reference Books:**
1.  R. Murugesan, (2013), Optics and Spectroscopy- S.Chand & Co., New Delhi.
2.  Sathyapraksh, (2016), Optics- Ratan Prakashan, Mandir.

**e-Resources:**
1. https://www.youtube.com/watch?v=ML7HcZo6IaE
2. https://www.youtube.com/watch?v=jB7suji-fCY
3. https://www.youtube.com/watch?v=ueurJnTGwx4
4. https://www.youtube.com/watch?v=HH58VmUbOKM
5. https://www.youtube.com/watch?v=8nxsx6AKDN8

**Mapping**

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1 | S | S | H | H | S |
| CO 2 | S | H | S | S | S |
| CO 3 | S | S | H | S | H |
| CO 4 | S | S | H | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong**          **H-High**          **M-Medium**          **L – Low**

# UPH

**Sub. Code: 24UPH507**

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Core Paper 7 - Principles of Electronic Devices and Circuits** | | | |
| **Batch 2024-2025** | **Semester 5** | **Hours/Week 4** | **Total Hours 60** | **Credits 4** | **Employability** |

## Course Objectives

To enable the learners to
1. Understand the principles of semiconductor devices and their applications.
2. Know the principle and working of oscillators.
3. Know the working of FET, MOSFET and UJT

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| **K1 to K5** | **CO1** | Understand the fundamentals of semiconductor devices |
| | **CO2** | Understand transistor biasing and stabilization |
| | **CO3** | Learn about the functioning of FET, MOSFET, UJT and SCR |
| | **CO4** | Understand the basic principles of amplifiers and Operational amplifiers |
| | **CO5** | Acquire knowledge on oscillators |

## Syllabus

**UNIT I** 12 hrs

**Semiconductors :** Commonly used semiconductors – energy band description of semiconductors – effect of temperature on semiconductors – n type and p type semiconductors – majority and minority carriers - pn junction – volt ampere characteristics.

**Semiconductors Diodes :** Characteristics, equivalent circuits, applications of pn junction and zener diode – tunnel diode – photodiode –thermistor.

**Rectifiers and Filters :** Half wave and full wave bridge rectifiers – Ripple factor - **Inductive and capacitive filters\*.**

**UNIT II** 12 hrs

**Transistor biasing and stabilization :** Leakage current and total output current in a CE and CC circuits – advantages of common emitter circuits - Load line – Q point and maximum undistorted output – factors affecting stability of Q point stability factor.

**Transistor equivalent circuits and h parameter :** AC load resistance – current gain – voltage gain – h parameters – h parameters of an ideal transistor.

**UNIT III** 12 hrs

**Field Effect Transistor**

Junction Field Effect Transistor (JFET) – construction, operation, parameters and characteristics of JFET – expression for transconductance – comparison between FET and bipolar junction transistor.

**Metal Oxide Semiconductor FET (MOSFET)**

Construction, working of drain and transfer characteristics of depletion type and enhancement type MOSFETs – advantages of MOSFETs over JFETs – advantages of n over p channel MOSFETs.

**Unijunction Transistor (UJT):** Construction, equivalent circuit, operation, characteristics and application

**Silicon Controlled Rectifier :** SCR - Working of SCR - VI characteristics – SCR as a switch

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# UPH

**UNIT IV**                                                                                         **12 hrs**

### Amplifiers – Single stage & multistage

Design of single stage transistor amplifier: RC coupled amplifier – multistage amplifier: transformer coupled amplifier

**Operational Amplifiers :** Characteristics of an ideal operational amplifier – operational amplifier as inverting and non- inverting amplifier – operational amplifier as an adder, subtractor, differentiator and integrator.

**UNIT V**                                                                                          **12 hrs**

### Sinusoidal Oscillators

Principle of an oscillator - Crystal oscillators - Hartley and Colpitts oscillators with theory - Waveforms of astable, monostable and bistable multivibrator circuits – clipping and clamping circuits and applications.

**\* Self study**

 **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1. V.K.Metha, (2020), Principles of Electronics - (12th Edition) S.Chand & Co., New Delhi.
2. R.S.Sedha, (2019), A Text Book of Applied Electronics- S.Chand & Co., New Delhi.

**Reference Book:**
1. B.L.Theraja (2007), Basic Electronics (Solid State) - S.Chand & Co., New Delhi.
2. Bernod Grob, (2010), Basic Electronics - McGraw Hill, New Delhi.

**e-Resources:**
1. https://byjus.com/jee/semiconductors/#properties-of-semiconductors
2. https://www.shobhituniversity.ac.in/pdf/econtent/4TransistorBiasing&Stabilization-Dr-Aniket-Kumar.pdf
3. https://byjus.com/physics/fet-transistor/
4. https://amiestudycircle.com/free-samples%5Camie%5Cchapters%5CSingle%20Stage%20and%20Multi%20Stage%20Amplifiers-sec-b-ec.pdf
5. https://www.tutorialspoint.com/sinusoidal_oscillators/sinusoidal_oscillators_introduction.htm

**Mapping**

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|:--------:|:-----:|:-----:|:-----:|:-----:|:-----:|
| CO 1     | S     | S     | H     | H     | S     |
| CO 2     | S     | H     | S     | S     | S     |
| CO 3     | S     | S     | H     | S     | H     |
| CO 4     | S     | S     | H     | H     | S     |
| CO 5     | H     | S     | H     | S     | H     |

**S- Strong**          **H-High**          **M-Medium**          **L - Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Core Paper 8 – Basics of Quantum Mechanics** | | | |
| **Batch 2024-2025** | **Semester 5** | **Hours/Week 4** | **Total Hours 60** | **Credits 4** | **Employability** |

## Course Objectives

To enable the learners to
1. Know about De Broglie concept
2. Know about operators and uncertainty relation
3. Know about applications of Schrodinger's equation

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Understand the wave aspects of matter |
|---|---|---|
| | **CO2** | Know the relation between group velocity and phase velocity of waves |
| | **CO3** | Understand uncertainty principle and its applications |
| **K1 to K5** | **CO4** | Understand the concept of operators and to solve Schrodinger's equation for simple systems in one dimension. |
| | **CO5** | Understand Schrodinger's equation, wave function and to solve Schrodinger's equation for systems in three dimensions. |

## Syllabus

### UNIT I
**Origin of Quantum Mechanics**                                                                 **12 hrs**

Inadequacy of classical mechanics - shortcomings of old quantum theory - Foundations of wave mechanics - dual nature of light and matter - experimental evidence for matter waves - Davisson and Germer's electron diffraction experiment - G.P.Thomson's experiment – De'Broglie concept of stationary orbits – De'Broglie wavelength associated with electron accelerated through a potential difference – Non relativistic expression – Relativistic expression.

### UNIT II
**Wave and Group velocity**                                                                       **12 hrs**

Wave (or Phase) velocity and group velocity – velocity of De'Broglie waves – relation between phase velocity and group velocity for a non relativistic free particle - Equation of motion of matter waves – Physical interpretation of the wave function – Normalized and orthogonal wave function – conditions satisfied by wave function – solution of the Schrodinger's equation – Stationary state solution.

### UNIT III
**Uncertainty principle and its Applications**                                                    **12 hrs**

Uncertainty Principle - Heisenberg's gamma ray microscope – Diffraction of a beam of electrons by a slit – application of uncertainty principle – Nonexistence of electrons in a nucleus – radius of the first orbit – Light Quanta – Minimum energy of a harmonic oscillator – Bohr's atomic energy levels and Uncertainty principle – Energy of particle in one-dimensional box.

**UNIT IV**
**Operators and Schrodinger Equation**                                                    **12 hrs**
Operators associated with different observables – Expectation values of dynamical quantities – probability current density – Ehrenfest theorem – related problems - Free particle - Particle in a box - Potential step – Reflectance and Transmittance for E>V0 and E<V0.

**UNIT V**
**Physical applications of Schrödinger's Equation**                                        **12 hrs**
Particle in one dimensional infinitely deep potential well - One dimensional linear harmonic oscillator - Eigen values of harmonic oscillator- Significance of zero point energy - Particle in three dimensional infinitely deep potential well – **The square well potential – Bound states: Discrete energy levels. ***

**\* Self study**
**Teaching Methods:** Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class

**Text Books:**
1.    Satya Prakash and Swati Saluja, (2021), Quantum Mechanics - Kedar Nath Ram Nath & Co., Meerut.
2.    R.Murugeshan and Kiruthiga Sivaprasath, (2018), Modern Physics - S.Chand & Co., New Delhi.

**Reference Books:**
1.    S.P.Singh and M.K.Bagde, Kamal Singh, (2004), Quantum Mechanics - S.Chand & Co., New Delhi.
2.    V.Devanathan, (2005), Quantum Mechanics - Narosa Publishing House, New Delhi.

**e-Resources:**
1. https://www.youtube.com/playlist?list=PLbMVogVj5nJTDMhThY9xu2Tvg0u1RPuxO
2. https://www.askiitians.com/revision-notes/physics/special-theory-of-relativity/
3. https://www.youtube.com/watch?v=zZ2975Ui26w&list=RDLV-yKwHvAWMT8&index=7
4. https://youtu.be/iRVfaR3N5K4?list=PLUl4u3cNGP629n_3fX7HmKKgin_rqGzbx
5. https://www.youtube.com/watch?v=wBAfNRnYYEE

**Mapping**

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|:---------:|:-----:|:-----:|:-----:|:-----:|:-----:|
| **CO 1**  | S     | S     | H     | H     | H     |
| **CO 2**  | H     | H     | S     | H     | S     |
| **CO 3**  | H     | H     | S     | S     | H     |
| **CO 4**  | S     | H     | H     | H     | H     |
| **CO 5**  | H     | S     | H     | S     | H     |

**S- Strong**              **H-High**              **M-Medium**              **L – Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Core Paper 9 - Atomic and Solid State Physics** | | | |
| **Batch 2024-2025** | **Semester 6** | **Hours/Week 5** | **Total Hours 75** | **Credits 4** | **Employability** |

## Course Objectives

To enable the learners to

1. Know about x - rays, Photoelectric effect and their applications
2. Know about different coupling schemes and the effect of magnetic and electric fields on the spectrum of an atom and molecule
3. Understand the different crystal structure and their bonds

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| | **CO1** | Acquire knowledge about atomic and molecular spectroscopy. |
| | **CO2** | Understand bonding in solids |
| | **CO3** | Understand crystal structure |
| **K1 to K5** | **CO4** | Gain knowledge about x-rays and photoelectric effect |
| | **CO5** | Understand the concept of Superconductors |

## Syllabus

### UNIT I                                                                                                  15 hrs
**Atomic and Molecular Spectroscopy**

Vector atom model – Quantum number associated with the Vector atom model – Coupling schemes – Pauli's exclusion principle – Electronic configuration of light elements – Normal and anomalous Zeeman effects - Expression for the Zeeman shift – Anomalous Zeeman effect – Paschen Back effect – Stark effect – Basic concepts of NMR, NQR, ESR – Raman Effect – Raman shift – Stokes and Antistokes lines.

### UNIT II                                                                                                 15 hrs
**Bonding in solids**

Interatomic forces and types of bonding – Ionic bonds – Metallic bonds – Vander Waal's bonds – Hydrogen bonds – Binding energy of ionic crystals – Evaluation of Madelung constant – Determination of range – Binding energy of crystals of inert gases – Vander Waals' Interaction – Repulsive interaction.

### UNIT III                                                                                                15 hrs
**Crystal structure**

Crystal lattice – Unit cell – Lattice parameter – Primitive cell – Types of crystal system – Bravais lattices – BCC – FCC – HCP – Miller indices – Procedure for finding miller indices of crystal planes – Representation of crystal planes in a cubic unit cell – Atomic radius, number of atoms and atomic packing factor of SC, BCC and FCC structures - Crystal growth by slow evaporation method - Czochralski method.

# UPH

**UNIT IV**                                                                                                       **15 hrs**

**X-Rays :** Productions of x-rays : Coolidge tube method - Spacing between three dimensional lattice planes – absorptions of x-rays - Bragg's Law - Bragg's x-ray Spectrometer - powder crystal diffraction Compton Scattering.

**Photoelectric effect:** Einstein's photoelectric equation - Experimental verification - Applications of photoelectric effect - Millikan's experiment – Determination of Planck's constant

**UNIT V**                                                                                                         **15 hrs**
**Superconductivity**

Experimental facts of Superconductivity – Persistent currents – Effect of magnetic fields – Meissner effect **– Type I and Type II superconductors \*** – BCS theory of superconductivity.

**\* Self study**

**Teaching Methods:** Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/Flipped Class

**Text Books :**
1. R.S.Khurmi, R.S.Sedha, (2014), Material Science- S.Chand & Co., New Delhi.
2. R.K.Puri, V.K.Babbar, (2010), Solid State Physics - S.Chand & Co., New Delhi.

**Reference Books:**
1. Saxena, Gupta and Saxena, (2019), Fundamentals of Solid State Physics, Pragati Prakashan, NewDelhi.
2. S.O.Pillai, (2018), Solid State Physics - New Age International Pvt. Ltd, New Delhi.
3. V. Raghavan, (2010), Materials Science and Engineering, Prentice Hall India Pvt. Ltd, New Delhi.

**e- Resources:**
1. https://www.youtube.com/watch?v=-3aqWCcfKzQ
2. https://www.youtube.com/watch?v=ik51zFSWN4g
3. https://www.youtube.com/watch?v=eMmNPGdx1Ec

**Mapping**

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1      | S     | H     | H     | H     | S     |
| CO 2      | H     | S     | H     | H     | S     |
| CO 3      | S     | H     | H     | S     | H     |
| CO 4      | H     | S     | H     | S     | H     |
| CO 5      | H     | S     | H     | S     | H     |

**S- Strong        H-High        M-Medium    L – Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Core Paper 10 - Fundamentals of Digital Electronics | | | |
| Batch 2024-2025 | Semester 6 | Hours/Week 5 | Total Hours 75 | Credits 4 | Employability |

## Course Objectives

To enable the learners to acquire knowledge about
1. Four different number systems & binary codes
2. Logic gates, Boolean algebra and Karnaugh map
3. Flip- flops, counters, arithmetic circuits, data processing circuits, shift registers, semiconductor memories, A/D and D/A converters

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Acquire knowledge on number systems, binary arithmetic operations and binary codes |
|---|---|---|
| **K1 to K5** | CO2 | Have an understanding of logic gates, Demorgan's theorems , Karnaugh maps and simplification of Boolean expressions |
| | CO3 | Apply the knowledge of logic gates to design flip-flops and counters |
| | CO4 | Understand arithmetic and data processing circuits |
| | CO5 | Be familiar with semiconductor memories, A/D and D/A converters |

## Syllabus

**UNIT I** 15 hrs

**Number System, Binary Arithmetic and Binary Codes**

Decimal, Binary, Octal, Hexadecimal number systems – Conversion from one system to another system- Binary arithmetic operations – Representation of negative numbers – Binary subtraction using 1's and 2's compliments – weighted codes – non weighted codes – alpha numeric codes: ASCII codes and EBCDIC codes – Parity: even parity and odd parity method of single bit error detection.

**UNIT II** 15 hrs

**Logic gates, Boolean algebra and Karnaugh map**

Basic Logic gates (NOT, OR, AND) – Universal building blocks (NAND and NOR gates) – EX-OR and EX-NOR gates – construction of basic gates using discrete components – Laws of Boolean algebra – DeMorgan's theorems – Construction of Karnaugh maps – Simplification of Boolean expressions usinglaws of Boolean algebra, DeMorgan's theorems and Karnaugh maps.

**UNIT III** 15 hrs

**Flip-flops and Counters**

R-S flip flop – D flip flop- JK flip flop – Master slave J-K flip flop – Edge triggered flip flops.
Asynchronous counters: Ripple counter – Mod 3, Mod 5 counters and Decade counters, Ring counters- synchronous counters.

# UPH

**UNIT IV**                                                                              **15 hrs**

**Arithmetic, Data processing circuits and Shift Register**

Half and full adder – Half and full subtractor – Parallel binary adder and subtractor – Multiplexer-Demultiplexer – Encoder – Decoder – Serial in serial out shift register – Parallel in parallel out shift registers- **Bidirectional shift register\*.**

**UNIT V**                                                                               **15 hrs**

**Semiconductor Memories, A/D and D/A converters and IOT**

Memory addressing – Volatile and Non-Volatile: ROM – PROM – EPROM – RAM - Static and dynamic RAM – Binary weighted register D/A converter – R-2R ladder D/A converter – Counter type A/D converter – What is IOT- Genesis of IoT – IoT and Digitization – **IOT based Glucose Monitoring system \*.**

**\* Self study**

   **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
   1. Thomos L. Floyd, (2017), Digital fundamentals -Tata McGraw Hill, India
   2. M. Morris Mano, (2016), Digital logic and computer Design - Prentice-Hall of India, NewDelhi.
   3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,(2017), IoT Fundamentals : Networking Technologies, Protocols, and Use Cases for the Internet of Things - Cisco Press.

**Reference Books:**
   1. V.Vijayendaran, S.Vishwanathan, (2011), Introduction to Integrated Electronics: Digital and Analog - Printers and Publishers Pvt. Ltd.
   2. Albert Paul Malvino & Donald P Leach, (2015), Digital principles and applications -Tata McGraw Hill, New Delhi.

**e-Resources:**
   1. https://www.youtube.com/watch?v=RKAQsyPRk_w
   2. https://www.youtube.com/watch?v=wjM2RDG5yTI
   3. https://www.youtube.com/watch?v=tSti91b6qec
   4. https://www.youtube.com/watch?v=QyKIuJY4u8A
   5. https://www.youtube.com/watch?v=CyQoiZjR_Wk

**Mapping**

| PSO CO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|--------|-------|-------|-------|-------|-------|
| **CO 1** | S | S | S | S | S |
| **CO 2** | S | S | S | H | S |
| **CO 3** | S | H | S | S | S |
| **CO 4** | S | S | S | H | S |
| **CO 5** | H | S | H | S | H |

**S- Strong**                    **H-High**                    **M-Medium**                    **L – Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Core Paper - 11: Nuclear Physics | | | |
| Batch 2024-2025 | Semester 6 | Hours/Week 5 | Total Hours 75 | Credits 4 | Employability |

## Course Objectives

To enable the learner to know about

1. General properties of atomic nuclei, particle accelerators and radioactivity
2. Artificial transmutation of elements and nuclear transmutation
3. Nuclear fission, fusion and elementary particles

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Know about basic nuclear properties and particle accelerators. |
|---|---|---|
| | CO2 | Gain knowledge on radioactivity |
| K1 to K5 | CO3 | Understand artificial and nuclear transmutations |
| | CO4 | Understand nuclear fission, fusion and detection of nuclear radiations. |
| | CO5 | Acquire knowledge on elementary particles |

## Syllabus

**UNIT I**                                                                                      **15 hrs**

### General properties of atomic nuclei

Classification of nuclei- nuclear spin angular momentum – nuclear magnetic dipole moment – electric quadruple moment – nuclear size – nuclear stability – nuclear forces – Meson theory of nuclear forces- theories of nuclear composition – proton electron hypothesis – Models of nuclear structure : liquid drop model – shell model.

**Particle accelerators:** Synchrocyclotron – betatron – electron synchrotron and **proton synchrotron**\*.

**UNIT II**                                                                                     **15 hrs**

### Radioactivity

Determination of e/m of alpha particles – determination of charge of alpha particles – experimental measure of range of alpha particles – Geiger and Nuttal experiment – Geiger Nuttal law – alpha particle disintegration energy – determination of e/m of beta particles – origin of line and continuous spectrum- neutrino theory of beta decay- k electron capture – origin of gamma rays – absorption of gamma rays – natural radioactive series – law of successive disintegration – radioactive equilibrium and radioactive dating.

**UNIT III**                                                                                    **15 hrs**

### Artificial transmutation of elements

Discovery of artificial transmutation – Rutherford experiment – Bohr's theory of nuclear disintegration - nuclear reaction – energy balance in nuclear reaction and Q value

### Nuclear transmutation

Transmutation by alpha particles, protons, deuterons and neutrons - scattering cross section and its determination - production of radioisotopes and their uses.

# UPH

**UNIT IV**                                                                                                          **15 hrs**

### Nuclear fission and fusion

Nuclear fission – energy released in fission – Bohr and Wheeler's theory of nuclear fission – chain reaction - multiplication factor - natural uranium and chain reaction - design of nuclear reactor - breeder reactor - nuclear fusion-source of stellar energy - thermonuclear reactions - transuranic elements.
**Detectors of nuclear radiations:** Ionization chamber – Geiger Muller counter - Proportional counter - Wilson's cloud chamber - bubble chamber.

**UNIT V**                                                                                                           **15 hrs**

### Elementary particles

Baryons – Leptons – Mesons – particles and antiparticles – concept of antimatter – strong interaction – electromagnetic interaction – weak interaction – gravitational interaction – elementary particle quantum numbers – conservation laws and symmetry – charge conjugation, parity and time reversal – CPT Quark model .

**\* Self study**

 **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

## Text Books:
1. R.Murugesan, Kiruthiga Sivaprasath, (2019), Modern Physics - 18th edition, S.Chand & Co., New Delhi.
2. Brijlal, N.Subramaniam and Jivan Seshan, (2013), Atomic and Nuclear Physics - S.Chand & Co., New Delhi.

## Reference Books:
1. D.C.Tayal, (2021), Nuclear Physics (5th edition) Himalaya Publishing House, Bombay.
2. M.L.Pandya, R.P.S.Yadav and Amiya Dash (2020), Elements of Nuclear Physics- Kedar Nath Ram Nath, Meerut.
3. B.C.Theraja, (2008), Modern Physics- (16th edition), S.Chand & Co., New Delhi.

## e-Resources:
1. https://byjus.com/physics/nuclear-physics/
2. https://chem.libretexts.org/Bookshelves/General_Chemistry/Chemistry_(OpenSTAX)/21%3A_Nuclear_Chemistry/21.3%3A_Radioactive_Decay
3. https://chem.libretexts.org/Courses/Modesto_Junior_College/Chemistry_150_-_Bunag/Textbook_for_Chemistry_150/06%3A_Nuclear_Weapons-_Fission_and_Fusion/6.01%3A_The_History_and_Basics_of_Fission
4. https://www.diffen.com/difference/Nuclear_Fission_vs_Nuclear_Fusion
5. https://theconversation.com/explainer-what-are-fundamental-particles-38339

## Mapping

| CO   PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | S | H | S | S | H |
| CO 2 | S | S | H | H | S |
| CO 3 | S | S | H | S | H |
| CO 4 | S | H | S | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong**                    **H-High**                    **M-Medium**                    **L – Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Core Practical I – General Experiments | | | |
| Batch 2024-2025 | Semester 1 & 2 | Hours/Week 3 | Total Hours 90 | Credits 3 | Skill Development |

## Course Objectives

To enable the learners to:

1. Understand the physical phenomena and fundamentals of General Physics.
2. Perform experiments in the field of General Physics.
3. Interpret the practical result to corroborate the theory.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Provide hands on experiences in conducting scientific investigations and laboratory experiments. |
|---|---|---|
| | CO2 | Develop the ability to analyze basic experiments |
| K3,K4,K5 | CO3 | To analyze the relationship between theory and experimental results. |
| | CO4 | To conduct experimental investigations on mechanical, electrical, heat and optical physics. |
| | CO5 | Practice recording of experimental work and data graphing |

## List of experiments (Any Fifteen)

1. Determination of Young's Modulus - Non-uniform bending - Optic lever

2. Determination of Young's Modulus - Cantilever - Static method

3. Determination of Rigidity Modulus - Static Torsion

4. Determination of rigidity modulus and moment of inertia - Torsional Pendulum

5. Determination of Young's modulus by uniform bending - optic lever method

6. Determination of co-efficient of viscosity - Stokes's method

7. Determination of A.C. frequency - Sonometer

8. Determination of acceleration due to gravity - Compound pendulum

9. Determination of co-efficient of thermal conductivity - Lee's disc method

10. Determination of specific heat capacity of a liquid - Newton's cooling method

# UPH

11. Determination of refractive index of a solid prism - Spectrometer

12. Determination of refractive index of a liquid prism - Spectrometer

13. Determination of refractive index of a solid prism (i-d) curve – Spectrometer

14. Determination of wavelength of spectral lines - Normal incidence method - Grating - Spectrometer

15. Calibration of low range voltmeter – Potentiometer

16. Calibration of low range ammeter – Potentiometer

17. Determination of specific resistance of a wire – Meter bridge

18. Determination of unknown resistance using Post office Box

19. Determination of pole strength – Tan C position

20. Determination of surface tension by Capillary rise method

21. Determination of wavelength of laser - Diffraction method

22. Determination of angle of deviation of laser

23. Determination of viscosity of a liquid by Poiseullie's flow method.

24. Determination of surface tension & interfacial surface tension by drop weight method.

25. Determination of frequency of tuning fork- Sonometer

### e-Resources:
1. https://www.youtube.com/watch?v=Ia_GINOcaTs
2. https://www.youtube.com/watch?v=VC_TT8S65ac
3. https://www.youtube.com/watch?v=B-W0eVv6fLI
4. https://www.youtube.com/watch?v=oRch7irmLvo
5. https://www.youtube.com/watch?v=Iv08qZqJnGk

### Mapping

| CO   PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO 1 | S | H | S | S | H |
| CO 2 | S | S | H | H | S |
| CO 3 | S | S | H | S | H |
| CO 4 | S | H | S | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong**          **H-High**          **M-Medium**          **L – Low**

### Practical beyond the syllabus

1. Measurement of error on simple pendulum

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Core Practical II – General Experiments | | | |
| Batch 2024-2025 | Semester 3 & 4 | Hours/Week 3 | Total Hours 90 | Credits 3 | Skill Development |

## Course Objectives

To enable the learners to:

1. Understand the physical phenomena and fundamentals of general physics
2. Perform experiments in the field of general physics.
3. Interpret the practical result to corroborate the theory.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| **K3,K4,K5** | **CO1** | Provide hands-on experiences in conducting scientific investigations and laboratory experiments. |
| | **CO2** | Develop the ability to analyze basic experiments |
| | **CO3** | Analyze the relationship between theory and experimental results. |
| | **CO4** | To conduct experimental investigations on mechanical, electrical, heat and optical physics. |
| | **CO5** | Practice recording of experimental work and data graphing |

## List of experiments (Any Fifteen)

1. Determination of Young's modulus – Uniform bending – pin and microscope

2. Determination of Young's modulus – Cantilever – Dynamic method

3. Determination of spring constant of different metals

4. Determination of specific gravity of liquid – Joule's Calorimeter

5. Determination of wavelength of mercury spectral lines – grating – minimum deviation – Spectrometer

6. Determination of refractive index of a prism (i-i') – Spectrometer

7. Determination of thickness of a thin wire – Air wedge method

8. Study of solar spectrum – Spectrometer

9. Calibration of high range voltmeter – Potentiometer

10. Determination of emf. of a thermocouple – Potentiometer

11. Determination of specific resistance of a wire – Potentiometer

12. Determination of temperature co-efficient of resistance of a wire - Carey Foster's Bridge

13. Conversion of Galvanometer into ammeter and its calibration

14. Conversion of Galvanometer into voltmeter and its calibration

15. Determination of A.C. frequency - Melde's method

# UPH

16.       Determination of self-inductance of a coil - Maxwell's bridge

17.       Study of series resonance circuit

18.       Study of parallel resonance circuit

19.       Determination of figure of merit - B.G.

20.       Determination of absolute capacitance of a condenser – B.G.

21.       Determination of moment of a magnet - circular coil – Deflection magnetometer

22.       Determination of field intensity of a circular coil - Vibrational magnetometer

23.       Study of Multimeter as Ammeter, Voltmeter and Ohm meter

24.       Determination of temperature co-efficient of resistance of a wire –Post office Box

**e-Resources:**
1. https://youtu.be/FRwHt4DAfhE
2. https://youtu.be/_m2toS3HGG8
3. https://youtu.be/AXTsOpyYl_0
4. https://youtu.be/SnxrvXQX8os
5. https://youtu.be/XuXUtGN928U

## Mapping

| CO    PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-----------|------|------|------|------|------|
| CO 1 | S | H | H | S | S |
| CO 2 | H | H | S | S | H |
| CO 3 | S | S | S | H | H |
| CO 4 | H | H | S | H | H |
| CO 5 | H | S | H | S | H |

**S- Strong**        **H-High**        **M-Medium**        **L – Low**

## Practical beyond the syllabus

1. Determination of Retentivity and Coercivity of a magnetic material - Hysteresis

2. Determination of e/m - Thomsons method

3. Determination of e/m – Magnetron method

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Core Practical III – General Experiments** | | | |
| **Batch 2024-2025** | **Semester 5 & 6** | **Hours/Week 3** | **Total Hours 90** | **Credits 4** | **Skill Development** |

## Course Objectives

To enable the learners to:
1. Have a good foundation in the fundamentals and applications of general Physics
2. Acquire the skill of finding and developing practical scientific facts
3. Employ the practical result to support the theory

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Develop the ability to analyze basic experiments. |
|---|---|---|
| **K3,K4,K5** | **CO2** | Take measurements to compare experimental results in the laboratory with thetheoretical analysis. |
| | **CO3** | Conduct experimental investigations on mechanical, heat and optical phenomena. |
| | **CO4** | Conduct experimental investigations on electrical and magnetic phenomena. |
| | **CO5** | Practice record keeping of experimental work and data graphing |

## List of Experiments (Any Fifteen)

1. Determination of Young's modulus – Uniform bending – Koenig's method

2. Determination of Young's modulus – Non-uniform bending – Koenig's method

3. Determination of Rydberg's constant – scale and telescope

4. Determination of dispersive and resolving power of a Grating - spectrometer

5. Determination of Cauchy's constant and dispersive power of a prism - spectrometer

6. Determination of refractive index of a prism- Stoke's formula- spectrometer

7. Determination of the wavelength of the arc spectrum - Hartmann's interpolation formula

8. Determination of the wavelength of a monochromatic source - Fresnel's Biprism - Optic bench

9. Determination of refractive index of a convex lens - Newton's rings

10. Determination of specific rotation of light and concentration of the solution - Polarimeter experiment

# UPH

11.     Comparison of Mutual Inductance - Ballistic Galvanometer

12.     Determination of high resistance by charging - Ballistic Galvanometer

13.     Determination of high resistance by leakage - Ballistic Galvanometer

14.     Determination of temperature co-efficient of resistance of a coil – Post office box.

15.     Determination of band gap energy of a semiconducting material

16.     Determination of melting point of wax - Thermistor

17.     Determination of impedance and power factor of an LR circuit

18.     Determination of self-inductance of a coil- Anderson bridge

19.     Determination of capacitance - Scherring bridge

20.     Determination of capacitance - DeSauty bridge

21.     Determination of inductance - Owen's bridge

22.     Determination of particle size - Laser diffraction method

23.     Determination of Planck's constant using photoelectric effect.

24.     Magnetic properties of Iron rod-I-H Curve apparatus

**e-Resources:**
1. https://www.youtube.com/playlist?list=PLuiPz6iU5SQ8-rZn_LgLofRX7n8z4tHYK

**Mapping**

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1      | S     | S     | H     | H     | H     |
| CO 2      | H     | H     | S     | H     | S     |
| CO 3      | H     | H     | S     | S     | H     |
| CO 4      | S     | H     | H     | H     | H     |
| CO 5      | H     | S     | H     | S     | H     |

**S- Strong            H-High                    M-Medium                L – Low**

**Practical beyond the syllabus**
1. Determination of Boltzmann constant
2. Zener diode as a voltage regulator
3. Determination of Youngs modulus-elliptical fringes (Cornus method)
4. Determination of Youngs modulus-hyperbolic fringes (Cornus method)

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Core Practical IV – Electronics** | | | |
| **Batch 2024-2025** | **Semester 5 & 6** | **Hours/Week 3** | **Total Hours 90** | **Credits 3** | **Employability** |

## Course Objectives

To enable the learners to

1. To design and construct electronic circuits
2. To develop experimental skills and understand relation between experimental data and theoretical analysis.
3. Have a foundation of constructing electronic devices

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| **K3,K4,K5** | **CO1** | Acquire basic knowledge in solid state electronics. |
| | **CO2** | Analyze and design analog electronic circuits using discrete components. |
| | **CO3** | Acquire knowledge in basic electronics by constructing electronic circuits and devices. |
| | **CO4** | Take measurements to compare experimental results with the theoretical data |
| | **CO5** | Practice record keeping of experimental work and data graphing |

## LIST OF EXPERIMENTS (Any Fifteen)

1. Construction and study of IC regulated power supply

2. Construction and study of bridge rectifier

3. Characteristics of PN junction diode and zener diode

4. Construction and study of voltage doubler

5. Study of transistor characteristics – CE configuration

6. Construction and study of single stage RC coupled amplifier

7. Construction and study of Feedback amplifier

8. Construction and study of Hartley oscillator

9. Construction and study of Colpitt's oscillator

10. Construction and study of monostable multivibrator using transistor

11.      Study of characteristics of tunnel diode

12.      Study of characteristics of SCR

13.      Study of characteristics of FET

14.      Study of characteristics of MOSFET

15.      Study of characteristics of UJT

16.      Construction of inverting amplifier using op-amp.

17.      Construction of non-inverting amplifier using op-amp.

18.      Construction of adder and subtractor using op-amp.

19.      Construction of scalar using op-amp

20.      Construction of integrator and differentiator using op-amp.

21.      Current and voltage characteristics of LED.

22.      Study of characteristics of photodiode.

23.      Verification of inverse square law of radiation

**e-Resources:**

1. https://youtu.be/HG22Y0KrvI0
2. https://youtu.be/okGdxX36pt0
3. https://youtu.be/dICmcSNo4eI
4. https://youtu.be/1G8Sx6vE7kM
5. https://youtu.be/NZAg4Li1mvs

**Mapping**

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1 | S | H | H | H | H |
| CO 2 | H | S | S | S | S |
| CO 3 | H | H | S | S | H |
| CO 4 | S | H | H | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong            H-High            M-Medium            L – Low**

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Core Practical V - Digital Electronics & Microprocessor | | | |
| Batch 2024-2025 | Semester 5 & 6 | Hours/Week 3 | Total Hours 90 | Credits 3 | Employability |

## Course objectives

To enable the learners to
1. Have foundations in the fundamentals of digital electronics.
2. Acquire the skill of writing and executing assembly language programming using 8085 microprocessor
3. Visualize the applications of digital electronics and microprocessor in arithmetic operations

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Construct basic logic gates. |
|---|---|---|
| | CO2 | Gain expertise to construct digital electronic circuits. |
| K3 to K5 | CO3 | Get familiarized to develop microprocessor based programming. |
| | CO4 | Accomplish microprocessor based tasks. |
| | CO5 | Practice record keeping of experimental work and data graphing |

## LIST OF EXPERIMENTS
## (Any fifteen)

1. Verification of truth tables of logic gates using IC's

2. Construction of logic gates using discrete components

3. Verification of NOR gate as universal building blocks

4. Verification of NAND gate as universal building blocks

5. Verifications of Demorgan's theorems

6. Study of Karnaugh Map Reduction

7. Construction and study of Half adder and Full adder

8. Construction and study of Half subtractor and Full subtractor

9. Construction and study of 4 bit parallel adder

10. Construction and study of 4 bit parallel subtractor

# UPH

**Sub Code: 24UPH6CP**

11.        Construction and study of T flip flop

12.        Construction and study of JK flip flop

13.        Construction of square wave generator using op-amp

14.        Construction of triangular wave generator using op-amp

15.        8085 - ALP for 8-bit addition and subtraction

16.        8085 - ALP for 8-bit multiplication and division

17.        8085 - ALP for sorting the array in descending and ascending order

18.        8085 - ALP to find square root of a number

19.        8085 - ALP for Hexadecimal to decimal and binary conversion

20.        8085 - ALP for ASCII to decimal conversion and BCD to Hexadecimal conversion

21.        8085 - ALP for 16-bit Addition and Subtraction

**e-Resources:**
1. https://www.youtube.com/watch?v=ldeQU8lvnts
2. https://www.youtube.com/watch?v=rM2FTNQbDCY
3. https://www.youtube.com/watch?v=4Po3-QHPGWo
4. https://www.youtube.com/watch?v=cdMJvFT-Afc
5. https://www.youtube.com/watch?v=wvJc9CZcvBc

## Mapping

| CO  PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---------|-------|-------|-------|-------|-------|
| CO 1 | S | H | H | H | H |
| CO 2 | H | S | S | S | S |
| CO 3 | H | H | S | S | H |
| CO 4 | S | H | H | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong      H-High      M-Medium      L – Low**

### Practical beyond the syllabus

1. Music tone generator using 8085 Microprocessor
2. Square wave generator using 8085 Microprocessor

# UPH

| Programme code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Project and Viva Voce** | | | |
| **Batch 2024-2025** | **Semester 6** | **Hours/Week -** | **Total Hours -** | **Credits 5** | **Skill Development** |

## Course objectives

To enable the learners to

1. Have foundations in the fundamentals of Physics and related area.
2. Acquire skills to develop a working model
3. Visualize the applications of theoretical concepts

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| K3 to K5 | CO1 | Construct working models |
|---|---|---|
| | CO2 | Gain expertise to present their ideas systematically through PPT |
| | CO3 | Get familiarized to develop a report on the project work |
| | CO4 | Accomplish the result accumulation and data graphing |
| | CO5 | Gain expertise to apply knowledge on multiciliary field |

## Marks Distribution

| CIA/ESE | Particulars | Marks |
|---|---|---|
| CIA | Project Review | 15 |
| | Regularity | 5 |
| | **Total Internal Marks** | 20 |
| *ESE | Project Report Presentation | 60 |
| | Viva Voce | 20 |
| | **Total External Marks** | 80 |
| Total Marks (CIA + ESE) | | 100 |

## Mapping

| CO  PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---|---|---|---|---|---|
| CO 1 | S | H | H | H | H |
| CO 2 | H | S | S | S | S |
| CO 3 | H | H | S | S | H |
| CO 4 | S | H | H | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong          H-High                    M-Medium                   L – Low**

\* Projects report and Viva voce will be evaluated jointly by Project Supervisor and an ExternalExaminer.

# Allied Physics

## Allied Subject II - Physics I

## Allied Subject II - Physics II

# UPH

ALLIED PHYSICS PAPER FOR B.Sc. MATHEMATICS / CHEMISTRY

| Programme code: 03 | For B.Sc. Mathematics and B.Sc. Chemistry | | | | |
|---|---|---|---|---|---|
| Title of the Paper | Allied Subject II – Physics I | | | | |
| Batch 2024-2025 | Semester 3 | Hours/Week 4 | Total Hours 60 | Credits 4 | Skill Development |

## Course Objectives

To enable the learners

1. To know about mechanics, properties of matter and sound
2. To understand thermal physics
3. To know about light, electricity and electromagnetism

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Know about simple harmonic motion and projectile motion |
|---|---|---|
| | CO2 | Understand moduli of elasticity and propagation of sound |
| K1 to K5 | CO3 | Acquire knowledge about thermal Physics |
| | CO4 | Gain knowledge on optics |
| | CO5 | Gain knowledge on current electricity and electromagnetism. |

## Syllabus

**UNIT I** $\qquad$ **12 hrs**

**Mechanics**

Composition of two simple harmonic motions along a line and at right angles – Lissajou's figures, uniform circular motion - Acceleration of a particle in a circle - Centripetal and centrifugal forces - Banking on curved tracks. Projectile - Motion in a horizontal plane - Maximum height – Time of flight – Range – Path of a Projectile – Range and time of flight in a horizontal plane.

**UNIT II** $\qquad$ **12 hrs**

**Properties of Matter and Sound**

**Elasticity**: Elastic constants – Bending of beams – Young's modulus by uniform and non-uniform bending – Energy stored in a stretched wire – Torsion in a wire – Determination of rigidify modulus – Torsional oscillation – Static torsion.

**Sound**: Interference of sound waves – Beats – Doppler Effect – Applications – Production of ultrasonics: Piezoelectric method – Applications.

**UNIT III** $\qquad$ **12 hrs**

**Thermal Physics**

Specific heat of solids and liquids – Dulong and Petit law – Newton's law of cooling – Thermal conductivity – Lee's disc method – Variation of specific heat with temperature – Vander waal's equation of state – derivation of critical constants – Black body radiation – Stefan's law – Laws of thermodynamics – Change of entropy in reversible and irreversible processes.

# UPH

**UNIT IV**                                                                                           **12 hrs**
**Optics**
Condition for interference – Young's double slit experiment – Interference due to transmitted light – Air wedge – Newton's rings – Determination of refractive index of a liquid – Diffraction - Diffraction at a single slit – Transmission grating – Polarization – Production and analysis of circularly and elliptically polarized light – Optical activity – Specific rotation – **Half shade Polarimeter*.**

**UNIT V**                                                                                            **12 hrs**
**Current electricity and Electromagnetism**
Kirchhoff's laws – Wheatstone's network – Condition for balance – Carey Foster's bridge – measurement of resistance – Capacitor – Energy of a charged capacitor – Loss of energy due to sharing of charges - Electromagnetic induction - Faraday's laws – AC circuits : Mean – rms – Peak values – LCR in series and in parallel – Sharpness of resonance – Ballistic Galvanometer – Theory – Measurement of capacitance – Transformer and its applications.

**\*Self study**
  **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
   1. R. Murugeshan, (2018), Allied Physics - S.Chand & Co., New Delhi.
   2. R. Murugeshan, (2018), Modern Physics - S.Chand & Co., New Delhi.

**Reference Books:**
   1. D.S.Mathur, (2018), Properties of Matter - Shyamlal Charitable Trust, New Delhi.
   2. Brijlal and Subramaniam, (2004), Heat and thermodynamics - S. Chand & Co., New Delhi.
   3. Brijlal and Subramaniam, (1997), Electricity and Magnetism - Rathan Prakasam, Mandir, India.

**e-Resources:**
   1. https://www.youtube.com/watch?v=_psIWtPBHzA
   2. https://www.youtube.com/watch?v=cQtFR0Qwm_E
   3. https://www.youtube.com/watch?v=2vm1WkXg4EY
   4. https://www.youtube.com/watch?v=e2MArppYcM4&list=PLCvpYrhOPdiWKu734tjeevs2-O0B7MJ1g
   5. https://www.youtube.com/watch?v=rtlJoXxlSFE&amp;list=PLyQSN7X0ro2314mKyUiOILaOC2hk6Pc 3j

**Mapping**

| CO  PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---|---|---|---|---|---|
| CO 1 | S | H | S | S | H |
| CO 2 | H | S | H | H | S |
| CO 3 | H | S | H | H | S |
| CO 4 | S | S | H | S | H |
| CO 5 | H | S | H | S | S |

**S- Strong          H-High          M-Medium    L – Low**

# UPH

ALLIED PHYSICS PAPER FOR B.Sc. MATHEMATICS / CHEMISTRY

| Programme code: 03 | | For B.Sc. Mathematics and B.Sc. Chemistry | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Allied Subject II – Physics II** | | | |
| **Batch 2024-2025** | **Semester 4** | **Hours/Week 4** | **Total Hours 60** | **Credits 4** | **Skill Development** |

## Course Objectives

To enable the learners
1. To know about atomic physics and concepts of relativity
2. To understand nuclear and quantum Physics
3. To know the basics of lasers, electronics and communication Physics

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Understand atomic Physics and concepts of relativity |
|---|---|---|
| | **CO2** | Know about nuclear Physics |
| **K1 to K5** | **CO3** | Know about quantum Physics |
| | **CO4** | Acquire knowledge on laser Physics |
| | **CO5** | Understand electronics and communication Physics |

## Syllabus

**UNIT I**             **12 hrs**

**Atomic Physics and Elements of Relativity**

**Atom models**: Sommerfeld atom model – Vector atom model – Periodic table – Pauli's exclusion principle – excitation and ionization potentials – Frank and Hertz method – Postulates of theory of relativity – Lorentz transformation equations – derivations – Length contraction – Time dilation – Mass- energy equivalence.

**UNIT II**             **12 hrs**

**Nuclear Physics**

Classification of nuclei – General properties of nuclei – Characteristics of nuclear forces – Nuclear structure – Liquid drop model – Shell model – Particle accelerators – Betatron – Electron synchrotron – Artificial transmutations by α particles – Photon particles - Nuclear fission and fusion (Quantitative) Elementary particles – Mesons – Baryons – Leptons.

**UNIT III**             **12 hrs**

**Quantum Physics**

Photoelectric effect - Laws of photoelectric effect – Millikan's experiment – Photoconductive and photovoltaic cells – **Photomultiplier \*–** Applications of photocells – Production and properties of x rays – x ray spectrum – Mosley's law – Compton effect – Relation for change in wavelength - x ray diffraction – Bragg's law – Miller indices – Determination of h,k,l values of cubic crystals.

# UPH

**UNIT IV**                                                                                                        **12 hrs**
**Laser Physics**
Purity of spectral lines – Coherence length and time – Spontaneous and induced emissions – population inversion – Meta stable state – Conditions for laser action – Ruby laser – He-Ne lasers – Applications of lasers – Raman effect – Raman shift – Stokes and antistokes lines – Laser Raman Spectrometer.

**UNIT V**                                                                                                         **12 hrs**
**Electronics and Communication Physics**
Characteristics of pn junction diode – Zener diode – Uses of Zenar diode – Characteristics of FET – UJT-Principles of LED and LCD - Number systems : Conversion of Binary into Decimal – Decimal into Binary – Binary addition – Subtraction – Basic logic gates – Boolean algebra – Demorgan's theorems – Modulation : AM and FM – Basic principles of antenna and RADAR.

**\* Self study**

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books**:
   1.R. Murugeshan, (2018), Allied Physics - S.Chand & Co., New Delhi.
   2.R. Murugeshan, (2018), Modern Physics - S.Chand & Co., New Delhi.

**Reference Books:**
   1.B.L.Theraja, (2006), Basic Electronics - S.Chand & Co., New Delhi.
   2.V.K.Mehta, (2014), Principles of Electronics - S.Chand & Co., New Delhi.

**e-Resources:**
   1. https://www.bhattadevuniversity.ac.in/docs/studyMaterial/UpakulMahanta_Physics_6thSem_NuclearPhysics.pdf
   2. https://physics.info/photoelectric/
   3. https://slideplayer.com/slide/5789401/
   4. https://www.slideshare.net/HebaRageh/laser-physics-lect1-1
   5. https://nith.ac.in/upload/phyece.pdf

**Mapping**

| CO  PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---------|-------|-------|-------|-------|-------|
| CO 1 | S | H | S | S | H |
| CO 2 | H | S | H | H | S |
| CO 3 | H | S | H | H | S |
| CO 4 | S | S | H | S | H |
| CO 5 | H | S | H | S | S |

S- Strong          H-High          M-Medium          L – Low

# UPH

ALLIED PHYSICS PRACTICALS FOR B.Sc. MATHEMATICS / CHEMISTRY

| Programme code: 03 | | For B.Sc. Mathematics and B.Sc. Chemistry | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Allied Physics Practical | | | |
| Batch 2024-2025 | Semester 3 & 4 | Hours/Week 3 | Total Hours 90 | Credits 2 | Skill Development |

## Course Objectives

To enable the learners to:
1. Understand Physical phenomena and fundamentals of general Physics.
2. Perform experiments in Physics and understanding the results.
3. Interpret the experimental results to support the theory

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Provide hands-on experiences in conducting laboratory experiments. |
|---|---|---|
| | CO2 | Analyze relationship between theory and experimental results. |
| K3, to K5 | CO3 | Conduct experimental investigations on mechanical and heat and optical Physics. |
| | CO4 | Conduct experimental investigations on optics, electricity and electronics |
| | CO5 | Practice record keeping of experimental work |

## List of Experiments (Any fifteen)

1. Determination of Young's Modulus – Uniform bending – Optic lever

2. Determination of Young's modulus – Cantilever – Static method

3. Determination of Rigidity Modulus – Static torsion

4. Determination of moment of inertia and rigidity modulus - Torsional pendulum

5. Determination of acceleration due to gravity – Compound pendulum

6. Measurement of terminal velocity of falling balls - Stokes method

7. Determination of thermal conductivity – Lee's disc

8. Determination of refractive index of a solid prism - Spectrometer

9. Determination of wavelength - Minimum deviation method – Grating - Spectrometer

10. Determination of radius of curvature of lens - Newton's ring

11. Calibration of low range voltmeter - Potentiometer

12. Calibration of low range ammeter - Potentiometer

13. Determination of specific resistance - Potentiometer

14. Determination of Moment of a magnet – Tan C position

15. Determination of AC frequency - Sonometer

16. Determination of frequency of a tuning fork– Melde's method

17. Characteristics of PN Junction diode

18. Characteristics of Zener diode

19. Verification of the truth tables of OR, AND, NOR, NOT, NAND gates using IC'S

20. Verification of De-Morgan's theorems.

**e-Resources:**
1. https://www.learncbse.in/to-find-the-frequency-of-the-ac-mains-with-a-sonometer/
2. https://www.youtube.com/watch?v=oRch7irmLvo
3. https://www.youtube.com/watch?v=DD5woC4ZYAQ

**Mapping**

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1 | S | H | H | H | S |
| CO 2 | H | S | H | H | S |
| CO 3 | S | H | H | S | H |
| CO 4 | H | S | H | S | H |
| CO 5 | H | S | H | S | S |

**S- Strong        H-High        M-Medium        L – Low**

# Major Elective Papers

(2 papers are to be chosen from the following 6 papers)

1. Laser Physics and Fiber Optics

2. Principles of Communication Systems

3. Introduction to Biophysics

4. Materials Science

5. Object Oriented Programming in C++

6. Introduction to Microprocessors

# UPH

| Programme Code: 03 | B.Sc. Physics | | | |
|---|---|---|---|---|
| **Title of the Paper** | **Major Elective Paper : Laser Physics and Fiber Optics** | | | |
| **Batch 2024-2025** | **Hours/Week** 4 | **Total Hours** 60 | **Credits** 5 | **Employability** |

## Course Objectives

To enable the learners to
1. Acquire knowledge about the principles of conventional and advanced lasers.
2. Understand the applications of lasers.
3. Understand fundamentals of optical fibers and their fabrication.

## Course outcomes (CO)

On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| | **CO1** | Understand the basic principles of lasers |
| | **CO2** | Explain the types of lasers and Laser amplifiers |
| **K1 to K5** | **CO3** | Illustrate the application of lasers in various fields. |
| | **CO4** | Understand optical fibers and its attenuations |
| | **CO5** | Know about fabrication of optical fibers. |

## Syllabus

**UNIT I**                                                                                              **12 hrs**

### Basic principles of laser

Quantum Nature of Light - Energy Levels - Population inversion - Schawlow -Towne's Threshold Condition for Laser Oscillations in Terms of Population Difference – Absorption - Spontaneous and stimulated emission - Einstein Co-efficients A & B - Basic Components of a Laser - Laser active Medium - Different Pumping Methods - Optical Resonator - Cavity Configuration - Plane Parallel Cavity - Confocal Cavity – **Hemispherical and Long Radius Cavity*.**

**UNIT II**                                                                                             **12 hrs**

### Types of lasers and Laser amplifiers
### Types of lasers

Solid laser (Ruby laser and Nd:YAG laser) – Gas laser (He-Ne laser and $CO_2$ laser) – Liquid laser (Dye laser) - Semiconductor laser.

### Laser amplifiers

General description of Q switching – Production of Q switching : Electro-optic shutter (Kerr effect and Pockels effect) - Mechanical and Saturable absorber shutters.

**UNIT III**                                                                                            **12 hrs**

### Applications of lasers

Materials processing with lasers : Drilling, Cutting and Welding - Nuclear fusion with lasers - Communication by lasers - Large range finders - Laser Gyro - LASIK - Optical computing - Principle of holography - Recording and reconstruction - Classification of hologram-Holographic interferometry in nondestructive testing - Lasers in compact disc players.

# UPH

**UNIT IV**                                                    **12 hrs**

**Fiber fabrication-:** Classification of fiber fabrication techniques: External chemical vapour deposition (External CVD), Axial vapour deposition (AVD), Internal chemical vapor deposition, Multielement glasses and Phasil system, Comparison of various fabrication processes, drawing and coating, double crucible method, rod in tube method-Mechanism of refractive index variation - Fiber strength –
**Mechanical strength measurement of fibers\*.**

                                                         **12 hrs**

**UNIT V**

**Optical fibers and its attenuation**

Basic structure of an optical fiber - Advantages of optical fibers –Propagation of light waves in an optical fiber - Types of fibers: step index single mode fiber, step index multimode fiber and graded index fiber - Acceptance angle and acceptance cone of a fiber – Numerical aperture of a step index fiber and graded index fiber - Attenuation in optical fibers: Material losses – Rayleigh scattering loss – Absorption losses – Bending losses – Radiation induced losses – Inherent defect losses.

**\***      **Self study**

   **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1. M.N.Avadhanalu, (2013), P.S.Hemne, An introduction to lasers and applications - S.Chand & Co., New Delhi.
2. Subir Kumar Sarkar, (2010), Optical fibers and fibers optic communication systems S.Chand & Co, New Delhi.

**Reference Books:**
1. B.B Laud, (2011), Lasers and Nonlinear Optics - New Age International Pub. Ltd, New Delhi.
2. K.R. Nambiar, (2014), Lasers: Principles, Types and Applications - New Age International, New Delhi.
3. William T. Silfvast, (2008), Laser fundamentals - University Press, Foundation books, New Delhi.

**e-Resources:**
1. https://www.youtube.com/watch?v=xZ9kSBHWpUM
2. https://www.youtube.com/watch?v=vd6Lo64s3vc
3. https://www.youtube.com/watch?v=2NNWPJj8hvU
4. https://www.youtube.com/watch?v=pavBq7HIoIE
5. https://www.youtube.com/watch?v=AEkIPwP0YI8

**Mapping**

| CO  PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---------|-------|-------|-------|-------|-------|
| CO 1    | S     | H     | S     | H     | H     |
| CO 2    | H     | S     | H     | S     | S     |
| CO 3    | S     | S     | H     | H     | S     |
| CO 4    | H     | H     | S     | S     | S     |
| CO 5    | H     | S     | H     | S     | H     |

**S- Strong**                      **H-High**                     **M-Medium**                  **L - Low**

# UPH

| Programme Code: 03 | B.Sc. Physics | | | |
|---|---|---|---|---|
| **Title of the Paper** | **Major Elective Paper - Principles of Communication Systems** | | | |
| **Batch 2024-2025** | **Hours/Week** 4 | **Total Hours** 60 | **Credits** 5 | **Employability** |

## Course Objectives

To enable the learners
1. To understand the basic idea of modulation and demodulation
2. To gain knowledge on transmission lines and antennas
3. To know about radio, cellular, fiber optic, television and satellite communications

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Get knowledge about modulation and demodulation |
|---|---|---|
| **K1 to K5** | CO2 | Understand the working principles of transmission lines and antennas |
| | CO3 | Acquire knowledge on radio and cellular communications |
| | CO4 | Gain knowledge on fiber optic communications |
| | CO5 | Understand television and satellite Communications |

## Syllabus

### UNIT I                                                                                                    12 hrs
**Modulation and Demodulation**

Amplitude modulation- modulation index – Expression for AM - Single side band generation – Suppression of carrier-Frequency modulation–Expression for FM wave - PM definition-Comparative advantages and disadvantages of AM, FM and PM – Basic principles of demodulation - AM diode detector – FM Ratio detector.

### UNIT II                                                                                                  12 hrs
**Transmission Lines and Antennas**

Line equations of transmission lines- Short circuited and open ended lines – Standing wave ratio- relation between SWR and reflection coefficient - Types of transmission lines - Properties of transmission lines - Mechanism of electromagnetic radiation from resonant circuit - Elementary dipole antenna-current and voltage distribution in a half-wave dipole antenna – Principle of radiation of a half-wave dipole antenna-directional pattern- Derivation of E and H in principle of radiation of half- wave.

### UNIT III                                                                                                 12 hrs
**Radio and Cellular Communications**

Classification of Radio Transmitters -AM radio transmitter stages – note on AM radio broadcast transmitters - Principle of superheterodyne receiver - Block diagram of the stages of superhet AM receiver - Block diagram of stages of a FM radio receiver – difference between AM and FM receivers - Cellular communications (Elementary ideas).

# UPH

**UNIT IV**                                                                                                    **12 hrs**
 **Fiber Optic Communications**
 Lightsources: LED (Light Emitting Diode)- LASER- Light Emitting Transistor- Photo detectors: Photo-emissive photodetector- PN Junction photodetector -Phototransistor – Optical connectors- Optical couplers: Biconically tapered - Offset Butt-joint- Beam Splitting– Star couplers- T couplers- Transmitter for fiber optic communication – High performance circuit (LED digital transmitter) – Fiber optic receiver – High performance receiver –Repeaters – Fiber optic based modems : Transreceivers

**UNIT V**                                                                                                     **12 hrs**
 **Television and Satellite Communications**
 Principle of picture transmission and reception – Television standards - gross structure of a television
–   Picture elements – Scanning, image continuity and persistence of vision – Horizontal and vertical blanking pulses- TV camera tubes: image orthicon – Vidicon – The block diagram of a basic TV transmitter – Block diagram of a monochrome TV receiver- Introduction on satellite communications
–   **Satellite links and Satellite construction\*** – Different domestic satellites.

**\*    Self study**
   **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
  1.    D.A Deshpande, (1989).Communication Electronics - McGraw Hill Publications, India.
  2.    Subir. Kumar. Sarkar, (2007), Optical Fibers and Fiber Optic Communication - S.Chand & Co.
  3.    Bernard Grob and Charles Herndon, (1999), Basic Television and Video Systems -McGraw Hill,

**Reference Books:**
  1.    George Kennedy, Bernard Davis and SRM Prasanna, (2017), Electronic Communication Systems McGraw Hill Publishers Ltd, India.
  2.    Sanjeeva Gupta, (1997), Electronics Communication Systems - Khanna Publications, Salem.

**e-Resources:**
  1. https://www.youtube.com/watch?v=S8Jod9AtpN4
  2. https://www.digimat.in/nptel/courses/video/108101092/L01.html
  3. https://www.youtube.com/watch?v=yWWfKrbMRUs
  4. https://www.digimat.in/nptel/courses/video/108104113/L01.html
  5. https://www.digimat.in/nptel/courses/video/117105131/L01.html

**Mapping**

| CO PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---|---|---|---|---|---|
| CO 1 | S | S | H | H | H |
| CO 2 | H | H | S | H | S |
| CO 3 | H | H | S | S | H |
| CO 4 | S | H | H | H | H |
| CO 5 | H | S | H | S | H |

**S- Strong**                          **H-High**                          **M-Medium**                          **L - Low**

# UPH

| Programme Code: 03 | | | B.Sc. Physics | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | | **Major Elective Paper - Introduction to Biophysics** | | |
| **Batch 2024-2025** | **Hours/Week** **4** | **Total Hours** **60** | **Credits** **4** | **Employability** | |

## Course Objectives

To enable the learners

1. To understand the concept of Physics principles and apply it to biological phenomenon
2. To know about Biophysics, fluid run and Gas transport
3. To know about audition of human ear and Physics of Vision

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Apply principles of Physics toward evaluation and analyses of biological phenomenon. |
|---|---|---|
| **K1 to K5** | CO2 | Understand the basic concepts of biophysics and fluid run. |
| | CO3 | Know about gas transport concepts. |
| | CO4 | Acquire knowledge on Physics of audition. |
| | CO5 | Acquire knowledge on Physics of vision. |

## Syllabus

**Unit – I Biomechanics** 12 hrs

Biostatics - Forces and Torques - Biophysics of Muscle –Muscle Power –Mass Specific Muscle Power - Strength of Bones - Biodynamics – Newton's law Frictional forces and stokes law – Frictional forces and Stokes Law - Locomotion of Land - Walking - Jumping - Propelling - Locomotion in Air - Locomotion in Water - Role of Gravity.

**Unit – II Biophysics and Fluid run** 12 hrs

Steady Laminar Flow - Co-efficient of viscosity - Temperature dependence - Newtonian Fluid - Poiseuille's Formula - Energetics of Fluid Flow – Turbulence – Reynolds's Number - Hemodynamics - Plasma skimming – Turbulence - Pressure flow relation

**Unit – III    Biophysics and Gas Transport** 12 hrs

Ideal Gas – Dalton's law of Partial Pressure – Vapor Pressure – Solutions and Henry's Law - Convective transport of Gases – Airway resistance – Transport of $O_2$ in blood – Transport of $CO_2$ in Blood - Diffusion of gases - Fick's Laws – Gas exchange in lungs – Gas exchange in tissues – Physiology of respiration – Physics of alveoli – Work of breathing.
.

**Unit – IV Physics of Audition** 12 hrs

Transverse and Longitudinal Waves - Physiological characteristics of Sound - Human Ear - phase sensitivity and determination of direction - Doppler Effect.

**Unit – V Physics of Vision** 12 hrs

Retina and Photoreceptors - Photochemistry of receptor cells – Intensity sensitivity – Spectral sensitivity – Resolving power of Eye – Diffraction – Polarization and Vision – Optical rotation – Birefringence and Dichroism - **Photoreceptors and Fiber optics\***.

# UPH

* **Self Study**
   **Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped
   Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1. P.K.Srivastava, (2015), Elementary Biophysics: An Introduction - Narosa Publishing House, New
   Delhi.

**Reference Books:**
1. Vasantha Pattabhi, N.Gautham, (2002), Biophysics – Springer.
2. M. Daniel, (2007), Basic Biophysics - Publisher Agrobios, India.

**e-Resources:**
1. https://www.youtube.com/watch?v=DNhLG1H7ttY
2. https://youtu.be/jFZHIPhmNTs?list=PLFn7fvIP7CbMun4daH24AZzX3r7ETT6aD
3. https://www.youtube.com/watch?v=VdoSff84Wqk
4. https://www.youtube.com/watch?v=fvQrbtRCH8I
5. https://www.youtube.com/watch?v=S1XeaNV4p38

**Mapping**

| CO PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---|---|---|---|---|---|
| CO 1 | S | H | H | H | H |
| CO 2 | S | S | S | S | S |
| CO 3 | H | S | S | S | H |
| CO 4 | S | H | H | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong                    H-High                    M-Medium                    L - Low**

# UPH

| Programme Code: 03 | B.Sc. Physics | | | |
|---|---|---|---|---|
| **Title of the Paper** | **Major Elective Paper - Materials Science** | | | |
| **Batch 2024-2025** | **Hours/Week** **4** | **Total Hours** **60** | **Credits** **5** | **Employability** |

## Course Objectives

To enable the learners

1. To understand the electron theory of solids
2. To know about electric and dielectric properties of materials.
3. To know about magnetic and superconducting properties of materials.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Understand the electron theory of solids. |
|---|---|---|
| | **CO2** | Know about electric properties of materials. |
| **K1 to K5** | **CO3** | Know about dielectric properties of materials. |
| | **CO4** | Understand magnetic properties of materials. |
| | **CO5** | Acquire knowledge about superconducting properties of materials. |

## Syllabus

### Unit I                                                                                     12 hrs
**Electron Theory of Solids**

Classical free electron theory - quantum free electron theory - Electron energy in metals and Fermi energy - density of states - antisymmetric nature of the wave functions of the Fermi system – covalent bonding in crystals - electron in a periodic potential - energy bands in solids - Brillouin zones – distinction between metals, insulators and semiconductors - effective mass of electron and concept of holes.

### Unit II                                                                                   12 hrs
**Conducting Properties of materials**

Atomic interpretation of ohms law - relaxation time - electrical conductivity - collision time - mean free path - heat developed in a current carrying conductor - sources of resistivity of metals and alloys - thermal conductivity - Wiedemann franz law - thermal expansion - electrical conductivity at high frequencies - geometrical and magnetic field effects on electrical conductivity - variation of electrical resistivity due to mechanical stress (strain gauge)- different types of conducting materials.

### Unit III                                                                                  12 hrs
**Dielectric Properties of materials**

Dielectrics - different types of electric polarization - frequency and temperature effects on polarization - dielectric loss - local field or internal field - Clausius- Mossotti relation – determination of dielectric constant – dielectric break down - properties and different types of insulating materials – **Ferroelectric materials\*.**

# UPH

## Unit IV                                                                 12 hrs
### Magnetic Properties of materials
Different type of magnetic materials – classical theory of diamagnetism (Langevin theory) - Langevin theory of paramagnetism- Weiss theory of paramagnetism- Weiss theory of ferromagnetism (molecular field theory on field magnetism) – Heisenberg interpretation on internal field and quantum theory of ferromagnetism - domain theory of ferromagnetism- hard and soft materials

## Unit V                                                                  12 hrs
### Superconducting materials
Occurrence of superconductivity – general properties of superconductors – Meissner effect - types of superconductors - Isotope effect – Specific heat capacity - BCS Theory - applications of superconductors - SQUID.

\*      **Self study**

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1.   M. Arumugam, (2012), Material Science - Anuradha Agencies, Chennai

**Reference Books:**
1.   Vijaya, Rangarajan, (2005), Materials Science - Tata McGraw Hill Publishing Co. Ltd, India.
2.   Raghavan, (2010), Materials Science - Prentice Hall of India, New Delhi.

**e-Resources:**
1. https://www.youtube.com/watch?v=D-9M3GWoBrw
2. https://youtu.be/hr08GUR2HQQ
3. https://youtu.be/Yl43KpsNncw
4. https://youtu.be/QQZ6EGf0Ju8
5. https://youtu.be/gtzNdfUD2wc

**Mapping**

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1     | S     | H     | H     | H     | S     |
| CO 2     | H     | S     | H     | H     | S     |
| CO 3     | S     | H     | H     | S     | H     |
| CO 4     | H     | S     | H     | S     | H     |
| CO 5     | H     | S     | H     | S     | H     |

S- Strong                H-High                M-Medium                L – Low

# UPH

| Programme Code: 03 | B.Sc. Physics | | | |
|---|---|---|---|---|
| **Title of the Paper** | **Major Elective Paper - Object Oriented Programming in C++** | | | |
| **Batch 2024-2025** | **Hours/Week 4** | **Total Hours 60** | **Credits 5** | **Employability** |

## Course Objective

To enable the learners to

1. Know about the basics in C++ language
2. Develop programming skills in C++ language
3. Understand about various functions and operators.

## Course Outcome (CO)

On successful completion of the course, the students will be able to

| | CO1 | Acquire basic knowledge about various data types, variables, operators and solving programs for real data. |
|---|---|---|
| | CO2 | understand about function prototyping and function overloading |
| **K1 to K5** | CO3 | Acquire relevant information about various classes, objects and programming with various functions and arguments. |
| | CO4 | Gain knowledge on Constructors, Destructors |
| | CO5 | Gain knowledge on Polymorphism and inheritance |

### UNIT I                                                                                              12 hrs
**Beginning with C++**

Basic concepts of Object oriented Programming – tokens – keywords – identifiers and constants – basic data types – user defined data types – derived data types – declaration of variables – dynamic initialization of variables – reference variables – scope resolution operators – expression and their types – **control structures**[*].

### UNIT II                                                                                            12 hrs
**Functions in C++**

Main function – function prototyping – call by reference – return by reference - inline functions – default arguments – Const arguments – function overloading.

### UNIT III                                                                                          12 hrs
**Classes and Objects**

Specifying a class – defining member functions - C++ program with class – making an outside function inline – nesting of member functions – private member functions – arrays within class – memory allocation for objects – static data members and functions – arrays of objects – objects as function arguments – friendly functions.

### UNIT IV                                                                                           12 hrs
**Constructors and Destructors**

Constructors – parameterized constructors – multiple constructors in class – copy constructors – dynamic constructors – destructors.

# UPH

**UNIT V**                                                                                                    **12 hrs**
### Polymorphism and Inheritance
Defining operator overloading – overloading unary and binary operators – rules for overloading operators – Inheritance: Introduction – defining derived class – single inheritance – **multilevel inheritance**[*] – multiple inheritance.

**\*     Self study**
**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Books for study:**
1.     E. Balagurusamy, (2017), Object Oriented Programming with C++ - Tata McGraw Hill, India

**Books for reference:**
1.     Yashwant Kaneetka, (2020), Let us C++ - BPB Publications, New Delhi.
2.     H. Schildt, (2014), C++: A beginners guide, McGraw Hill, India.

**e-Resources:**
1. https://www.digimat.in/nptel/courses/video/106105151/L01.html
2. https://youtu.be/JenkXelhImM
3. https://youtu.be/1puaGnJ9pyAA
4. https://youtu.be/wtuks_f3vP4
5. https://youtu.be/Qe8zcyTlvjc

**Mapping**

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|:---:|:---:|:---:|:---:|:---:|:---:|
| CO 1 | S | H | H | S | H |
| CO 2 | H | S | S | S | S |
| CO 3 | S | S | S | H | S |
| CO 4 | S | H | S | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong      H-High      M-Medium      L - Low**

# UPH

| Programme Code: 03 | | B.Sc. Physics | | |
|---|---|---|---|---|
| **Title of the Paper** | | **Major Elective paper-Introduction to Microprocessor** | | |
| **Batch 2024-2025** | **Hours/Week 4** | **Total Hours 60** | **Credits 5** | **Skill development** |

## Course Objectives

To study about the

1. History, origin and development of microprocessor
2. Architecture, instruction set and programming of 8085 microprocessors
3. Interfacing and applications

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Know about history, origin and development of microprocessor |
|---|---|---|
| | **CO2** | Understand architecture |
| **K1 to K5** | **CO3** | Understand instruction sets |
| | **CO4** | Knowledge about programming and interfacing |
| | **CO5** | Understand the applications of microprocessor |

## Syllabus

### UNIT I                                                                 12 hrs
**Origin and Development**

Microprocessor – Origin – History and Development – Microprocessor generations – Difference between LSI and VLSI Circuits- Applications of Microprocessor

### UNIT II                                                                12 hrs
**Architecture**

Pin diagram of 8085 – Architecture – Addressing Modes- Instruction Set

### UNIT III                                                               12 hrs
Timing Diagram

Timing Diagram - Timing diagram for op.code fetch cycle - memory read – memory write – I/O read- I/O write-Instruction Cycle.

### UNIT IV                                                                12 hrs
**Memory**

Need for Memory – ROM-RAM-EROM

### UNIT V                                                                 12 hrs
**Interfacing and Applications**

Concept of interfacing-Intel 8255PPI –Pin diagram- Architecture-Simple Programming-Addition-Subtraction-Multiplication –Division-Smallest/Biggest number in a array-Sorting of an array-**Matrix addition-Matrix Multiplication\***

 \* **Self study**

**Teaching Methods:** Smart Class Room/Power point presentation/Seminar/Quiz/Discussion/FlippedClass

**Text Books:**
1. B.Ram, (2005), Fundamentals of Microprocessor and Microcomputers - Dhanpat Rai Publications, New Delhi.
2. A.P.Mathur, (2017), Introduction to Microprocessors, Tata McGraw Hill, India.

**Reference Books:**
1. Ramesh, (2013), Microprocessor Architecture & Applications with 8085- International Publishing India.

**e- Resources:**
1. https://www.tutorialspoint.com/microprocessor/microprocessor_overview.htm
2. https://www.tutorialspoint.com/microprocessor/microprocessor_8085_architecture.htm
3. https://developer.arm.com/architectures/instruction-sets
4. https://www.tutorialspoint.com/microprocessor/microprocessor_intel_8255a_programmable _peripheral_interface.htm
5. https://www.geeksforgeeks.org/subroutine-subroutine-nesting-and-stack-memory/

**Mapping**

| CO PSO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|--------|------|------|------|------|------|
| CO 1 | S | H | S | S | H |
| CO 2 | S | S | H | H | S |
| CO 3 | S | S | H | S | H |
| CO 4 | S | H | S | H | S |
| CO 5 | H | S | H | S | H |

**S- Strong    H-High       M-Medium      L – Low**

# Non - Major Elective Papers

1. Human Rights

2. Women's Rights

3. Consumer affairs

# UPH

| | |
|---|---|
| **Programme Code:03** | **For B.A., BBA, B.Com, BCA and B.Sc., Degree Students** |
| **Title of the Paper** | **Part IV – Non Major Elective - I    Human Rights** |
| **Batch 2024-2025** | **Hours / Week** 2 / **Total Hours** 30 / **Credits** 2 |

| Batch 2024-2025 | Hours / Week | Total Hours | Credits |
|---|---|---|---|
| 2024-2025 | 2 | 30 | 2 |

## COURSE OBJECTIVES

➢ To prepare for responsible citizenship with awareness of the relationship between Human Rights, democracy and development.

➢ To impart education on national and international regime on Human Rights.

➢ To sensitive students to human suffering and promotion of human life with dignity.

➢ To develop skills on human rights advocacy

➢ To appreciate the relationship between rights and duties

➢ To foster respect for tolerance and compassion for all living creature.

## COURSE OUTCOMES

After Completion of the Course the student will be able to

| | | |
|---|---|---|
| K1 ↑ ↓ K5 | CO1 | To understand the hidden truth of Human Rights by studying various provisions in the Constitution of India. |
| | CO2 | To acquire overall knowledge regarding the Feminist perspectives in the Liberative Empowerment of Women. |
| | CO3 | To gain knowledge about various gender roles and stereotypes involved in the comprehension of gender equality and women's rights. |
| | CO4 | To comprehend the legal provisions and policies that foreground the safety of children in the society and to promote awareness. |
| | CO5 | To gain enhanced knowledge about sexual and gender minorities to recognize, celebrate and acknowledge the diversified forms of gender expressions and rights. |

## SYLLABUS

**UNIT I**                                                    **(6 Hours)**
**HUMAN RIGHTS HUMANS RIGHTS CONSTITUTION OF INDIA:** Humans Rights - Constitution of India

**UNIT II**                                                    **(6 Hours)**
**WOMEN EMPOWERMENT IN INDIA:** Feminism and Sexual Violence - Women And Liberation

**UNIT III**                                                    **(6 Hours)**
**GENDER EQUALITY AND WOMEN'S RIGHTS:** Stereotype Gender Roles - Women's Education, Power And Science

**UNIT IV**                                                    **(6 Hours)**
**RIGHTS OF THE CHILD IN INDIA:** Status of child in contemporary Indian society - Special Laws and Policies for protection of children

**UNIT V**                                                    **(6 Hours)**
**SOGIESC RIGHTS:** Understanding SOGIESC- basic Definitions- inclusivity of SOGIESC- importance of studying SOGIESC- presence of SOGIESC in Indian Traditions- temples and cultural practices that exemplify SOGIESC in India- Genetics of Sex determination- Genetics of Intersex community- Successful SOGIESC Personalities and achievers – Alan Turing- Sally Ride- Leonardo da vinci- Alan Hart- Virginia -Woolf- Bayard Rustin- Padmini Prakash- Akkai Padmashali- K Prithika Yashini- Laxmi Narayan Tripati- Madhu Bai Kinnar-Manabi Bandhopadhyay- SOGIESC Rights and laws

# UPH

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Books for Study:**
1. Human Rights (2024) Compiled by Kongunadu Arts and Science College,  Coimbatore –29.

**REFERENCES:**
1. Human Rights, (2018) by Jaganathan,MA.,MBA.,MMM.,ML.,ML., (Humanitarian Law) and J.P. Arjun  Proprietor: Usha Jaganathan, Refugee Law  Law series, 1st floor, Narmatha Nanthi Street, Magathma Gandhi Nagar, Madurai – 625014.

2. Country Report on SOGIESC Rights In India: An Unfinished Agenda.
Weblink: https://www.ilgaasia.org/publications/india-country-report-an-unfinished-agenda

3. Intersex. Weblink: https://my.clevelandclinic.org/health/articles/16324-intersex

4. SOGIESC Personalities:
https://www.bbc.com/news/world-asia-india-29357630
https://en.wikipedia.org/wiki/Laxmi_Narayan_Tripathi
https://en.wikipedia.org/wiki/Akkai_Padmashali
https://www.indiatoday.in/india/story/prithika-yashini-india-first-transgender-police-officer-tamil-nadu-969389-2017-04-04
https://yourstory.com/2018/03/first-transgendre-college-principal-west-bengal

5. SOGIESC Rights and laws
https://www.openglobalrights.org/lgbtqia-to-sogiesc-reframing-sexuality-gender-human-rights/
https://static1.squarespace.com/static/5a84777f64b05fa9644483fe/t/625ead0484f9005d75b92
dd0/1650371887436/ILGA+Asia+India+Report+2021.pdf

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## Question Paper Pattern
### (External only)

**Duration: 3 hrs**                                                                         **Max: 75 marks**

### Answer <u>ALL</u> Questions

<u>**SECTION A**</u>          (5 x 5 = 25 marks)
Short answers, either or type, one question from each unit.

<u>**SECTION B**</u>          (5 x 10 = 50 marks)
Essay type questions, either or type, one question from each unit.

# UPH

| Programme Code: 03 | B.Sc. Physics | | |
|---|---|---|---|
| Title of the Paper | Part IV – Non Major Elective – II | | Women's Rights |
| Batch 2024-2025 | Hours/Week 2 | Total Hours 30 | Credits 2 |

## Course Objectives
1. To know about the laws enacted to protect Women against violence.
2. To impart awareness about the hurdles faced by Women.
3. To develop a knowledge about the status of all forms of Women to access to justice.
4. To create awareness about Women's rights.
5. To know about laws and norms pertaining to protection of Women.
6. To understand the articles which enables the Women's rights.
7. To understand the Special Women Welfare laws.
8. To realize how the violence against Women puts an undue burden on healthcare services.

## Course Outcomes (CO)
On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| **K1 - K5** | CO1 | Understand the importance of Women's Studies and incorporate Women's Studies with other fields. |
| | CO2 | Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication. |
| | CO3 | Interpret the laws pertaining to violence against Women and legal consequences. |
| | CO4 | Study the important elements in the Indian Constitution, Indian Laws for Protection of Women. |
| | CO5 | To be Aware of Government Developmental schemes for women and to create Awareness on modernization and impact of technology on Women. |

## Syllabus

**Unit I**                                                                                   **6 hrs**

**Women's Studies:**
Basic concepts of Women's studies in Higher education, Women's studies perspectives-Socialization- Patriarchy- Women's studies as an academic discipline- Growth and development of Women's studies as a discipline internationally and in India.

**Unit II**                                                                                  **6 hrs**

**Socio-Economic Development of Women:**
Family welfare measures, role of Women in economic development, representation of Women in media,status of Women land rights, Women Entrepreneurs, National policy for the empowerment of women.

**Unit III**                                                                                **6 hrs**

**Women's Rights – Access to Justice:**
Crime against Women, domestic violence – physical abuse- verbal abuse – emotional abuse - economicabuse – minorities, dowry- harassment and death, code of conduct for work place, abetment of suicide.

**Unit IV**                                                                                 **6 hrs**

**Women Protective acts:**
Protective legislation for Women in the Indian constitution- Anti dowry, SITA, PNDT, and Prevention Sexual Harassment at Workplace (Visaka case), Domestic violence (Prevention) Act.

Sub. Code: 24UWR4N2

**Unit V**                                                                                                                          **6 hrs**

**Women and Child welfare:**

Safety provisions - various forms of mass media, radio, visual, internet, cyber space, texting, SMS and smart phone usage. Healing measures for the affected Women and child society by private and public sector, NGO and society.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Book:**

1. **Women's Rights** (2021), compiled by Kongunadu Arts & Science College, Coimbatore – 641 029.

**Reference Books:**

**1. "Rights of Indian Women"** by Vipul Srivatsava. Publisher: Corporate Law Advisor, 2014.
**2. "Women's security and Indian law"** by Harsharam Singh. Publisher: Aabha Publishers and

   Distributors, 2015.
3. **"Women's Property Rights in India"** by Kalpaz publications, 2016.

**Question Paper Pattern**
**(External only)**

**Duration: 3 hrs**                                                                                              **Max: 75 marks**

**Answer <u>ALL</u> Questions**

**<u>SECTION A</u>**          (5 x 5 = 25 marks)

Short answers, either or type, one question from each unit.

**<u>SECTION B</u>**          (5 x 10 = 50 marks)

Essay type questions, either or type, one question from each unit.

# UPH

| Programme Code: 03 | B.Sc. Physics | | |
|---|---|---|---|
| **Title of the Paper** | **Part IV – Non Major Elective III - Consumer Affairs** | | |
| **Batch 2024-2025** | **Hours/Week 2** | **Total Hours 30** | **Credits 2** |

## Course Objectives

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act
5. To impart awareness about the Role of Industry Regulators in Consumer Protection
6. To understand Contemporary Issues in Consumer Affairs

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Able to know the rights and responsibility of consumers. |
|---|---|---|
| **K1 - K5** | **CO2** | Understand the importance and benefits of Consumer Protection Act. |
| | **CO3** | Applying the role of different agencies in establishing product and service standards. |
| | **CO4** | Analyze to handle the business firms' interface with consumers. |
| | **CO5** | Assess Quality and Standardization of consumer affairs |

## Syllabus

**UNIT I** **(6 hrs)**

Conceptual Framework - Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labeling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite

**UNIT II** **(6 hrs)**

The Consumer Protection Law in India - Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice.
Organizational set-up under the Consumer Protection Act: Advisory Bodies: Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

**UNIT III** **(6 hrs)**

Grievance Redressal Mechanism under the Indian Consumer Protection Law - Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing

of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court/National Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

**UNIT IV** (6 hrs)

Role of Industry Regulators in Consumer Protection
 i. Banking: RBI and Banking Ombudsman
 ii. Insurance: IRDA and Insurance Ombudsman
 iv. Telecommunication: TRAI
 v. Food Products: FSSAI
 vi. Electricity Supply: Electricity Regulatory Commission
 vii.   Real Estate Regulatory Authority

**UNIT V** (6 hrs)

**Contemporary Issues in Consumer Affairs** - Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.
**Quality and Standardization**: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview.

**Note:** Unit 2 and 3 refers to the Consumer Protection Act, 2086. Any change in law would beadded appropriately after the new law is notified.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Suggested Readings:**

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, UniversitiesPress.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications PvtLtd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, RegalPublications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, NewDelhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books : www.consumereducation.in
8. Empowering Consumers e-book, www.consumeraffairs.nic.in
9. E-books : www.bis.org
10. The Consumer Protection Act, 2086 and its later versions.

# UPH

**Non-Major Elective III - Consumer Affairs**

**Question paper pattern (External Only)**

**Duration: 3 hrs**                                                    **Max: 75 Marks**

**Section A (5 x 5=25)**
Short notes
Either – or / type – question from each unit.


**Section B (5 x 10=50)**
Essay type
Either – or / type – question from each unit.

# Skill Based Subjects (SBS)

1. Cyber Security
2. Scientific Computing- Python
3. Basics of IPR

# UPH

| Programme Code: 03 | | | B.Sc. Physics | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | | **SBS I – CYBER SECURITY** | | |
| **Batch 2024-2025** | **Semester 3** | **Hours/Week 2** | **Total Hours 30** | **Credits 3** | **Skill Development** |

## Course Objectives
1. The course introduces the basic concepts of Cyber Security
2. To develop an ability to understand about various modes of Cyber Crimes and Preventive measures
3. To understand about the Cyber Legal laws and Punishments

## Course Outcomes (CO)
On successful completion of the course, the students will be able to

| | CO1 | To Understand the Concepts of Cybercrime and Cyber Frauds |
|---|---|---|
| | CO2 | To Know about Cyber Terrorism and its preventive measures |
| **K1-K5** | CO3 | To Analyze about the Internet, Mobile Phone and E-commerce security issues |
| | CO4 | To Understand about E-mail and Social Media Issues |
| | CO5 | To Describe about various legal responses to Cybercrime |

## Syllabus

**Unit I**       **6 hrs**

Introduction to Cyber Security: Definition of Cyber Security- Why is Cyber Security important? Layers of Cyber Security- Evolution of Cyber Security. Cyber hacking - Cyber fraud: Definition - Different modes of cyber fraud - Cyber fraud in India. Cyber pornography.

**Unit II**       **6 hrs**

Cyber Terrorism: Modes of cyber terrorism. Cybercrime: What is Cybercrime? Cybercrime preventive methods - Preventive steps for individuals & organizations - Kinds of cybercrime - Malware and its types – Cyber attacks.

**Unit III**       **5 hrs**

Internet Mobile Phone and E-commerce Security issues: Data theft - Punishment of data theft- Theft of internet hours - Internet safety tips for children & parents. Mobile phone privacy- E-Commerce security issues.

**Unit IV**       **6 hrs**

Email and Social media issues: Aspects of Social Media - The Vicious Cycle of unhealthy social media use- Modifying social media use to improve mental health. Computer Virus - Antivirus – Firewalls.

**Unit V**       **7 hrs**

Cyber Forensics and Digital Evidence: What does Digital Footprint Mean? - Web Browsing and Digital Footprints- Digital Footprint examples – How to Protect Your Digital Footprints? - How to erase your Footprints? - Browser Extensions and Search Engine Deletion - Cyber Crime and Cyber Laws - Common Cyber Crimes and Applicable Legal Provisions: A Snapshot - Cyber Law (IT Law) in India – The Information Technology Act of India 2000 - Cyber Law and Punishments in India - Cyber Crime Prevention guide to users – Regulatory Authorities.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Book:**
1. **"Cyber Security", Text Book** prepared by "Kongunadu Arts and Science College", Coimbatore -29, 2022.

**Reference Books:**
1. Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamental of Cyber Security", BPB Publications, 1st Edition, 2017.
2. Anand Shinde, "Introduction to Cyber Security-Guide to the world of Cyber Security",Notion Press,2021.
3. Paul Grishman, "Cyber Terrorism- The use of the Internet for Terrorist Purpose",Axis Publication,1st Edition 2010.
4. Shilpa Bhatnagar, "Encyclopaedia of Cyber and Computer Hacking", Anmol Publications, 1st Edition 2009.

**Web References:**
1. http://deity.gov.in/ - Department of Electronics and Information Technology, Govt. of India
2. http://cybercellmumbai.gov.in/ - Cybercrime investigation cell
3. http://ncrb.gov.in/ - National Crime Records Bureau
4. http://catindia.gov.in/Default.aspx - Cyber Appellate Tribunal
5. http://www.cert-in.org.in/ - Indian Computer Emergency Response Team
6. http://cca.gov.in/rw/pages/index.en.do - Controller of Certifying Authorities
7. www.safescrypt.com - Safescrypt
8. www.nic.in – National Informatics Center
9. https://www.kaspersky.com/resource-center/definitions/what-is-a-digital-footprint
10. https://geekflare.com/digital-footprint/

**Mapping**

| PSO / CO | PSO1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|---|---|---|---|---|---|
| CO1 | S | H | M | S | H |
| CO2 | H | S | S | H | S |
| CO3 | M | H | M | S | H |
| CO4 | S | H | H | M | H |

**S** – Strong    **H** – High    **M** – Medium    **L** – Low

# UPH

## Question Paper Pattern

**Duration: 3 hrs**                                              **Max: 75 marks**

**Section - A** (10x1=10)
**Choose the correct answer**

**Section - B** (5x5=25)
**Short answer questions, either or type, one question from each unit.**

**Section - C** (5x8=40)
**Essay answer questions, either or type, one question from each unit.**

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## CIA EXAMINATION MARK BREAKUP

| S. NO | DISTRIBUTION COMPONENT | MARKS |
|-------|------------------------|-------|
| 1. | CIA I – 75 Marks Converted to 30 | **30** |
| 2. | CIA II – 75 Marks Converted to 30 | **30** |
| 3. | Assignment I | **10** |
| 4. | Assignment II | **10** |
| 5. | Attendance | **05** |
| 6. | Any Case Study related to Cyber Security | **15** |
| | **Total** | **100** |

# UPH

| Programme Code: 03 | | | B.Sc. Physics | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | | **Skill Based Subject 2 – Scientific Computing- Python** | | |
| **Batch 2024-2025** | **Semester 4** | **Hours/Week 2** | **Total Hours 30** | **Credits 3** | **Employability** |

## Course Objectives

To enable the learners to

1. build basic programme using fundamental programming constructs
2. build programme for Physics related applications.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Gain knowledge about how to use list |
|---|---|---|
| | **CO2** | Gain knowledge about conditions and loops |
| **K1 to K5** | **CO3** | Understand the concepts of functions and class |
| | **CO4** | Understand the concepts of python libraries |
| | **CO5** | Able to do basic python projects |

## Syllabus

**UNIT I**        **6 hrs**

### Introduction to Python

Python on different operating systems - Variables – Strings – Numbers – Comments – List – Changing, Adding and Removing Elements – Organizing a List – Looping through List – **Making Numerical List***.

**UNIT II**        **6 hrs**

### Conditions and Loops

Conditional Tests - If statements with Lists – Dictionaries – Nesting - While statement – Infinite loops – – Continue statement – For loops – Counting and summing loops – Maximum and minimum loops - Loop with Lists and Dictionaries.

**UNIT III**        **6 hrs**

### Functions and Class

Functions – Styling - Creating and Using a Class – Importing classes – Opening files – Text files – Reading files – Searching through files – Selecting files names from user – Writing files – Testing a Function – Testing a Class.

**UNIT IV**        **6 hrs**

### Python Libraries

Basic Numpy: 2D Numpy Arrays - Pandas: Basic data manipulation - Matplotlib: Basic plotting – Plot types - Image functions - Axis functions - Figure functions - 2D and 3D plots - Annotations and texts.

# UPH

Sub Code: 24UPH4S2

**UNIT V**  6 hrs
**Python projects**

Arithmetic formatter – Time calculator – Polygon area calculator – Probability calculator

**Self Study \***
**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books**
1. Eric Matthes(2019), Python Crash Course - 2nd Edition, No Starch Press
2. Wes McKinney (2013), Python for Data Analysis - O'Reilly Media

**Reference Books**
1. Charles R. Severance, (2017), Python for Everybody: "Exploring data using Python 3", Schroff Publishers, ISBN 978-9352136278.
2. Timothy C. Needham, (2017), Python for Beginners: A crash course guide to learn python in 1 week.

**e-Resources:**
1. https://www.python.org/about/gettingstarted/
2. https://www.w3schools.com/python/python_intro.asp
3. https://www.youtube.com/watch?v=QXeEoD0pB3E&list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3
4. https://archive.nptel.ac.in/courses/106/106/106106182/
5. https://www.youtube.com/watch?v=7wnove7K-ZQ&list=PLu0W_9lII9agwh1XjRt242xIpHhPT2llg

**Mapping**

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1      | S     | H     | S     | H     | H     |
| CO 2      | H     | S     | H     | S     | S     |
| CO 3      | S     | S     | H     | H     | S     |
| CO 4      | H     | H     | S     | S     | S     |
| CO 5      | H     | S     | H     | S     | H     |

**S- Strong**  **H-High**  **M-Medium**  **L - Low**

# UPH

| Programme Code : | For B.A., BBA, B.Com, BCA and B.Sc., Degree Students | | |
|---|---|---|---|
| Skill Based Subject 3 - BASICS OF INTELLECTUAL PROPERTY RIGHT'S | | | |
| Batch 2024-2025 | Hours / Week 2 | Total Hours 30 | Credits 3 |

## COURSE OBJECTIVES

- To create awareness about recent trends in IPR and Innovation
- To explore the basic concepts IPR
- To focus upon trademarks, copyrights, patents, industrial designs and traditional knowledge.
- To learn more about managing IP rights and legal aspects.

## COURSE OUTCOMES

On successful completion of the course, the students will be able to

| K1 | CO1 | Know about basic concepts of IPR and patent |
|---|---|---|
| | CO2 | Understand copyrights, industrial designs and geographical indication of goods. |
| | CO3 | Differentiate between trademarks and trade secrets |
| | CO4 | Acquire knowledge on parotection of traditional knowledge and plant varieties. |
| K5 | CO5 | Manage and protect IP Rights |

**UNIT – I**        **(6 hours)**

**Introduction -**origin and development of Intellectual Property Rights (IPR), need for protecting IP, **Patents:** Foundation of patent law, patent searching process, basic criteria of patentability. Patentable and non - patentable subject matters in India. Patent prior art search, drafting the patent specification and filing procedure

**UNIT – II**        **(6 hours)**

**Copyrights:** Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright. **Industrial Designs:** Kind of protection provided in Industrial design. **Geographical Indication of Goods:** Basic aspects and need for the registration.

**UNIT – III**        **(6 hours)**

**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, transfer of rights, selecting and evaluating trademark, registration of trademarks, claims. **Trade Secrets:** Trade secret law, determination of trade secret status, liability form is appropriation of trade secrets, trade secret litigation.

**UNIT – IV**        **(6 hours)**

**Protection of traditional knowledge** - Objectives, concept of traditional knowledge, issues concerning, bioprospecting and biopiracy. **Protection of Plant Varieties -** Objectives, international position, plant varieties protection in India. Rights of farmers, breeders and researchers.

**UNIT- V**        **(6 hours)**

**Managing IP Rights:** Acquiring IP Rights: letters of instruction, joint collaboration agreement, protecting IP Rights: non-disclosure agreement, cease and desist letter, settlement memorandum. **Transferring IP Rights:** Assignment contract, license agreement, deed of assignment. Infringement and enforcement.

# UPH

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

## TEXT BOOKS

1. Ramakrishna Chintakunta and M. Geethavani (2022). A Textbook of Intellectual Property Rights. Blue Hills publications.
2. N.K Acharya (2021).Intellectual property rights(8thEdn). Asia Law House.
3. Craig Allen Nard, Michael J. Madison, and Mark P. McKenna. (2017). Law of Intellectual Property (5thEdn). New York Aspen publishers.
4. Barrett and Margreth (2009). Intellectual Property. New York Aspen publishers.
5. Deborah E.Bouchoux(2013). Intellectual property:The Law of Trademarks, Copyrights, Patents, and Trade Secrets. Publisher: Cengage India

## REFERENCES

1. B.Ramakrishna and H.S.Anil Kumar (2017). Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers.Notion Press.
2. V. K. Ahuja(2013). Law relating to Intellectual Property rights (2nd Edn). LexisNexis.
3. R. Radhakrishnan and S. Balasubramanian(2008).Intellectual property rights: Text and Cases. Excel Books India.
4. D. Goeland S. Parashar (2013). IPR Biosafety and Bioethics. Pearson Education India.

## Mapping

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1 | S | H | S | H | H |
| CO 2 | H | S | H | S | S |
| CO 3 | S | S | H | H | S |
| CO 4 | H | H | S | S | S |
| CO 5 | H | S | H | S | H |

**S- Strong**          **H-High**          **M-Medium**          **L - Low**

# UPH

| Programme Code: 03 | | B.Sc. Physics | | |
|---|---|---|---|---|
| **Title of the Paper** | | **Part IV – Environmental Studies** | | |
| **Batch 2024-2025** | **Semester 1** | **Hours/Week 2** | **Total Hours 30** | **Credits 2** |

## Course Objectives

1. The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi- disciplinary nature of environmental health sciences
2. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
3. To shape students into good "Ecocitizens" thereby catering to global environmental needs.
4. This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil
5. The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | | |
|---|---|---|
| **K1-K5** | **CO 1** | Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems |
| | **CO2** | Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues |
| | **CO3** | Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones |
| | **CO4** | To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity |
| | **CO5** | To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems |

## Syllabus

**UNIT I** (6 hrs)

**Multidisciplinary nature of Environment**

Definition : scope and importance – Need for public awareness - Natural resources – Types of resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

**UNIT II** (6 hrs)

**Ecosystems**

Concept of an ecosystem – Structure and functions of an ecosystem – Procedures, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food web and ecological pyramids – Structure and function of the following ecosystem – Forest Ecosystem – Grassland Ecosystem – Desert Ecosystem – Aquatic Ecosystem.

# UPH

## UNIT III                                                           (6 hrs)

### Biodiversity and its conservation

Introduction – Definition – Genetic – Species and ecosystem diversity- Bio geographical classification of India – Value of biodiversity – Biodiversity at global, national and local levels – India as a mega - diversity Nation - Hot spot of biodiversity – Threats to biodiversity - Endangered and endemic species of India – Conservation of Biodiversity – *Insitu* Conservation of Biodiversity – *Exsitu* Conservation of Biodiversity

## UNIT IV                                                            (6 hrs)

### Environmental Pollution

Definition - Causes, effects and control measures of : Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Pollution – Solid Waste Management: Causes, effects, control measures of urban and industrial wastes – Role of individual in prevention of pollution – Pollution case studies – domestic waste water, effluent from paper mill and dyeing, cement pollution – Disaster Management – Food, Drought, Earthquake, Tsunami, Cyclone and Landslide.

## UNIT V                                                             (6 hrs)

### Social issues and the environment

Sustainable Development – Smart City, Urban planning, Town Planning , Urban problems related to energy – Water Conservation: Rain Water Harvesting and Watershed Management – Resettlement and rehabilitation of people, its problems and concerns, case studies Narmatha Valley Project – Environmental ethics, issues and possible solutions – Climate change, global warming, ozone layer depletion, acid rain, nuclear accidents and holocaust, case studies – Hiroshima and Nagasaki, Chernobyl Consumerism and waste products – Environmental Protection Act – Air Pollution Act (Prevention and Control) – Water Pollution Act (Prevention and control) – Wild Life Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness – Human Population and the environment – Population Growth and Distribution – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV/ AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health.

**Text Book:**

1. P.Arul, (2004), A Text Book of Environmental Studies, Environmental Agency, No. 27, Nattar street, Velacherry main road, Velacheery, Chennai - 600042, First Edition 2004.

**Reference Books:**

1. Purohit ShammiAgarwal, A Text Book of Environmental Sciences - Publisher Mrs.Saraswati Prohit, Student Education, Behind Naswan Cinema, Chopansi Road, Jodhpur – 342003.

2. Dr.Suresh and K.Dhameja, Environmental Sciences and Engineering - Publisher S.K.Kataria & Sons, 424/6, Guru Nanak Street, Vaisarak, New Delhi -110 006.

3. J.Glynn Henry and Gary W Heinke, Environmental Science and Engineering - Publisher Prentice Hall of India Private Ltd., New Delhi – 110 001.

### Question Paper Pattern

**Duration: 3 hours**                                    **Total Marks: 50**

**Answer all Questions (5 x 10 = 50 Marks)**

Essay type, either or type questions from each unit.

# UPH

| Programme Code: | For B.A., BBA, B.Com, BCA and B.Sc., Degree Students | | |
|---|---|---|---|
| **VALUE EDUCATION – MORAL AND ETHICS** | | | |
| Batch 2024-2025 | Hours / Week 2 | Total Hours 30 | Credits 2 |

## COURSE OBJECTIVES

➢ To impart Value Education in every walk of life.
➢ To help the students to reach excellence and reap success.
➢ To impart the right attitude by practicing self introspection.
➢ To portray the life and messages of Great Leaders.
➢ To insist the need for universal brotherhood, patience and tolerance.
➢ To help the students to keep them fit.
➢ To educate the importance of Yoga and Meditation.

## COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

| K1 | CO1 | will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice |
|---|---|---|
| | CO2 | will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations |
| | CO3 | can emulate the principled life of great warriors and take it forward as a message to self and the society |
| | CO4 | will be able to Analyse the Practical outcome of practicing Moral values in real life situation |
| K5 | CO5 | could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills |

## SYLLABUS

**UNIT I:**                                                          **(4 Hours)**
**Moral and Ethics:** Introduction – Meaning of Moral and Ethics – Social Ethics – Ethics and Culture – Aim of Education.

**UNIT II:**                                                          **(6 Hours)**
**Life and Teachings of Swami Vivekananda:** Birth and Childhood days of Swami Vivekananda – At the Parliament of Religions – Teachings of Swami Vivekananda

**UNIT III:**                                                          **(4 Hours)**
**Warriors of our Nation:** Subhas Chandra Bose – Sardhar Vallabhbhai Patel – Udham Singh – V. O. Chidambaram Pillai – Bhagat Singh – Tiruppur Kumaran – Dheeran Chinnamalai – Thillaiaadi Valliammai – Velu Nachiyar – Vanchinathan

**UNIT IV:**                                                          **(8 Hours)**
Introduction -yoga and its benefits - Ardhasiddhasana- Yoga for peace- Yoga for health - Yoga for wellbeing - Yoga for success - Brain yoga benefits - The science of Yoga.

**UNIT V:**                                                          **(8 Hours)**
        Isha kriya -Surya Shakthi and it's benefits.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
- Value Based Education – Moral and Ethics – compiled by Kongunadu Arts and Science College (Autonomous), 3rd Edition (2024).

**Reference Books:**
1. Swami Vivekananda - A Biography, Swami Nikhilananda, Advaita Ashrama, India, 24th Reprint Edition (2010).
2. Gandhi, Nehru, Tagore and other eminent personalities of Modern India, Kalpana Rajaram, Spectrum Books Pvt. Ltd., revised and enlarged edition(2004).
3. Freedom Fighters of India, Lion M.G. Agrawal, Isha Books Publisher, First Edition (2008).
4. Easy steps to Yoga by Swami Vivekananda, A Divine Life Society Publication(2000).

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**Question Paper Pattern**

**Duration: 3 hours**                                      **Total Marks: 50**

**Answer all Questions (5 x 10 = 50 Marks)**
Essay type, either or type questions from each unit.

**Extra Departmental Course (EDC)**
**Physics in Everyday life**

# UPH

| Programme Code: 03 | | | B.Sc. Physics | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | | **EDC - Physics in Everyday life** | | |
| **Batch 2024-2025** | Semester 5 | Hours/Week 2 | Total Hours 30 | Credits 3 | **Skill Development** |

## Course Objectives

To study about the

1. Physics of Universe and solar systems
2. Principles, advancements and applications of Physics in various fields.
3. Physics principles involved in common household appliances

## Course outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Understand origin of universe and study about planets. |
|---|---|---|
| | **CO2** | Study Physics in Human anatomy. |
| **K1 to K5** | **CO3** | Study about various Physics principles behind sports. |
| | **CO4** | Application of Physics in Technology. |
| | **CO5** | Realize Physics in appliances |

## Syllabus

**Unit I**                                                                                                           **6 hrs**

**Physics of Universe and Solar system**

Origin of the Universe - Big bang theory - Oscillating theory – Steady state theory – Sun – Solar system – Interior planets – exterior planets - Moon - Bode's law.

**Unit II**                                                                                                          **6 hrs**

**Physics in Human Body**

Eyes as an optical instrument - Vision defects - Rayleigh criterion and resolving power, Sound waves and hearing - Sound intensity - Decibel scale - temperature control.

**Unit III**                                                                                                        **6 hrs**

**Physics in Sports**

The sweet spot - Dynamics of rotating objects - Running, Jumping and pole vaulting - Motion of a spinning ball - Banana shot: Magnus force - Turbulence and drag.

**Unit IV**                                                                                                        **6 hrs**

**Physics in Technology**

Microwave ovens - CCDs – Lasers – Displays - Optical recording: **CD, DVD Player \*** - Electricmotors : Hybrid car - Telescope – Microscope - Projector.

**Unit V**                                                                                                          **6 hrs**

**Physics in Appliances**

Pressure cooker - Automatic wrist watches - Air conditioner - Refrigerator - Television - Computer - Global Positioning System - Smoke Detectors - Polaroid Sunglasses

# UPH

**\* Self Study**

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1. F.W.Sears, M. Zemansky, R.A.Freedman, and H.D.Young, (2004), University Physics - Pearson Education, UK
2. The Hindu Speaks on Scientific facts, (2017) - Kasturi & Sons Ltd, India.

**Reference Books:**
1. Hugh D. Young, (2012), College Physics - Pearson Education, UK
2. D. Halliday, R. Resnick, J. Walker, (2014), Fundamentals of Physics – John Wiley & Sons, India.

**e-Resources:**
1. https://www.youtube.com/watch?v=pivS9HzattI
2. https://www.youtube.com/watch?v=XV3PTLBBTzs
3. https://www.youtube.com/watch?v=k6zRYoUs_YA
4. https://www.youtube.com/watch?v=D9_2qtD8flo
5. https://www.youtube.com/watch?v=SQDWNdO6xE4

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## Mapping

| CO PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|--------|-------|-------|-------|-------|-------|
| CO 1   | S     | H     | S     | S     | H     |
| CO 2   | H     | S     | S     | S     | S     |
| CO 3   | S     | S     | S     | H     | S     |
| CO 4   | S     | H     | S     | S     | S     |
| CO 5   | H     | S     | H     | S     | H     |

**S- Strong**          **H-High**          **M-Medium**          **L - Low**

# UPH

## EDC
## Question Paper Pattern

**Duration: 3 hrs**                                    **Max: 75 marks**

**Section - A** (10x1=10)
**Choose the correct answer**

**Section - B** (5x5=25)
**Short answer questions, either or type, one question from each unit.**

**Section - C** (5x8=40)
**Essay answer questions, either or type, one question from each unit.**

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## CIA EXAMINATION MARK BREAKUP

### ( For Theory Only)

| S. NO | DISTRIBUTION COMPONENT | MARKS |
|-------|------------------------|-------|
| 1. | CIA I – 75 Marks Converted to 40 | **40** |
| 2. | CIA II – 75 Marks Converted to 40 | **40** |
| 3. | Assignment I | **05** |
| 4. | Assignment II | **05** |
| 5. | Attendance | **05** |
| 6. | Others (Seminar, Group Discussion, Flipped Class room, etc., ) | **05** |
| **Total** | | **100** |

**Add on Courses**

1. **Job Oriented Course**
2. **Advanced Learners Course**

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **JOC - Electrical Appliances: Maintenance and Servicing** | | | |
| **Batch 2024-2025** | **Semester 3 / 5** | **Hours/Week 2** | **Total Hours 30** | **Extra Credits 2** | **Employability** |

**Course Objectives**

To study about
1. Fundamentals of electricity, electrical connections and wiring
2. Heating and motorized appliances
3. Refrigerator, air cooler and air conditioner appliances

**Course Outcomes (CO)**

On successful completion of the course, the students will be able to

| | **CO1** | Understand the fundamentals of electricity |
|---|---|---|
| | **CO2** | Understand the fundamentals of electrical connections and wiring |
| **K1 to K5** | **CO3** | Understand heating appliances |
| | **CO4** | Understand motorized appliances |
| | **CO5** | Understand refrigerator, air cooler and air conditioner appliances |

**Syllabus**

**UNIT I** **6 hrs**

**Fundamentals of electricity**

Electrical charge – current – potential – Ohm's law – electrical energy – power – consumption of electrical power – resistance – capacitance – inductance – Meters: Galvanometer, ammeter, voltmeter and Megger - Measuring and Checking: Basics and usage of Multimeter - Checking transistors and diodes in circuit measurements.

**Unit II** **6 hrs**

**Electrical connections and wiring**

Soldering station: Soldering Iron – Flux – lead - Zero defect soldering – Desoldering pump - AC and DC – single phase and three phase connections. Switches – ceiling rose – lamp holders, sockets – Fuse base – Distribution box – Miniature Circuit Breaker (MCB) – Electromagnetic relays - Earthing Process - Electrical Wiring – Main board preparation – Distribution – Cut-out preparation – Switch board preparation – Safety precautions.

**Unit III** **6 hrs**

**Heating appliances**

Heater types – working principle – Heating Rod – Iron Box – Iron box with steamer – Toasters – Geysers – Microwave Oven: Oven disassembling and assembling procedure – Fault indicator – Testing and troubleshooting methods.

**Unit IV** **6 hrs**

**Motorized appliances**

Types of Motors: DC and AC motors – fans – mixers – blenders – wet grinders: circuit connection - testing methods - Washing machine: Electrical connections – assembly – Dish washer : Electrical connection – Testing and troubleshooting methods.

# UPH

**Unit V**                                                           **6 hrs**
### Refrigerator and Air conditioner appliances
Refrigerator: Electrical connection – Compressor – coolants – automatic defrost circuits – Testing and troubleshooting of refrigerators – Air coolers and Air conditioners: Mounting and fixing of air conditioners – testing and troubleshooting methods.

**Text Books:**
1. B.L.Theraja, A.K.Theraja, (2006), A Textbook of Electrical Technology - S.Chand & Co., New Delhi.
2. J.B.Gupta, (2013), An Integrated Course in Electrical Engineering - S.K.Kataria & Sons, New Delhi.

**Reference Books:**
1. Eric Kleinert, (2012), Troubleshooting and Repairing Major Appliances - Mc Graw Hill, India.
2. H.Partas, (2017), Arts And Science of Utilization of Electrical Energy - Dhanpat Rai & Sons, New Delhi.

**Mapping**

| CO PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|--------|-------|-------|-------|-------|-------|
| CO 1   | S     | H     | S     | S     | H     |
| CO 2   | H     | S     | S     | S     | S     |
| CO 3   | S     | S     | S     | H     | S     |
| CO 4   | S     | H     | S     | S     | S     |
| CO 5   | H     | S     | S     | S     | H     |

**S- Strong**           **H-High**           **M-Medium**           **L  -  Low**

# UPH

| Programme Code: 03 | | | B.Sc. Physics | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | | **ALC - Measurement techniques and Data analysis** | | |
| **Batch 2024-2025** | **Semester** - | **Hours/Week** - | **Total Hours** - | **Extra Credits** 2 | **Entrepreneurship** |

## Course Objectives

To study about

1. Basic concept of measurement & transducers
2. Measurement of error and standards of measurements
3. Electronic and vibration measuring instruments

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Understand the basic concept of measurement & transducers |
|---|---|---|
| **K1 to K5** | CO2 | Understand measurement of error |
| | CO3 | Understand standards of measurements |
| | CO4 | Know about electronic measuring instruments |
| | CO5 | Know about vibration measuring instruments |

## Syllabus

**Unit I** 6 Hours

**Basic concept of measurement & transducers**

Introduction - System configuration – Problem Analysis – Basic Characteristics of measuring devices, Calibration - Transducers: capacitive, transducer - Photoelectric effect – Photoconductive Transducers - Piezoelectric transducers - temperature and pressure transducers.

**Unit II** 6 Hours

**Measurement of errors**

Accuracy, precision, Significant Figures - types of errors - Statistical Analysis - Probability of errors - limiting error

**Unit III** 6 Hours

**Standards of measurements**

Classification of standards - Standards for Mass, Length and Volume - time and frequency standards, electrical standards, standards of temperature and luminous intensity.

**Unit IV** 6 Hours

**Electronic Measuring Instruments**

Q meter - Vector impedance meter - Digital frequency meter – Digital voltmeter – Phase meter - RF power and voltage measurement – Power factor meter – Vector voltmeter.

**Unit V**
**Vibration measuring instruments** 6 Hours
Random vibration – Shock – analyzing vibration sensing devices – generalized second order system – Absolute displacement – Absolute velocity and acceleration vibrating sensing devices - Banded strain gauge accelerators – Piezoelectric accelerometer.

**Text Books:**
1. Hefrick. A.O, Cooper, (2019), Modern Electronic Instrumentation and Measurement Techniques
2. Prentice Hall India, New Delhi.
3. C.S. Rangan, G.R. Sharma, (1997), Instrumentation Devices and Systems - Tata McGraw Hill Publications, India.

**Reference Books:**
1. WD. Cooper, (2015), Electronic Instrumentation and Measurement Techniques – Prentice Hall India, New Delhi.
2. William Bolton, (1996), Measurement and Instrumentation Systems – Newnes Books, UK.

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**Mapping**

| CO PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|--------|-------|-------|-------|-------|-------|
| CO 1 | S | H | S | S | H |
| CO 2 | H | S | S | S | S |
| CO 3 | S | S | S | H | S |
| CO 4 | S | H | S | S | S |
| CO 5 | H | S | S | S | H |

**S- Strong** **H-High** **M-Medium** **L - Low**

# Certificate Courses

1. Certificate course in Astrophysics

2. Certificate course in Non-Conventional Energy

3. Certificate course in Electronic Instrumentation

# UPH

## Certificate course in Astrophysics

Scheme of CurriculumDuration: 6 months

| Sub. Code | Subject | Instr. Hours /week | Internal | External | Max marks | Exam. Hrs. | Credits |
|---|---|---|---|---|---|---|---|
| 24CAP101 | **Theory 1-** Astronomy and Astrophysics | **2** | **25** | **75** | **100** | **3** | **2** |
| 24CAP102 | **Theory 2-** Stellar Evolution and Astronomical Imaging | **2** | **25** | **75** | **100** | **3** | **2** |
| 24CAP1Z1 | **Project and Viva-voce** | **-** | **20** | **80** | **100** | **3** | **2** |
| **Total marks** | | | | | **300** | | **6** |

## Question Paper Pattern

**Theory Examination:**                                   **External Max.Marks: 75**

Section - A ($10 \times 1 = 10$ Marks)
Multiple Choice (2 Questions from Each Unit)

Section -B ($5 \times 5 = 25$ Marks)
Either or type (1 Question from Each Unit)

Section - C ($5 \times 8 = 40$ Marks)
Either or type (1 Question from Each Unit)

**Project and viva-voce:**                                **External Max. Marks: 80**

Project Report Presentation          : 60 Marks
Viva-voce                                       : 20 Marks

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Astronomy and Astrophysics** | | | |
| **Batch 2024-2025** | **Semester Odd** | **Hours/Week 2** | **Total Hours 30** | **Credits 2** | **Skill Development** |

## Course Objectives

To enable the learners
1. To know about the universe and astronomical objects
2. To know about the astronomical instruments, Indian astronomy and astronomers
3. To know about the applications of astronomy

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Understand the origin of universe. |
|---|---|---|
| | **CO2** | Gain knowledge on astronomical objects |
| **K1 to K5** | **CO3** | Acquire knowledge on astronomical instruments |
| | **CO4** | Know about Indian Astronomy and Astronomers |
| | **CO5** | Realize various applications of astronomy |

### UNIT I                                                                 6 hrs
**Origin of Universe**

Big bang theory- Evidences of big bang theory- Steady state theory - Future of Universe - Pulsating theory - Tidal and planetesimal theories- Hertzprung Russel Diagram- Saha's ionization theory

### UNIT II                                                                6 hrs
**Astronomical Objects**

Classification of celestial bodies: Stars- Planets- Satellites- Comets- Asteroids- Meteors and meteorites- Galaxies- Red giants- White drawfs - Quasers- Chandrasekar's mass limit - Rotating black holes- Schwarzchild radius

### UNIT III                                                               6 hrs
**Astronomical Instruments**

Hubble Space telescope- Basics of orbiting telescope - Reflecting telescope - Types of reflecting telescope - Parapoloid reflection antenna- Broad band antenna- Arrays

### UNIT IV                                                               6 hrs
**Indian Astronomy and Astronomers**

Hindu calendar – Indian Astronomers: Lagadha – Aryabhatta - Bhramagupta - Varahamihira - Bhaskara I – Indian astronomy in comparison with greek, Chinese and Europe astronomies - Astronomy research institutes in India – Modern day astrophysicists in India.

### UNIT V                                                                6 hrs
**Applications of Astronomy**

Bioastronomy- Habitable planets- Space shuttles- Geosynchronous satellite-Search for extraterrestrial intelligence (SETI) - UFO phenomenon- Radio telemetry- space probes.

# UPH

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**
1. A.B.Bhattacharya, S.Joardar, R.Bhattacharya, (2010), Astronomy and Astrophysics - Overseas Press, New Delhi
2. Baidyanathan Basu, (2001), An Introduction to Astrophysics - Prentice Hall of India, New Delhi.

**Reference Books:**
1. J.V.Narlikar, (1983), Introduction to Cosmology - Cambridge University Press, UK.
2. K.D.Abhyankar, (1992), Astrophysics- Stars and galaxies - University Press, India.
3. K.S.Krishnaswamy, (2002), Astrophysics: A modern perspective - New Age International Pvt. Ltd, New Delhi.

## Mapping

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1 | S | H | S | H | H |
| CO 2 | H | S | H | S | S |
| CO 3 | S | S | H | H | S |
| CO 4 | H | H | S | S | S |
| CO 5 | H | S | H | S | H |

**S- Strong          H-High          M-Medium          L - Low**

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Stellar Evolution and Astronomical imaging** | | | |
| **Batch 2024-2025** | **Semester Odd** | **Hours/Week 2** | **Total Hours 30** | **Credits 2** | **Skill Development** |

## Course Objectives

To enable the learners
1. To know about the calendar and constellations
2. To know about the stellar distances and stellar evolution
3. To know about the luminosity of stars and advanced astronomical imaging techniques

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Understand sky and calendar |
|---|---|---|
| | **CO2** | Get exposure to measure the distances in space |
| **K1 to K5** | **CO3** | Gain knowledge about the evolution of stars, their birth and decay |
| | **CO4** | Will understand intensity of stars and their measurements |
| | **CO5** | Get knowledge on advanced imaging methods and analysis |

## Unit I                                                                                    6hrs
### Sky and Calendar

Motion of the Earth - Sidereal day and sidereal time - Celestial co-ordinates - Celestial sphere - Universal equatorial system – Calendars : Moon - Sun and stars as calendars - Constellations – Aries, Pisces - Orion and Cassiopeia - Interesting objects in the sky : Summer triangle - North Polaris and Big dipper (Saptarishi).

## Unit II                                                                                   6hrs
### Stellar distances

Measurement of terrestrial distances - Measurement of distances within solar system (Moon, planet and Sun) - Astronomical unit and its measurement by aberration of star light - Trigonometric parallaxes of stars - Method of luminosity distance (concept of absolute magnitude) - Spectroscopic parallax - Period luminosity law.

## Unit III                                                                                  6hrs
### Stellar Evolution

Protostar – Birth - Maturity - Aging of stars (main sequence) - Death of small stars - Death of massive stars (supernova explosion) - Pulsars and neutron stars - Binary Stars.

## Unit IV                                                                                   6hrs
### History and Luminosity of Stars

Ptolemy's astronomical work - Copernican heliocentric system - Tycho and Kepler's system - Galileo work - Newton's law of gravitation - Kepler's laws of planetary motion - Luminosity (apparent and absolute) of stars - Magnitude scale - Measurement of apparent luminosity by visual, photographic and photoelectric methods.

# UPH

**Unit V**                                                                                          **6hrs**

**Advanced Astronomical Imaging**

Imaging and detector basics - Fourier transform - Deconvolution and Image reconstruction – Photography - CCD - Large optical / IR telescopes and their designs - Thin lens - Segmented mirrors - Active optics - Designs of few upcoming large telescopes (eg. EVLT, TMT) - Interferometry - Michelson stellar interferometer.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Study Books:**
1. Thomas T. Arny, (1994), Exploration – An Introduction to Astronomy- Mosley-Year Book Inc.
2. Baidhnath Basu, (2014), An Introduction to Astrophysics- PHI Course Pvt. Ltd.
3. Ian S. McLean, (2008), Electronic Imaging in Astronomy: Detectors and Instrumentation, Springer.

**Reference Books:**
1. R. Jastrow, M. H. Thomson, (1984), Astronomy Fundamentals and Frontiers- John Wiley.
2. M. Jay, Astronomy, (1992), From the Earth to the Universe - Pasachoff Books / Cole Thomson Course, W B Saunders Co Ltd, UK.
3. Theo Koupelis Jones, Barttlett Course, (2010), In Quest of the Universe - LLC Publications, New York.
4. K.D.Abhyankar, (2012), Astrophysics: Stars and Galaxies - Tata McGraw Hill Publication, India

## Mapping

| CO \ PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1 | S | H | S | H | H |
| CO 2 | H | S | H | S | S |
| CO 3 | S | S | H | H | S |
| CO 4 | H | H | S | S | S |
| CO 5 | H | S | H | S | H |

**S- Strong**             **H-High**             **M-Medium**             **L - Low**

# UPH

## Certificate course in Non-Conventional Energy

### Scheme of Curriculum Duration: 6 months

| Sub. Code | Subject | Instr. Hours /week | Internal | External | Max marks | Exam. Hrs. | Credits |
|-----------|---------|--------------------|----------|----------|-----------|------------|---------|
| **24CNE101** | **Theory 1** Non-Conventional Energy sources and Storage System | **2** | **25** | **75** | **100** | **3** | **2** |
| **24CNE102** | **Theory 2** Energy Management and Auditing | **2** | **25** | **75** | **100** | **3** | **2** |
| **24CNE1Z1** | **Project and Viva voce** | **-** | **20** | **80** | **100** | **3** | **2** |
| **Total marks** | | | | | **300** | | **6** |

## Question Paper Pattern

**Theory Examination:**                                                   **External Max.Marks: 75**

Section - A (10× 1 = 10 Marks)
Multiple Choice (2 Questions from Each Unit)

Section -B (5 × 5 =  25 Marks)
Either or type  (1 Question from Each Unit)

Section - C (5 × 8 = 40 Marks)
Either or type  (1 Question from Each Unit)

**Project and viva voce:**                                                **External Max.Marks: 80**
Project Report Presentation          : 60 Marks
Viva voce                            : 20 Marks

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Non-Conventional Energy sources and storage system | | | |
| Batch 2024-2025 | Semester Odd | Hours/Week 2 | Total Hours 30 | Credits 2 | Skill Development |

## Course Objectives

To enable the learners to
1. Understand various forms of non-conventional energy sources and ways to harness energy from these energy sources.
2. Have a broad understanding of scientific principles that underpin the operation of such systems.
3. Acquire knowledge on different types of energy storage systems.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Know about the need of non-conventional energy |
|---|---|---|
| | CO2 | Gain knowledge on solar and wind energy |
| K1 to K5 | CO3 | Acquire knowledge on Biomass, Wave, Tidal and Geothermal energy |
| | CO4 | Understand MHD, Thermal and Hydrogen energy |
| | CO5 | Acquire knowledge on different energy storage systems |

## Syllabus

**UNIT I** **6 hrs**

**Need of Non-conventional energy Sources**

Energy Resources- Global warming and ocean acidifications- Classifications- Energy Parameters- Non-conventional sources- Significance- Merits and Demerits- Environmental Aspects- Energy Chain.

**UNIT II** **6 hrs**

**Solar and Wind Energy**

Solar radiation measurements- Solar Collectors- Flat plate type- Concentrating collectors- Applications of Solar Energy- Solar water heater- Solar Cell- Solar distillation- Solar pump - Wind energy conversion system.

**UNIT III** **6 hrs**

**Biomass, Wave, Tidal and Geothermal energy**

Biomass energy generation- Wave energy generation and conversion devices- Advantages and Limitations of wave energy- Tidal power generation systems- Advantages and Limitations of tidal energy- Geothermal energy- Origin and Nature- Energy extraction- Advantages and Limitations of geothermal energy.

**UNIT IV** **6 hrs**

**MHD, Thermal and Hydrogen energy**

Magnetohydrodynamics (MHD) generation - Thermionic convertor - Thermoelectric power - Thermonuclear fusion energy - Hydrogen energy - Solar hydrogen.

# UPH

**UNIT V**                                                                                               **6 hrs**

**Energy Storage Systems**

Electrical storage- Batteries- Supercapacitor- Mechanical storage- Compressed air storage- Flywheel-
Chemical storage- Energy storage via Hydrogen- Ammonia- Reversible chemical reaction- Thermal
energy storage- Sensible heat storage- Latent heat storage.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped
Class / Peer Learning / Experiential Learning / Blended Learning

**Text Books:**

1. G.D. Rai, (1998), Non-conventional Energy Sources, Khanna Publishers, New Delhi.
2. Tasneem Abbasi, S.A. Abbasi, (2010), Renewable Energy Sources: Their impact on global
   warming and pollution - PHI Learning, India.

**Reference Books:**

1. D.P. Kothari, K.C. Singal, Rakesh Ranjan, (2018), Renewable energy sources and technologies -
   PHI Learning, New Delhi.
2. Godfrey Boyle, (2010), Renewable energy: Power for a Sustainable future - Oxford University
   Press, UK.
3. John Andrews, Nick Jelley, (2007), Energy Science: Principles, Technologies and Impacts -
   Oxford University Press, UK.

## Mapping

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1     | S     | S     | H     | S     | H     |
| CO 2     | H     | H     | S     | S     | S     |
| CO 3     | S     | S     | H     | H     | H     |
| CO 4     | H     | S     | S     | H     | S     |
| CO 5     | S     | H     | S     | H     | H     |

**S- Strong**                **H-High**                **M-Medium**                **L - Low**

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| Title of the Paper | | Energy Management and Auditing | | | |
| Batch 2024-2025 | Semester Odd | Hours/Week 2 | Total Hours 30 | Credits 2 | Employability |

## Course Objectives

To enable the learners to

1. Understand the concepts and features of energy conservation.
2. Gain knowledge on energy management techniques.
3. Acquire knowledge on energy audit.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Understand the concept of energy conservation. |
|---|---|---|
| | CO2 | Know about energy management techniques. |
| K1 to K5 | CO3 | Gain knowledge on methodologies of energy audit. |
| | CO4 | Acquire knowledge on material and energy balance. |
| | CO5 | Understand the duties and responsibilities of energy manager and energy auditors. |

## Syllabus

### UNIT I                                                                                                      6 hrs
**Energy conservation**

Introduction- Salient features- Opportunities- Energy conservation in households- Transport sector- Agricultural sector- Industrial sector- Lighting- Energy saving opportunities.

### UNIT II                                                                                                    6 hrs
**Energy management**

Concept of Energy management– Techniques- Tariff- Objectives- Characteristics- Types: Simple- Flat rate- Block rate- Two part- Maximum demand- Power factor- Three part.

### UNIT III                                                                                                  6 hrs
**Energy Audit**

Concept of Energy Audit- Type- Methodology: Preliminary and Detailed- Procedure for conducting Energy Audit- Preparation- Execution- Reporting- Collecting data strategy- Technical and Economic feasibility.

### UNIT IV                                                                                                   6 hrs
**Material and Energy Balance**

Components of material and energy balance- Basics principles- Classification of Processes- Procedures of Material and Energy balance- Facility as an Energy system-Energy analysis- Sankey Diagram.

# UPH

**UNIT V**                                                                                                      **6 hrs**
   **Energy Managers and Auditors**
   Energy Conservation Act- Characteristics- Energy Managers: Duties- Responsibilities- Energy Auditors: Duties- Responsibilities- Energy Audit instruments- Energy audit applied to Buildings- Computer software and Formats for Energy Audits.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Study Books:**
1. Anil Kumar, Om Prakash, Prashanth Singh Chauhan, Samsher, (2020), Energy Management, Conservation and Audits- CRC Press, Florida.
2. Albert Thumann, Terry Niehus, William J. Younger, (2013), Handbook of Energy Audits, The Fairmont Press Inc., Georgia.

**Reference Books:**
1. General Aspects of Energy management and Energy Audit (2015), Bureau of Energy Efficiency, New Delhi.
2. Sonal Desai, (2015), Handbook of Energy Audits- Mc Graw Hill, India.

## Mapping

| CO    PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|-----------|-------|-------|-------|-------|-------|
| CO 1      | S     | S     | H     | S     | H     |
| CO 2      | H     | H     | S     | S     | S     |
| CO 3      | S     | S     | H     | H     | H     |
| CO 4      | H     | S     | S     | H     | S     |
| CO 5      | S     | H     | S     | S     | H     |

**S- Strong**                    **H-High**                    **M-Medium**                    **L - Low**

**Certificate course on Electronic Instrumentation**
Scheme of Curriculum
Duration: 6 months

| Sub. Code | Subject | Instr. Hours /week | Internal | External | Max marks | Exam. Hrs. | Credits |
|-----------|---------|--------------------|----------|----------|-----------|------------|---------|
| 24CEI101 | **Theory 1** Basic Electronic Instrumentation | 2 | 25 | 75 | 100 | 3 | 2 |
| 24CEI102 | **Theory 2** Modern Electronic Instrumentation | 2 | 25 | 75 | 100 | 3 | 2 |
| 24CEI1Z1 | **Project and Viva voce** | - | 20 | 80 | 100 | 3 | 2 |
| **Total marks** | | | | | **300** | | **6** |

**Question Paper Pattern**

**Theory Examination:**                                                        **External Max.Marks: 75**

Section - A (10× 1 = 10 Marks)
Multiple Choice (2 Questions from Each Unit)

Section -B (5 × 5 =  25 Marks)
Either or type  (1 Question from Each Unit)

Section - C (5 × 8 = 40 Marks)
Either or type  (1 Question from Each Unit)

**Project and viva voce:**                                   **External Max.Marks: 80**
Project Report Presentation            : 60 Marks
Viva voce                                       : 20 Marks

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Basic Electronic Instrumentation** | | | |
| **Batch 2024-2025** | **Semester Even** | **Hours/Week 2** | **Total Hours 30** | **Credits 2** | **Employability** |

## Course Objectives

To enable the learners to
1. Understand the basic concepts of measurement and error analysis.
2. Get exposure to the knowledge on transducers and basic meters.
3. Understand the working of regulated power supply.

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | CO1 | Understand the concept of analog and digital measurement techniques |
|---|---|---|
| | CO2 | Gain knowledge on accuracy of measurements and their error analysis |
| **K1 to K5** | CO3 | Acquire knowledge on different type of transducers |
| | CO4 | Acquire knowledge on different type of meters |
| | CO5 | Understand the working of regulated power supply |

## Syllabus

### UNIT-I                                                                     6 hrs
**Measurements**

Measurements-methods of measurement: Direct methods – indirect methods - Classification of instruments: absolute & secondary instruments - Analog and digital modes of operations-Static characteristics of the measurement: Ture value- static error – static correction– Scale range and scale span – Repeatability – Noise.

### UNIT-II                                                                     6 hrs
**Error Analysis**

Accuracy and precision – indication of precision – signification figures - Linearity – Hysteresis – Threshold – Dead time - Dead Zone – Resolution - Loading effects: Loading effect due to shunt connected instruments and series connected instruments – Impedance matching and maximum power transfer theorem.

### UNIT-III                                                                     6 hrs
**Transducers**

Classification of transducers – classification based on electrical principle involved – Resistive position transducer – Resistive pressure transducer – self generating inductive transducer - Piezoelectric transducer – Strain gauge transducer.

### UNIT-IV                                                                     6 hrs
**Meters**

Basic meter movement (BMM) – characteristics of BMM – Conversion of BMM into a DC single range ammeter – multirange ammeter – DC single range voltmeter – multirange voltmeter – ohmmeter – Rectifier type of AC meters- Watt meters: Electrodynamic wattmeter – Induction wattmeter - Energy meter: Single phase induction type energy meter.

# UPH

**Sub. Code : 24CEI101**

**UNIT-V**                                                                                                        **6 hrs**

**Regulated Power Supply**

Filter Circuits: Low pass filter - High pass filter – Band pass filter - Half wave and Full wave bridge rectifier – efficiency - Zener diode: Shunt regulator - Transistor: Series & Shunt regulator - Switched mode power supply (SMPS).

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz /Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Book for Study:**
1. A.K.Sawhaney, (2005), A course in Electrical and Electronic Instruments and Instrumentation – Dhanpat Rai & Co Pvt. Ltd, New Delhi.
2. B.L.Theraja, (2019), Basic Electronics – Solid state – S.Chand & Co., New Delhi.

**Books for Reference:**
1. R.S.Sedha, (2019), A Text Book of Applied Electronics - S.Chand & Co., New Delhi.
2. Rajendra Prasad, (2012), Electrical Measurement and Measuring Instruments – Khanna Publishers, New Delhi.

## Mapping

| CO   PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|----------|-------|-------|-------|-------|-------|
| CO 1     | S     | H     | S     | H     | H     |
| CO 2     | H     | S     | H     | S     | S     |
| CO 3     | S     | S     | H     | H     | S     |
| CO 4     | H     | H     | S     | S     | S     |
| CO 5     | S     | H     | S     | H     | H     |

**S- Strong**                    **H-High**                    **M-Medium**                    **L – Low**

# UPH

| Programme Code: 03 | | B.Sc. Physics | | | |
|---|---|---|---|---|---|
| **Title of the Paper** | | **Modern Electronic Instrumentation** | | | |
| **Batch 2024-2025** | **Semester Even** | **Hours/Week 2** | **Total Hours 30** | **Credits 2** | **Employability** |

## Course Objectives

 To enable the learners to

1. Understand different types of display techniques.
2. Acquire knowledge on waveform generators and household wiring
3. Understand the function of Ardrino platform and Internet of Things

## Course Outcomes (CO)

On successful completion of the course, the students will be able to

| | **CO1** | Understand the different types of display techniques |
|---|---|---|
| | **CO2** | Gain knowledge on wave form generators |
| **K1 to K5** | **CO3** | Get exposure to modern house hold wiring techniques |
| | **CO4** | Acquire knowledge on Arduino software interface |
| | **CO5** | Understand the concept of Internet of Things |

## Syllabus

**UNIT-I**                                                                                                    **6 hrs**

 **Displays**

Cathode ray tube (CRT) – Color theory - Pixel information – Resolution – Refresh rate – Active and Passive addressing - Plasma display panels (PDP) - Liquid crystal display (LCD) - Light emitting diodes display (LED) - Quantum Dot LED – Flexible display.

**UNIT-II**                                                                                                  **6 hrs**

 **Signal Generator and counter**

Sine wave generator - Square wave generator - Triangle wave generator - Sawtooth wave generator – Astable and Monostable multivibrator – Frequency counter – Analog and digital oscilloscope – Digital storage Oscilloscope.

**UNIT-III**                                                                                                 **6 hrs**

 **Household Wirings**

House hold wiring – Circuit diagram – Short circuit protection – Current consumption of household appliances – Power calculation – power distribution – AC load – DC load : DC fan - LED lighting - Advantages and limitations of DC load.

**UNIT-IV**                                                                                                  **6 hrs**

 **Arduino**

Arduino interfaces – Different models of Arduino kit - Display devices - Timer display - IR Sensor - Motion sensor – Hall sensor - Humidity sensor - DC motor control - Brushless DC motor control - Temperature                                                                                                 sensor.

**UNIT-V**                                                                                      **6 hrs**

**Internet of Things**

Control of wireless relay communication through internet – Tracking of movable objects: Global Positioning System (GPS) - Navigation with Indian Constellation (NavIC) - Internet through cellular communication: Global System for Mobile (GSM) – Code division multiple access (CDMA) – Drones.

**Teaching Methods:** Smart Class Room / Power point presentation / Seminar / Quiz / Discussion / Flipped Class / Peer Learning / Experiential Learning / Blended Learning

**Book for Study:**
1.  Janglin Chen, Wayne Cranton, Mark Fihn, (2016), Handbook of Display Technology - Springer International Publishing
    2.      R. M. Marston, (1997), 110 Waveform Generator Projects for the Home Constructor - Butterworth-Heinemann.
3.  K. C. Agrawal, (2020), Electrical Power Engineering - Elsevier Science.
4.  Neerparaj Rai, (2019), Arduino Projects for Engineers - BPB Publications, New Delhi.
5.  Cuno Pfister, (2011), Getting Started with the Internet of Things - Maker Media.

**Books for Reference:**
1.  https://create.arduino.cc/projecthub
2.  https://engineering.case.edu/lab/circuitslab/sites/engineering.case.edu.lab.circuitsl ab/files/docs/S ignal_Generator_Fundamentals-_Tektronix.pdf
3.  Rajkumar Buyya, Amir Vahid Dastjerdi, (2016), Internet of Things: Principles and Paradigms -Morgan Kaufmann Press.

**Mapping**

| CO     PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO 5 |
|:---:|:---:|:---:|:---:|:---:|:---:|
| CO 1 | S | H | S | H | H |
| CO 2 | H | S | H | S | S |
| CO 3 | S | S | H | H | S |
| CO 4 | H | H | S | S | S |
| CO 5 | S | H | S | H | H |

**S- Strong**                    **H-High**                    **M-Medium**                    **L – Low**

\*\*\*\*\*\*