



# **K.M.G. COLLEGE OF ARTS AND SCIENCE** **(AUTONOMOUS)**

Approved by the Government of Tamil Nadu  
Permanently Affiliated to Thiruvalluvar University, Vellore.  
Recognized under Section 2(f) and 12(B) of the UGC Act 1956  
Accredited by NAAC (2<sup>nd</sup> Cycle) with (CGPA of 3.24/4) 'A' Grade

## **DEPARTMENT OF PHYSICS** **ELECTIVE - PHYSICS**

### **SYLLABUS FOR III SEMESTER** **(CHOICE BASED CREDIT SYSTEM)**

**Under**

### **LEARNING OUTCOMES-BASED CURRICULUM** **FRAMEWORK (LOCF)**

**(Effective for the Batch of Students Admitted from 2024-2025)**

## COURSE DESCRIPTORS

|                            |                           |                            |          |
|----------------------------|---------------------------|----------------------------|----------|
| <b>Title of the Course</b> | <b>ALLIED PHYSICS – I</b> | <b>Hours/Week</b>          | 03       |
| <b>Course Code</b>         | AUEPH33                   | <b>Credits</b>             | 03       |
| <b>Category</b>            | ELECTIVE COURSE - III     | <b>Year &amp; Semester</b> | II & III |
| <b>Prerequisites</b>       | Higher secondary Physics  | <b>Regulation</b>          | 2024     |

### Objectives of the course:

- To impart basic principles of Physics that which would be helpful for students who have taken programmes other than Physics.

| UNITS           | Contents   | COs | Cognitive Levels |
|-----------------|--|-----|------------------|
| <b>UNIT-I</b>   | <b>WAVES, OSCILLATIONS AND ULTRASONICS:</b> Definition of simple harmonic motion (SHM) – laws of transverse vibrations of strings – determination of AC frequency using sonometer (steel and brass wires) – ultrasound – production – piezoelectric method – application of ultrasonic's: medical field – ultrasonography-NDT  | CO1 | K1<br>K2<br>K3   |
| <b>UNIT-II</b>  | <b>PROPERTIES OF MATTER:</b> Elasticity: elastic constants – bending of beam – theory of non- uniform bending – determination of Young's modulus by non-uniform bending – determination of rigidity modulus by torsional pendulum Viscosity: streamline and turbulent motion – critical velocity – coefficient of viscosity – Poiseuille's formula – comparison of viscosities – burette method, Surface tension: definition– drop weight method – surface tension and interfacial surface tension | CO2 | K1<br>K2<br>K3   |
| <b>UNIT-III</b> | <b>HEAT AND THERMODYNAMICS:</b> Joule-Kelvin effect – Joule Thomson porous plug experiment – theory – temperature of inversion –Linde's process of liquefaction of air– liquid Oxygen for medical purpose– importance of cry coolers– entropy – change of entropy in reversible and irreversible process   | CO3 | K1<br>K2<br>K3   |

|                |  |     |                |
|----------------|--|-----|----------------|
| <b>UNIT-IV</b> | ELECTRICITY AND MAGNETISM: potentiometer – principle – measurement of thermo emf using potentiometer –magnetic field due to a current carrying conductor – Biot-Savart’s law – field along the axis of the coil carrying current – peak, average and RMS values of ac current and voltage. | CO4 | K1<br>K2<br>K3 |
| <b>UNIT-V</b>  | DIGITAL ELECTRONICS AND DIGITAL INDIA: Semiconductor: Pure, N and P type semiconductor, PN junction diodes, Logic gates, OR, AND, NOT, NAND, NOR , EXOR logic gates – universal building blocks – Boolean algebra – De Morgan’s theorem – verification .                                   | CO5 | K1<br>K2<br>K3 |

**Recommended Text Books**

1. R.Murugesan (2001), Allied Physics ,S. Chand and Co, NewDelhi.
2. Brijlal and N.Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi
- 3.Brijlal and N.Subramaniam (1994), Properties of Matter, S.Chand and Co., New Delhi.
4. J.B.Rajam and C.L.Arora (1976). Heat and Thermodynamics (8th edition), S.Chand and Co., New Delhi.
5. R.Murugesan (2005), Optics and Spectroscopy, S.Chand and Co, New Delhi.
6. A.Subramaniyam, Applied Electronics 2<sup>nd</sup> Edn., National Publishing Co., Chennai.

**Reference Books**

- 1.Resnick Halliday and Walker(2018).Fundamentals of Physics(11the Edition),John Willey and Sons, Asia Pvt.Ltd., Singapore.
2. V.R.Khanna and R.S.Bedi (1998), Text book of Sound1st Edn. Kedharnaath Publish and Co, Meerut.
3. N.S.Khare and S.S.Srivastava (1983), Electricity and Magnetism10thEdn.,AtmaRam and Sons, New Delhi.
4. D.R.Khanna and H.R. Gulati(1979). Optics,S. Chand and Co.Ltd., New Delhi.
5. V.K.Metha(2004).Principlesofelectronics6thEdn. S.Chandandcompany
6. V. Vijayendran, Introduction to Integrated Electronics, Viswanathan Printers & Publisher Pvt. Ltd.

**Web Resources**

1. [https://youtu.be/M\\_5KYncYNyc](https://youtu.be/M_5KYncYNyc)
2. <https://youtu.be/ljJLJgIvaHY>
3. [https://youtu.be/7mGqd9HQ\\_AU](https://youtu.be/7mGqd9HQ_AU)

**Course Learning Outcomes (for Mapping with POs and PSOs)**

On completion of the course the students should be able to

| COs | CO Description  | Cognitive Level |
|-----|---|-----------------|
| CO1 | Demonstrate mathematically types of motion and extend their knowledge in the study of various dynamic motions.  | K1,K2,K3        |
| CO2 | Explain about materials and their behaviors and apply it to various situations in laboratory and real life.   | K1,K2,K3        |
| CO3 | Comprehend basic concept of thermodynamics, concept of entropy and associated theorems in the back ground of growth of this technology.   | K1,K2,K3        |
| CO4 | Articulate the knowledge about electric current resistance, capacitance in terms of potential electric field and electric correlate the connection between electric field and magnetic field. | K1,K2,K3        |
| CO5 | Interpret the real life solutions using AND, OR, NOT basic logic gates and in tend their ideas to universal building blocks .   | K1,K2,K3,       |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2   | 3   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 3    | 2    | 1    |
| CO2 | 3   | 2   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 3    | 2    | 1    |
| CO3 | 3   | 2   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 3    | 2    | 1    |
| CO4 | 3   | 3   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 3    | 2    | 1    |
| CO5 | 3   | 2   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 3    | 2    | 1    |

## COURSE DESCRIPTORS

|                            |                           |                            |         |
|----------------------------|---------------------------|----------------------------|---------|
| <b>Title of the Course</b> | <b>PHYSICS PRACTICALS</b> | <b>Hours/Week</b>          | 02      |
| <b>Course Code</b>         | AUEPPH43                  | <b>Credits</b>             | 01      |
| <b>Category</b>            | ELECTIVE COURSE -II       | <b>Year &amp; Semester</b> | II & IV |
| <b>Prerequisites</b>       | Higher secondary Physics  | <b>Regulation</b>          | 2024    |

### Objectives of the course:

- Apply various Physics concepts to understand concepts of Light, electricity and magnetism and waves, set up experimentation to verify theories, quantify and analyze.
- Able to do error analysis and correlate results.

| UNITS | Contents   | COs | Cognitive Levels    |
|-------|--|-----|---------------------|
|       | 1.Young’s modulus by non-uniform bending using pin and microscope    |     |                     |
|       | 2.Rigidity modulus by torsional oscillations without mass            |     |                     |
|       | 3.Surface tension and interfacial Surface tension–drop weight method | CO1 |                     |
|       | 4.Comparison of viscosities of two liquids–burette method            |     |                     |
|       | 5.Verification of laws of transverse vibrations using sonometer      | CO2 |                     |
|       | 6.Calibration of low range voltmeter using potentiometer             | CO3 |                     |
|       | 7. Determination of thermo emf using potentiometer.                  |     | K1,K2,<br>K3,K4, K5 |
|       | 8.Wavelength of mercury lines using spectrometer and grating         | CO4 |                     |
|       | 9.Refractive index of material of the lens by minimum deviation      |     |                     |
|       | 10.Characterisation of Zener diode                                   | CO5 |                     |
|       | 11. Construction of AND,OR,NOT gates using diodes and transistor     |     |                     |
|       | 12. NAND & NOR gates as a universal building block.                  |     |                     |

**Recommended Text Books**

1. R.Murugesan (2001), *Allied Physics*, S. Chand and Co, NewDelhi.
2. Brijlal and N.Subramanyam (1994), *Waves and Oscillations*, Vikas Publishing House, New Delhi
3. Brijlal and N.Subramaniam (1994), *Properties of Matter*, S.Chand and Co., New Delhi.
4. J.B.Rajam and C.L.Arora (1976). *Heat and Thermodynamics (8th edition)*, S.Chand and Co.,New Delhi.
5. R.Murugesan (2005), *Optics and Spectroscopy*, S.Chand and Co, New Delhi.
6. A.Subramaniyam, *Applied Electronics 2<sup>nd</sup> Edn.*, National Publishing Co., Chennai.
7. B.L Theraja, *Applied Electronics* S.Chand and Co, 2003.

**Course Learning Outcomes (for Mapping with POs and PSOs)**

On completion of the course the students should be able to

| COs | CO Description   | Cognitive Level |
|-----|--|-----------------|
| CO1 | Determine the material of the beam by young modulus method       | K1,K2,K3        |
| CO2 | Find the rigidity modulus using torsional pendulum without mass. | K1,K2,K3        |
| CO3 | Verify the frequency of a.c (steel wire) using sonometer.        | K1,K2,K3        |
| CO4 | Calculate internal resistance of a cell using potentiometer.     | K1,K2,K3        |
| CO5 | Verify the truth table and Boolean algebra using logic gates.    | K1,K2,K3,       |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2   | 3   | 1   | 3   | -   | -   | -   | -   | -   | 1    | 3    | 2    | 1    |
| CO2 | 3   | 2   | 1   | 3   | -   | -   | -   | -   | -   | 2    | 3    | 2    | 1    |
| CO3 | 3   | 2   | 1   | 3   | -   | -   | -   | -   | -   | 1    | 3    | 2    | 2    |
| CO4 | 3   | 3   | 1   | 3   | -   | -   | -   | -   | -   | 1    | 3    | 2    | 1    |
| CO5 | 3   | 2   | 1   | 3   | -   | -   | -   | -   | -   | 1    | 3    | 2    | 2    |

## COURSE DESCRIPTORS

|                            |                          |                           |         |
|----------------------------|--------------------------|---------------------------|---------|
| <b>Title of the Course</b> | <b>PHYSICS–II</b>        | <b>Hours/Week</b>         | 02      |
| <b>Course Code</b>         | AUEPH43                  | <b>Credits</b>            | 02      |
| <b>Category</b>            | ELECTIVE COURSE-II       | <b>Year&amp; Semester</b> | II & IV |
| <b>Prerequisites</b>       | Higher secondary Physics | <b>Regulation</b>         | 2024    |

**Objectives of the course:**

- To understand the basic concepts of optics, modern Physics, Concepts of relativity and quantum physics, semiconductor physics and electronics.

| UNITS    | Contents   | COs | Cognitive Levels |
|----------|--|-----|------------------|
| UNIT-I   | <b>OPTICS:</b> Definition of interference–air wedge–determination of diameter of at hinwire by air wedge–diffraction–diffraction of Lights sound–normal incidence – experimental determination of Wavelength using diffraction grating (no theory)–polarization–polarization by double refraction – Brewster’s law.  | CO1 | K1<br>K2<br>K3   |
| UNIT-II  | <b>ATOMIC PHYSICS:</b> Mass number–atomic number–nucleons–vector atom model–various quantum numbers–Pauli’s exclusion principle–electronic configuration– periodic classification of elements–photoelectric effect–Einstein’s photoelectric equation–applications of photoelectric effect: solar cells, LED, photodiode.   | CO2 | K1<br>K2<br>K3   |
| UNIT-III | <b>NUCLEAR PHYSICS:</b> Magic numbers–shell model – nuclear energy –mass defect – binding energy – radio activity–uses–half life–mean life–radio isotopes and uses–controlled and uncontrolled chain reaction–nuclear fission–energy release dinfission–critical size – atom bomb–nuclear fusion–thermonuclear reactions–differences between fission and fusion. | CO3 | K1<br>K2         |
| UNIT-IV  | <b>INTRODUCTION TO RELATIVITY AND GRAVITATIONAL WAVES:</b> frame of reference – postulates of Special theory of relativity–Galilean transformation equations–Lorentz trans formation equations–derivation–length contraction–Time dilation –twin paradox–mass-energy equivalence.  | CO4 | K1 K2<br>K3 K4   |
| UNIT-V   | <b>SEMICONDUCTOR PHYSICS:</b> p-n junction diode Forward and reverse biasing–characteristic of diode–zener diode–Characteristic of zener diode–voltage regulator–full wave bridge rectifier–construction and working–advantages(no mathematical treatment)–USB cell phone charger–introduction to e-vehicles and EV charging stations.                           | CO5 | K1<br>K2<br>K3   |

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1. R. Murugesan (2001), Allied Physics, S.Chandand Co, New Delhi.
2. Brijlaland N. Subramanyam (1994), Waves and Oscillations, Vikas Publishing House, New Delhi
3. Brijlaland N. Subramaniam (1994), Properties of Matter, S. Chand and Co., New Delhi.
4. J. B. Rajam and C.L. Arora (1976). Heat and Thermodynamics (8<sup>th</sup> edition), S.Chandand Co., New Delhi.
5. R. Murugesan (2005), Optics and Spectroscopy, S. Chand and Co, New Delhi.
6. A. Subramaniam, Applied Electronics 2<sup>nd</sup> Edn., National Publishing Co., Chennai.

**Reference Books**

1. Resnick Halliday and Walker(2018), Fundamentals of Physics, 11<sup>th</sup> Edn., John Willey and Sons, Asia Pvt. Ltd., Singapore.
2. D.R. Khannaand H.R.Gulati (1979). Optics, S.Chandand Co.Ltd., New Delhi.
3. A. Beiser (1997), Concepts of Modern Physics, Tata McGrawHill Publication, New Delhi.
4. Thomas L.Floyd (2017), Digital Fundamentals, 11<sup>th</sup> Edn., Universal Book Stall, New Delhi.
5. V.K. Metha (2004), Principles of electronics, 6<sup>th</sup> Edn., S. Chandand Company, New Delhi.

**Web Resources**

1. [https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=OrhxU47gtj4https://www.youtube.com/watch?time\\_continue=318&v=D38BjgUdL5U&feature=emb\\_logo](https://www.berkshire.com/learning-center/delta-p-facemask/https://www.youtube.com/watch?v=OrhxU47gtj4https://www.youtube.com/watch?time_continue=318&v=D38BjgUdL5U&feature=emb_logo)
2. <https://www.youtube.com/watch?v=JrRrp5F-Ou4>
3. <https://www.validyne.com/blog/leak-test-using-pressure-transducers/>
4. <https://www.atoptics.co.uk/atoptics/blsky.htm>
5. <https://www.metoffice.gov.uk/weather/learn-about/weather/optical-effects>

**Course Learning Outcomes (for Mapping with POs and PSOs)**

On completion of the course the students should be able to

| COs | CO Description   | Cognitive Level |
|-----|--|-----------------|
| CO1 | Explain the concepts of interference diffraction using principles of super position of waves   | K1,K2,K3        |
| CO2 | Outline the basic foundation of different atom models and various experiments establishing quantum concepts.   | K1,K2,K3        |
| CO3 | Understand the importance of nuclear energy, safety measure scarried and get our Govt. agencies like DAE guiding the country in the nuclear field.                         | K1,K2           |
| CO4 | Describe the basic concepts of relativity like equivalence principle, inertial frames and Lorentz transformation   | K1,K2, K3, K4   |
| CO5 | Summarize the working of semiconductor devices like junction diode, Zenerdiode, transistors and practical devices we daily use like USB chargers and EV charging stations. | K1,K2,K3,       |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 | PSO3 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2   | 3   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 3    | 2    | 1    |
| CO2 | 3   | 2   | 1   | 3   | 1   | 2   | 1   | -   | -   | 1    | 1    | 2    | -    |
| CO3 | 3   | 2   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 2    | 2    | -    |
| CO4 | 3   | 3   | 1   | 3   | 1   | 2   | 1   | -   | -   | 1    | 3    | -    | 1    |
| CO5 | 3   | 2   | 1   | 3   | 1   | 1   | 1   | -   | -   | 1    | 3    | 2    | 1    |