## Sacred Heart College (Autonomous), Tirupattur District

## 1.2.1 List of New Courses

## Department: B.Sc. Physics

# B. Sc Physics

| Sem | Paper | Title of the Paper | Hours/ Week | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | | | | CA | Sem |
| I | Main Core | Mechanics | 3 | 3 | 50 | 50 |
| | Main Core | Properties of matter | 3 | 3 | 50 | 50 |
| | Main Core Practicals | Physics Main Practicals – I | 4 | 4 | 50 | 50 |
| | Allied | Allied Mathematics – I | 6 | 5 | 50 | 50 |
| | Language | Tamil | 5 | 3 | 50 | 50 |
| | Language | General English | 5 | 3 | 50 | 50 |
| | | Communicative English | - | 1 | 50 | 50 |
| | Life Education | Personal Skills | 2 | 1 | 50 | 50 |
| | | Christian Religion–1 / Value Education-1 | 2 | 1 | 50 | 50 |
| TOTAL | | | 30 | 24 | | |

| Sem | Paper | Title of the Paper | Hours/ Week | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | | | | CA | Sem |
| II | Main Core | Heat and Thermodynamics | 3 | 3 | 50 | 50 |
| | Main Core | Waves and Oscillations | 3 | 3 | 50 | 50 |
| | Main Core Practicals | Physics Main Practicals – I | 4 | 4 | 50 | 50 |
| | Allied | Allied Mathematics – II | 6 | 5 | 50 | 50 |
| | Language | Tamil | 5 | 3 | 50 | 50 |
| | Language | General English | 5 | 3 | 50 | 50 |
| | | Communicative English | | 1 | 50 | 50 |
| | Life Education | Social Skills | 2 | 1 | 50 | 50 |
| | | Christian Religion-2/Value Education-2 | 2 | 1 | 50 | 50 |
| TOTAL | | | 30 | 24 | | |

| Sem | Paper | Title of the Paper | Hours/ Week | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | | | | CA | Sem |
| III | Main Core | Electricity and Magnetism | 3 | 3 | 50 | 50 |
| | Main Core | Optics | 3 | 3 | 50 | 50 |
| | Main Core Practicals | Physics Main Practicals – II | 4 | 4 | 50 | 50 |
| | Allied | Allied Chemistry –I | 4 | 3 | 50 | 50 |
| | Alied | Allied Chemistry Lab work | 2 | 1 | 50 | 50 |
| | Language | Tamil | 5 | 3 | 50 | 50 |
| | Language | General English | 5 | 3 | 50 | 50 |
| | Life Education | Employability Skills –1 | 2 | 1 | 50 | 50 |
| | | Environmental Science | 2 | 1 | 50 | 50 |
| | Extra credit Course | 1.Special Project- I<br>2.NPTEL online courses | - | 2# | 100 | |
| TOTAL | | | 30 | 22+2# | | |

| Sem | Paper | Title of the Paper | Hours/ Week | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | | | | CA | Sem |
| IV | Main Core | Modern Physics | 3 | 3 | 50 | 50 |
| | Main Core | Electromagnetism | 3 | 3 | 50 | 50 |
| | Main Core Practicals | Physics Main Practicals – II | 4 | 4 | 50 | 50 |
| | Allied | Allied Chemistry –II | 4 | 3 | 50 | 50 |
| | Alied | Allied Chemistry Lab work | 2 | 1 | 50 | 50 |
| | Language | Tamil | 5 | 3 | 50 | 50 |
| | Language | General English | 5 | 3 | 50 | 50 |
| | Life Education | Employability Skills –2 | 2 | 1 | 50 | 50 |
| | | Human Rights | 2 | 1 | 50 | 50 |
| | Extra Credit Course | 1. Special Project II (Repair and Maintenance of Lab Equipments)<br>2. Internship | - | 2# | 100 | |
| | Extension | Outreach program | - | 2 | | |
| | | SHELTERS | - | 2 | | |
| **TOTAL** | | | 30 | 26+2# | | |

| Sem | Paper | Title of the Paper | Hours/ Week | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | | | | CA | Sem |
| V | Main Core | Classical mechanics and Statistical Physics | 4 | 4 | 50 | 50 |
| | Main Core | Semiconductor devices and their Applications | 4 | 4 | 50 | 50 |
| | Main Core | Solid State Physics | 4 | 4 | 50 | 50 |
| | Main Core | Mathematical Physics | 4 | 4 | 50 | 50 |
| | Main Core | Physics Main Practicals – III(General experiments) | 3 | 3 | 50 | 50 |
| | Main Core | Physics Main Practicals – IV(Electronic experiments) | 3 | 3 | 50 | 50 |
| | Subject Elective | 1. Nanomaterials and their applications<br>2. Electronic communication systems<br>3. Renewable Energy and Energy Harvesting | 3 | 2 | 50 | 50 |
| | Subject Elective | 1. Programming in C<br>2. 8085 Microprocessor and its applications<br>3. Medical Physics | 3 | 2 | 50 | 50 |
| | Self-Study Paper | 1. 1. Astrophysics<br>2. 2. Laser Physics and Fiber Optics | – | 1* | 100 | |
| | Non-Major Elective | Offered by other departments | 2 | 1 | 100 | |
| TOTAL | | | 30 | 27+1* | | |

| Sem | Paper | Title of the Paper | Hours/ Week | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | | | | CA | Sem |
| VI | Main Core | Applied Electronics | 5 | 5 | 50 | 50 |
| | Main Core | Nuclear and Particle Physics | 5 | 5 | 50 | 50 |
| | Main Core | Quantum Mechanics and Relativity | 4 | 4 | 50 | 50 |
| | Main Core | Physics Main Practical – III (General experiments) | 2 | 2 | 50 | 50 |
| | Main Core | Physics Main Practicals – IV (Electronic experiments) | 2 | 2 | 50 | 50 |
| | Subject skill | Electrical circuits and Networks | 5 | 4 | 50 | 50 |
| | Subject skill | Basic Instrumentation | 5 | 4 | 50 | 50 |
| | Self-Study Paper | Physics Revisited | – | 1* | 100 | |
| | Non-Major Elective | Offered by other departments | 2 | 1 | 100 | |
| Total | | | 30 | 27+1* | | |

# Sacred Heart College (Autonomous), Tirupattur District

## 1.2.1 List of New Courses

## Department: B.Sc. Physics

| S.No | Course Code | Course Name |
|---|---|---|
| 1. | P312 | Electricity and Magnetism |
| 2. | P313 | Optics |
| 3. | P414 | Modern Physics |
| 4. | P415 | Electromagnetism |
| 5. | AP309A | Allied Physics for Chemistry I |
| 6. | AP409A | Allied Physics for Chemistry II |
| 7. | PAP409A | Allied Physics Practicals for Chemistry |
| 8. | AP409B | Allied Physics for Computer Science II |

# Semester: III

## Electricity and Magnetism

**Semester: III** **Hours / Week: 3**

**Course code: P 312** **Credits: 3**

**Objectives**

- To introduce to the students the basic concepts of Electrostatics
- To make the students understand concepts on working and applications of capacitors and electrometers
- To explain the principle and working of Potentiometer and Carey Foster's Bridge. Also to understand the working of LCR and resonance circuits.
- To provide an overview of the fundamental principles of Coulomb's law, Biot-Savart law and magnetostatics.
- To make the students understand the various types of magnetism.

**Learning outcomes**

| Sl. No. | Course outcomes<br>On successful completion of course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | Explain and differentiate between electric field and electric potential and also illustrate the coulomb's law and its applications | K2, K3,K4 |
| CO2 | Understand the functions and the basic principles of capacitors and electrometers. | K2, K1 |
| CO3 | Explain the working principle of Carey-Foster bridge and Potentiometer and apply their knowledge to set up experiments in the laboratory. | K2, K3,K5 |
| CO4 | State and explain various laws of magnetostatics and illustrate their applications. | K1, K2, K3 |
| CO5 | Compare the properties of Dia, Para and Ferro magnetic materials and identify the form of magnetism possessed by a material | K6, K2 |

**Mapping of CO with PO and PSO**

| CO | Programme Outcomes (PO) | | | | | | | Programme Specific Outcomes (PSO) | | | | | Mean Scores of COs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2.3 |
| CO2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2.1 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2.3 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2.2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2.3 |
| | | | | | | | | | | | | **Mean Overall Score** | **2.2** |
| | | | | | | | | | | | | **Result** | **HIGH** |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 15 | 15 | 30 |
| Understand | 15 | 15 | 40 |
| Apply | 5 | 5 | 10 |
| Analyze | 5 | 5 | 10 |
| Evaluate | 5 | 5 | 5 |
| Create | 5 | 5 | 5 |

**Unit I: Electrostatics**

Gauss law – charge inside the closed surface – charge outside the closed surface – insulated conductor – electric field due to a uniformly charged sphere – Coulomb's law – electric field intensity – electric induction – electric potential – electric current – relation between electric field and electric potential in vector form – potential due to the charged conducting sphere – Poisson's and Laplace's equations

**Unit II: Capacitors and Electrometers**

Capacitance – principle of a capacitor – capacitance of spherical (inner sphere earthed and outer sphere earthed) and cylindrical capacitors – energy of a charged capacitor – energy density – loss of energy due to sharing of charges

Electrometers – Kelvin's attracted disc electrometer – measurement of potential difference and relative permittivity of a dielectric slab – Quadrant electrometer – heterostatic and idiostatic uses

**Unit-III: Current Electricity**

Carey foster's bridge – theory – measurement of resistance and temperature coefficient of resistance of a coil – Potentiometer – principle – resistance of potentiometer wire – calibration of ammeter – calibration of voltmeter (low range and high range) – LCR Circuit – series resonant circuit – parallel resonant circuit – comparison between series and parallel resonant circuits

**Unit IV: Magnetostatics**

Ampere's circuital law – curl of magnetic field – Biot-Savart law – magnetic induction at a point on the axis of a circular coil carrying current – Force on a current carrying conductor placed in a magnetic field – theory of moving coil ballistic galvanometer – damping correction – figure of merit of BG – absolute capacitance of a capacitor

**Unit - V: Magnetism**

Magnetic properties of materials: Magnetic intensity, permeability, magnetic susceptibility – relation between the three magnetic vectors B, H and M – Curie temperature – Magnetic materials: dia, para, ferro, antiferro, ferri– electron theory of magnetism – Langevin's theory of dia magnetism and para magnetism – general applications of magnetic materials

**Books for study**


1. R. Murugeshan, Electricity and Magnetism, S. Chand & Co, New Delhi, 2019.
2. M. Narayanamurthy., N. Nagarathanam., Electricity & Magnetism, Meerut, National publishing Co, 2001.


**Books for reference**


1. K. K. Tewari, Electricity and Magnetism, Magnetism, S Chand & co., New Delhi, 2001.
2. Brijlal and N. Subramanyan, Electricity and Magnetism, Agra., Ratan & Prakash,1995**.**
3. D. L. Shegal, K. L. Chopra, N. K. Sehgal, Electricity and Magnetism, Sultan Chand & Sons., New Delhi, 2006.
4. B. D. Dugal and C. L. Chopra. Fundamentals of Electricity and Magnetism, Shobanlal Nagin Chand, New Delhi, 2000.
5. Edward Purcell, Electricity and Magnetism, Cambridge University press, United Kingdom, 2011.
6. Dugald C. Jackson, An elementary book on Electricity, Magnetism and their Applications, The Macmillian Company, New York, 1994.


**Websites**

http://www.ncert.nic.in/html/learning_basket/electricity/electricity/electrostatics/laws_of_electrostatics.htm

www.learnnext.com/nextgurukul/wiki/concept/CBSE/X/Science/Magnetic-Effects-of- Electric-Current.htm

http://www-spof.gsfc.nasa.gov/Education/Imagnet.html

http://www.electronics-tutorials.ws/electromagnetism/electromagnetic-induction.html

https://www.electronics-tutorials.ws/accircuits/series-circuit.html

https://eng.libretexts.org/Bookshelves/Materials_Science/Supplemental_Modules_(Materials_Science)/Magnetic_Properties/Diamagnetism

https://www.toppr.com/ask/content/story/amp/capacitance-in-spherical-and-cylindrical-capacitor-problem-l1-76074/

# Semester: III

## Optics

**Semester : III** **Hours / week : 3**

**Course code : P313** **Credits: 3**

## Objectives

- To impart the knowledge on angular dispersion produced by prism, aberrations in lenses and methods of minimizing them in thin lenses.
- To understand the basic phenomena of interference and determination of thickness of a thin wire and refractive index of medium by using various interference experiments
- To explain the diffraction of light and classify Fresnel's and Fraunhofer diffraction with illustration of necessary theory and experiments.
- To Illustrate the polarization of light waves, their types and explain the various optical activity produced when the light passing through the crystal.
- To apply the LASER/MASER action produced in the material; analyze the principle, working mechanism and applications.

| Sl. No. | Course Outcomes<br>On successful completion of the course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | Differentiate the various aberrations in lenses and describe different methods of minimizing them. | K2, K4 |
| CO2 | Explain the phenomenon of interference and illustrate interference experiments to find the thickness of a thin wire and refractive index of medium | K2, K3 |
| CO3 | Exemplify the diffraction of light and compare the Fresnel's and Fraunhofer diffraction of light with an illustrative diffraction experiments | K2, K4 |
| CO4 | Compare the different types of polarization of light waves and analyze the optical characteristics when the light is passing through the crystals | K6, K4 |
| CO5 | State the principle of LASER/MASER action in materials and set up experiments to demonstrate the working mechanism of $CO_2$ and semiconductor lasers | K1, K5, K3 |

**Mapping of CO with PO and PSO:**

| COs | Programmes Outcomes (POs) | | | | | | | Programmes Specific Outcomes (PSOs) | | | | | Mean scores of COs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| 1 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 2.5 |
| 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2.3 |
| 3 | 3 | 2 | 1 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2.8 |
| 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2.5 |
| 5 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2.5 |
| Mean Overall Score | | | | | | | | | | | | | 2.5 |
| Result | | | | | | | | | | | | | High |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 15 | 15 | 30 |
| Understand | 15 | 15 | 40 |
| Apply | 5 | 5 | 10 |
| Analyze | 5 | 5 | 10 |
| Evaluate | 5 | 5 | 5 |
| Create | 5 | 5 | 5 |

**Unit – I: Geometrical Optics**

Dispersion produced by a prism-angular dispersion-dispersive power-combination of prisms to produce (i) Dispersion without deviation (ii) deviation without dispersion-direct vision spectroscope. Aberration in lenses-spherical aberration-methods to minimize spherical aberration-chromatic aberration-achromatic combination of two lenses (i) in contact (ii) out of contact.

**Unit– II: Interference**

Interference: Amplitude and wave front – Young's Double Slit experiment – phase change on reflection: Stokes' treatment. Interference in Thin Films – condition for maxima and minima – Air wedge – thickness of thin wire – Newton's Rings: measurement of wavelength and refractive index – Michelson's Interferometer **–** Determination of wavelength – Wavelength difference.

**Unit – III: Diffraction**

Fresnel Diffraction: Half – period zones – Explanation of rectilinear propagation of light-theory of zone plate-Fresnel's Diffraction pattern of a slit and a narrow wire

Fraunhofer diffraction: Single slit– double Slit-diffraction grating - normal incidence-Experiment to determine wavelength and Dispersive power of grating

**Unit – IV: Polarization**

Transverse nature of light waves – double refraction – optical axis – plane polarized light – production and analysis by Nicol prism – circular and elliptical polarization – optical activity – Fresnel's explanation of optical rotation- Analysis of light by Laurent's half shade polarimeter- polaroids – applications.

**Unit – V: LASER and MASER**

Laser: characteristics – Einstein's' coefficients-Principle of laser-Population inversion – pumping – types – principle of Laser action – condition for Laser action – $CO_2$ Laser – semiconductor Laser – applications of Laser.

Maser – principle of Maser action – Ammonia gas Maser.

**Books for study**


1. BrijLal and N. Subramanyam, A text book of Optics, NirajPrakahshan, New Delhi, 2003.
2. Murugesan R, Modern Physics,S.Chand&Co.Ltd., New Delhi, 2001.
3. Arora C .L ,Optics , S.Chand&Co.Ltd., New Delhi, 1999.


**Books for reference**


1. R. Murugesan., Optics and spectroscopy, S. Chand & company Ltd., New Delhi, 2003.
2. A. Kumar, H.R. Gulati and D.R. Khanna, Fundamental of Optics, R. ChandPublications.New Delhi, 2011


**Websites**

http://www.rpi.edu/dept/phys/Dept2/APPhys1/optics/optics/node7.html

http://hyperphysics.phy–astr.gsu.edu/hbase/phyopt/fresnelcon.html

www.microscopyu.com/techniques/polarized–light/introduction–to–polarized–light

http://hyperphysics.phy–astr.gsu.edu/hbase/optmod/fibopt.html

http://electrons.wikidot.com/principle–and–application–of–laser

https://www.youtube.com/watch?v=-sKpM5wRbwc

## Semester: IV

## Modern Physics

**Semester: IV** **Hours/week : 3**

**Course Code: 414** **Credits:3**

## Objectives

- To gain knowledge about positive rays and massspectrographs.
- To acquire knowledge about magnetic dipole moment due to orbital and spin motions of electron.
- To study and understand Zeeman effect and Paschen-Back effect.
- To gain knowledge about electronic spectroscopy.
- To review the fundamental concepts of vibrational spectroscopy.

**Learning outcomes**

| Sl. No. | Course outcomes<br>On successful completion of the course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | Differentiate between Positive rays and cathode rays and explain the working principle of different mass spectrographs. | K4, K2 |
| CO2 | List and explain the various quantum numbers associated with electrons and distinguish between LS coupling and jj coupling in atoms | K1, K2, K4 |
| CO3 | Differentiate between Zeeman effect and Anamolous Zeeman effect and explain Paschen–Back effect. | K4, K2 |
| CO4 | Understand the interaction of electromagnetic radiation with matter, state the basic laws of absorption and transmission of radiation and outline the principle involved in UV-Visible spectroscopic technique. | K2, K1, K4 |
| CO5 | Acquire a knowledge on Vibrational pectroscopy, inspect the functional groups in compounds using IR spectroscopy and Compare IR and Raman spectroscopy. | K2, K5, K6 |

**Mapping of CO with PO and PSO**

| CO | Programme Outcomes (PO) | | | | | | | Programme Specific Outcomes (PSO) | | | | | Mean Scores of COs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2.41 |
| CO2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2.41 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2.83 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2.58 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2.66 |
| CO6 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2.41 |
| **Mean Overall Score** | | | | | | | | | | | | | **2.57** |
| **Result** | | | | | | | | | | | | | **HIGH** |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 15 | 15 | 30 |
| Understand | 15 | 15 | 40 |
| Apply | 5 | 5 | 10 |
| Analyze | 5 | 5 | 10 |
| Evaluate | 5 | 5 | 5 |
| Create | 5 | 5 | 5 |

**Unit - I: Positive rays :**Discovery – Properties – Positive ray analysis: Thomson's Parabola method – Detection of Isotopes -Dempster's mass spectrographs –Aston's Mass spectrograph – uses of mass spectrograph.

**Unit - II: Structure of the atom :**Vector atom model – spatial quantization and electron spin – Quantum numbers associated with electron – Pauli's exclusion principle – Spin-orbit coupling in atoms: LS and jj couplings – periodic classification of elements.

**Unit - III: Magneto Optical Properties of Spectrum:** Magnetic dipole – moment due to orbital motion of the electron – Magnetic dipole moment due to spin – Stern and Gerlach experiment – Normal and Anomalous Zeeman effect – Experiment – Larmor's theorem – Paschen – Back effect.

**Unit-IV: Electronic Spectroscopy:** Electromagnetic spectrum – interaction of electromagnetic radiation with matter – scattering, dispersion and transmission of radiation-Fundamental laws of absorption- Lamberts Bouguer's law, Beer's law – deviations from Beer's law – absorptivity and absorbance – absorbance and transmission spectrum – Origin of visible and UV spectra-UV-Visible spectrophotometer

**Unit-V: Vibrational Spectroscopy :**Vibrational spectroscopy of diatomic and simple molecules: Harmonic Oscillator – Anharmonic Oscillator –Normal modes of vibration of $CO_2$ and $H_2O$ molecules – Experimental setup of IR spectrometer.

Raman Effect - Classical theory of Raman Scattering - Quantum theory of Raman Scattering (no derivation) – experimental setup of Raman spectrometer – comparison of IR and Raman spectroscopy

**Books for study**


1. R. Murugeshan, Modern Physics, S. Chand and Company Ltd., New Delhi, 2009.
2. N. Subrahmanyam and Brijlal, Atomic Physics, S. Chand and Company Ltd., New Delhi, 2010.
3. C. N. Banwell, E. M. McCash, Fundamentals of Molecular Spectroscopy, 5th Edition, Tata McGraw-Hill Publications, New Delhi, 2002.


**Books for reference**


1. S. N. Ghoshal, Atomic and Nuclear Physics, Volume–I, S. Chand and Company Ltd., New Delhi, 1996.
2. Arthur Beiser, Concepts of Physics, Tata Mcgraw – Hill – New Delhi, 2003.
3. Sehgal Chopra Sehgal – Modern Physics, Sultan Chand Sons, New Delhi, 2004.
4. G. Aruldas, Molecular Structure and Spectroscopy, 2nd Edition, Prentice – Hall of India Pvt.Ltd. New Delhi, 2007.
5. D. N. Satyanarayana, Vibrational Spectroscopy and Applications, New Age International Publications, New Delhi, 2004.
6. H. Kaur, Spectroscopy, Pragagi Edition, 7th Edition Meerut, 2012.


**Websites**

http://www.preservearticles.com/201012302039/positive-rays-properties.html

http://subhasishchandra.com/wp-content/uploads/2012/08/Motion-of-Charged-Particles-in-Electric-and-Magnetic-Fieldsx.pdf

http://www.citycollegiate.com/xii_chpxiv1.htm

http://www.readorrefer.in/article/Photoelectric-effect---Dual-Nature-of-Radiation_2942

http://www.physics-assignment.com/vector-atom-model

http://www.chembio.uoguelph.ca/educmat/chm364_preuss/1_10%20Vector%20model.pdf

www.quora.com/What-is-an-expression-for-the-magnetic-dipole-moment-of-a-revolving-electron

http://www.physics.nus.edu.sg/~L3000/Level3manuals/stern-Gerlach.pdf

http://www.physics-assignment.com/zeeman-effect

http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/paschen.html

http://www.readorrefer.in/article/Bragg---s-law-for-X-ray-diffraction_2933

http://www.readorrefer.in/article/X-ray-spectra---continuous-and-characteristic-X-ray-spectra_2935

http://www.readorrefer.in/article/Bragg-s-X-ray-spectrometer_2934

http://www.readorrefer.in/article/Moseley-s-law-and-Applications-of-Moseley-s-law_2936

http://nptel.ac.in/courses/122101002/downloads/lec-25.pdf

## Semester: IV

# Electromagnetism

**Semester : IV** **Hours / week : 3**

**Course code : P415** **Credits: 3**

- To impart knowledge on concepts of Electromagnetic induction
- To make students understand the concept of self-inductance
- To understand the working principle of Ballistic galvanometer and its applications
- To learn the principle and working of earth inductor and A.C generator
- To apply Maxwell's equations to discuss the propagation of electromagnetic waves in free space.

**Learning Outcomes**

| Sl. No. | Course outcomes<br>On successful completion of the course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | State Faraday's laws of Electromagnetic induction and estimate the emf induced in a Rectangular loop of wire moving through a non uniform magnetic field | K1, K5 |
| CO2 | Explain self-induction and its physical significances and design Anderson bridge to determine the self inductance of an inductor using. | K2, K6, K5 |
| CO3 | Understand and apply the principle of B.G. to determine the mutual inductance between pair of coils | K2, K3, K5 |
| CO4 | Outline the principle, working and applications of Earth inductor, Search coil and A.C. Generator | K4 |
| CO5 | Explain the significance of Maxwell's equations in free space and apply it to electromagnetic waves in isotropic non-conducting media. | K2, K3 |

**Mapping of CO with PO and PSO**

| CO | Programme Outcomes (PO) | | | | | | | Programme Specific Outcomes (PSO) | | | | | Mean Scores of Cos |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2.5 |
| CO2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2.58 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2.83 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2.75 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2.41 |
| CO6 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2.5 |
| **Mean Overall Score** | | | | | | | | | | | | | **2.61** |
| **Result** | | | | | | | | | | | | | **HIGH** |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 15 | 15 | 30 |
| Understand | 15 | 15 | 40 |
| Apply | 5 | 5 | 10 |
| Analyze | 5 | 5 | 10 |
| Evaluate | 5 | 5 | 5 |
| Create | 5 | 5 | 5 |

**UNIT-I: Electromagnetic Induction:**

Faraday's laws of electromagnetic Induction-Deduction of Faraday's law from Lorentz' force-Rotational Electromotive force-Moving conducting rod in a constant magnetic field-Conducting rod sliding along a stationary U-shaped conductor placed on a uniform magnetic field-Rectangular loop of wire moving through a non uniform magnetic field

**UNIT-IISelf Inductance**

Self Inductance: Inductors and inductance-Physical significance of self-inductance-self inductance of solenoid, two parallel wires,two coaxial cylinders-Self inductance by Anderson Bridge.

**UNIT-III Mutual Inductance**

Mutual Inductance: Mutual Inductance between two arbitrary circuits-Newmaan's formula-reciprocity theorem-Proof-Theory of B.G-Damping correction-Measurement of mutual inductance by B.G

**UNIT-IV Electromagnetic Devices:**

Earth inductor: horizontal and vertical components of earth's magnetic field-Search coil: measurement of strong magnetic field-Eddy currents-Applications-Induction coil-Automatic make and Break arrangement-A.C.Generator

**UNIT-V Electromagnetic waves**

Maxwell's Displacement current-Significance of displacement current-Maxwell's equations in integral and differential forms-Significance-Maxwell's equations in free space-Electromagnetic waves in free space-Electromagnetic waves in isotropic non-conducting media (Dielectrics).

**Books for study**


1. K.K.Tewari, Electricity and magnetism, S.Chand and Company Ltd, New Delhi,2018
2. D.C.Tayal, Electricity and Magnetism, Himalaya Publishing House, New Delhi,2012


**Books for Reference**


1. Brijlal and N. Subrahmanyam, Electricity and Magnetism, RatanPrakashanMandir Educational & University Publishers, Agra, 1999.
2. R.Murugeshan, Electricity and Magnetism, S.Chand and Company Ltd, New Delhi, 1999.


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https://courses.lumenlearning.com/physics/chapter/23-3-motional-emf/

http://vlabs.iitkgp.ernet.in/asnm/exp23/index.html

https://www.britannica.com/technology/induction-coil

http://odessa.phy.sdsmt.edu/~lcorwin/PHYS721EM1_2014Fall/ChiranjibiFinal.pdf

https://physicsabout.com/maxwells-equations/

http://hyperphysics.phy-astr.gsu.edu/hbase/electric/maxeq.html

# Semester: III

## Allied Physics for Chemistry I

**Semester: III** **Hours / week: 4**

**Course Code: AP309A** **Credits: 3**

**Objectives**

- To study the basics of elasticity and its importance in beams.
- To study the concepts of viscosity and the various methods to determine the parameters experimentally.
- To understand the concepts behind thermodynamics and thermodynamic laws.
- To study the propagation of sound waves, the production of ultrasonic waves, Acoustics and their applications.
- To distinguish the geometrical and physical optics.
- To understand the concept of basic electronics and digital electronics.

**Learning Outcomes**

| Sl. No. | Course outcomes<br>On successful completion of the course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | Acquire basic knowledge about elasticity and viscosity of liquids and measure the viscosity of liquids by Poiseuille's method. | K1, K5 |
| CO2 | State and explain different laws of thermodynamics and distinguish between adiabatic and isothermal changes. | K1, K2, K4 |
| CO3 | Apply the laws of transverse vibrations to estimate the AC frequency using sonometer, describe the production and applications of Ultrasonic waves and recommend the conditions for good acoustics of auditoriums. | K2, K3, K6 |
| CO4 | Comprehend the concepts of spherical aberration, chromatic aberration and the methods of minimizing them and interference of light. | K2 |
| CO5 | Construct rectifiers and voltage regulators using diodes and explain the logic functions of basic logic gates. | K6, K2 |

**Mapping of CO with PO and PSO**

| CO | Programme Outcome (PO) | | | | | | | Programme Specific Outcome (PSO) | | | | | Mean score of COs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2.4 |
| CO2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2.5 |
| CO3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2.3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2.5 |
| CO5 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2.4 |
| Mean Overall Score | | | | | | | | | | | | | 2.4 |
| Results | | | | | | | | | | | | | High |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 15 | 15 | 30 |
| Understand | 15 | 15 | 40 |
| Apply | 5 | 5 | 10 |
| Analyze | 5 | 5 | 10 |
| Evaluate | 5 | 5 | 5 |
| Create | 5 | 5 | 5 |

**Unit – I: Properties of matter**

**Elasticity:** Stress – strain – Hooke's Law – Elastic moduli – beam – bending of beams – expression for bending moment – Young's modulus by non–uniform bending (Optic lever & telescope) theory and experiment – torsional couple per unit twist – work done in twisting a wire – torsional pendulum – theory – rigidity modulus by torsional oscillations experiment (without symmetrical masses).

**Viscosity:** Coefficient of viscosity – rate of flow of liquid in a capillary tube (Poiseuille's formula) – Poiseuille's method for determining coefficient of viscosity of a liquid (Variable pressure head).

**Unit – II: Thermodynamics**

Zeroth and first law of thermodynamics – reversible and irreversible processes – isothermal process – adiabatic process – work done during adiabatic and isothermal process - second law of thermodynamics – Carnot's engine – efficiency of Carnot's engine – Entropy –change of entropy when ice converted into steam - third law of thermodynamics –Maxwell thermodynamical relations ; derivation and application in Clausius - Clapeyron equation and specific heat relation.

**Unit – III: Sound and Acoustics**

**Wave Motion:** longitudinal waves and transverse waves – velocity of transverse vibrations in a stretched string – laws of transverse vibrations – experiment to determine the AC frequency using sonometer.

**Ultrasonics:** Definition – production of ultrasonic waves by Piezo-electric method – applications – non-destructive testing (Echo pulse method).

**Acoustics:** Intensity of sound–Decibel and Bel–Loudness of sound–Reverberation–Sabine's reverberation formula–Acoustic intensity–Factors affecting the acoustics of Buildings.

**Unit – IV: Optics**

**Geometrical Optics**: Chromatic and spherical aberration in lenses – condition for achromatism of two thin lenses placed in contact and separated by a finite distance – Methods of reducing spherical aberration ―deviation and dispersion of light – determination of refractive index of the given solid prism.

**Physical Optics**: Interference – condition for interference – air wedge – determination of thickness of a thin wire by air wedge – Newton's rings (determine the radius of curvature).

**Unit – V: Electronics**

**Analog electronics:** PN junction diode – rectifiers – half wave – full wave and bridge rectifiers – zener diode – characteristics of zener diode―zener diode as voltage regulator―junction transistor – types of transistors – working of NPN transistor (common base) – integrated circuits – advantages and disadvantages.

**Digital electronics:**AND, OR, NOT, NOR, NAND, EX-OR gate – construction of AND, OR gates using diodes (Two input) and NOT gate using transistor – NAND as a Universal gate – half and full adders**.**

**Books for study**


1. R. Murugeshan, Properties of matter, revised edition, S. Chand & Co. Pvt. Ltd, New Delhi, 2019.
2. N. Subrahmanyam, Brij Lal, Waves and oscillations, 2nd revised edition, Vikas publishing, 2019
3. R. Murugeshan, Optics, 25threvised edition, S. Chand & Co. Pvt. Ltd, New Delhi, 2012.
4. V. K. Metha, Principle of Electronics, S.Chand& Co. Pvt. Ltd, New Delhi, 2003.
5. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, 1 st edition, John Wiley & Sons Ltd, 2007.
6. R. Murugeshan, Er. KiruthigaSivaprasath, Thermal Physics, revised edition, S. Chand & Co, 2018.

**Books for reference**


1. N. Subrahmanyam, and Brij Lal, Properties of matter, S. Chand & Co. Pvt.Ltd, New Delhi, 2005.
2. N. Subrahmanyam, and Brij Lal, A text book of sound, Vikas Publishing House, New Delhi, 1985.
3. Murugeshan and KiruthigaSivaprasath., A Text Book of Optics, 9th revised edition, S. Chand & Co. Pvt. Ltd, New Delhi, 2014.
4. R. Murugeshan, KiruthigaSivaprasath, Modern Physics, 7th revised edition, S. Chand &Co., 2014
5. Devaraj Singh, Giridhar Mishra, Raja Ram Yadav, Thermal Physics, Kinetic Theory and thermodynamics, Narosa publications, 2016
6. Frank. L. Pedrotti, S. J Leno M. Pedorotti, Leno S. Pedorotti, Introduction to optics, 3rd edition, 2012
7. N. Subrahmanyam, and Brij Lal, Optics, 25threvised edition, S. Chand & Co. Pvt. Ltd, New Delhi, 2012.


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https://people.bath.ac.uk/ensmjc/Notes/acoustics.pdf

https://www.win.tue.nl/~sjoerdr/papers/boek.pdf

http://www.mediafire.com/file/abp5ppd06brg5eu/Principle+of+Electrical+%26+Electronics+Engineering+BY+VK+Metha.zip

http://ruangbacafmipa.staff.ub.ac.id/files/2012/02/ebooksclub.org__Digital_Electronics__Principles__Devices_and_Applications.pdf

http://www.phys.ens.fr/~ebrunet/Thermo-en.pdf

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http://www.crectirupati.com/sites/default/files/lecture_notes/TD-lecture%20notes.pdf

https://www3.nd.edu/~powers/ame.20231/notes.pdf

# Semester: III

## Allied Physics for Chemistry II

**Semester: 4** **Hours/Week : 4**

**Course code:** AP409A

**Credit: 3**

**Objectives**

- To study the basic ideas of electricity and magnetism
- To study vector atom model and to determine the methods of critical potential
- To study the structure of the alkali spectral lines
- To study the basics of nuclear reactions, process of radioactivity and its applications
- To understand the concepts of wave mechanics and dualistic nature of light
- To study the different methods of preparing thin films, nanomaterials and their applications

**Learning Outcomes**

| Sl. No. | Course outcomes<br>On successful completion of the course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | **Describe the growth and decay of current in DC circuits, design experiments to calibrate ammeter and voltmeter using potentiometer and distinguish dia, para, and ferromagnetic materials.** | K2, K6, K4 |
| CO2 | **Explain the various** quantum numbers associated with the vector atom model. | K2 |
| CO3 | **Illustrate a knowledge on the basics of nuclear reactions, radioactivity and classification of elementary particles and estimate the amount of energy released in nuclear reactions.** | K3, K5 |
| CO4 | **State and explain the concepts of matter waves, Heisenberg's uncertainty principle and laws of photo electric effect.** | K1, K2 |
| CO5 | **Describe various methods of thin films and Nanomaterials preparation and state the applications of nanomaterials.** | K2, K1 |

**Mapping of CO with PO and PSO**

| CO | Programme Outcome (PO) | | | | | | | Programme Specific Outcome (PSO) | | | | | Mean score of COs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2.6 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 1 | 2.4 |
| CO3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2.3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2.5 |
| CO5 | 2 | 3 | 2 | 2 | 3 | 3 | 1 | 3 | 2 | 3 | 2 | 3 | 2.4 |
| Mean Overall Score | | | | | | | | | | | | | 2.5 |
| Results | | | | | | | | | | | | | High |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 15 | 15 | 30 |
| Understand | 15 | 15 | 40 |
| Apply | 5 | 5 | 10 |
| Analyze | 5 | 5 | 10 |
| Evaluate | 5 | 5 | 5 |
| Create | 5 | 5 | 5 |

## Unit – I: Electricity and Magnetism

**Electricity:** D.C circuits: growth and decay of current in L.R circuit – growth and decay ofcharge in C.R circuit – time constant – potentiometer – principle – calibration of high rangeammeter – calibration of low range voltmeter.

**Magnetism:** Intensity of magnetization – susceptibility – types – Properties of para, dia andferromagnetic materials – Langevin's theory of diamagnetism.

## Unit – II: Atomic Physics

**Structure of the atom: Concepts of Sommerfeld's and** Vector atom model – spatial quantization – spinning electron –quantum numbers associated with the vector atom model - Doublet structure of the alkali spectral lines – Fine structure of the hydrogen spectral terms - Pauli's exclusion principle.

**Critical Potentials:** Excitation potential – ionization Potential – determination of criticalpotential – Frank and Hertz method.

**Unit – III: Nuclear Physics**

**Nuclear Reactions and Radioactivity:** Nuclear reactions – types of reactions – conservationlaws – Q-value of a nuclear reaction – Neutron – discovery – detection – properties ofneutron – artificial transmutation – Rutherford's experiment – artificial radioactivity – radioisotopes – applications.

**Nuclear Energy and Elementary particles:** Nuclear fission – energy released in fission –chain reaction – nuclear fusion and particle accelerators – cyclotron and betatron - elementary particles – classification ofelementary particles.

**Unit – IV: Modern Physics**

Dual nature of light – matter waves – Louis de Broglie concepts of matter waves – de Brogliewavelength for matter waves – G.P. Thomson's experiment to confirm the wave nature ofelectron – Davisson and Germer'sexperiment.Heisenberg's Uncertainty principle – statement – position and momentum of a particle –Gamma ray microscope – diffraction of a beam of electrons by a slit.

**Photo electric effect:** Laws of photo electric emission – Einstein's photo electric equation –applications (Specific applications)

**Unit – V: Material Science**

**Thin:** Thin films – preparation of thin films –Thermal Evaporation– sputtering – pulsed laser deposition– applications of thin films -Thin film solar cells.

**Nanomaterials and Applications:** Nanomaterials – classification based on dimension –preparation of nanomaterials: top–down and bottom–up approach – ball milling – sol-gelmethod – applications of nanomaterials in medicine, industry, sensors and textiles – Moore's law – quantum dots – applications of quantum dots.

**Books for study**


1. R. Murugeshan, Kiruthiga Sivaprasath, Modern Physics, 18th Edison, S. Chand & Co. Ltd, New Delhi, 2019.
2. N. Subrahmanyam and Brij Lal, Atomic and Nuclear Physics, S Chand & Co., 2007.
3. R. Murugeshan, Electricity and Magnetism,10th Edison, S.Chand & Co. Ltd, New Delhi, 2017.
4. A. K. Bandyopadhyay, Nano Materials, New Age International Publishers, New Delhi, 2009.
5. S. Shanmugam, Nanotechnology, MJP Publishers; 1st edition (28 April 2019), Chennai, 2019.


**Books for reference**


1.N. Subrahmanyam and Brij Lal, Atomic Physics, S. Chand & Co. Ltd., New Delhi, 2013.
2.S.N. Ghoshal, Atomic and Nuclear Physics, S.Chand & Co. Ltd, New Delhi, 2004.
3.R.B. Gupta, Material Science and Processes, Satya Prakashan, New Delhi, 2002.
4.L.I. Maissel and R. Glang, Handbook of Thin film Technology, McGraw–Hill, New York, 2000.
5.A. Goswami, Thin Film Fundamentals, New Age International Pvt. Ltd, New Delhi, 2007.
6.V. Raghavan, Materials science and Engineering, Prentice–Hall of India Pvt. Ltd., New Delhi, 2009.

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http://physics.doane.edu/hpp/Resources/Fuller3/pdf/F3Chapter_30.pdf

http://ncert.nic.in/ncerts/l/leph203.pdf

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http://ducc.du.ac.in/web4/ever-shrinking-mex/43m9vc1.php?3c6e0b=langevin%27s-theory-of-dia-and-paramagnetism

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https://www.phys.sinica.edu.tw/TIGP-NANO/Course/2020_Spring/notes/ 08_chapter_2_20200409.pdf

https://www.researchgate.net/publication/259118068_Chapter_-_INTRODUCTION_TO_NANOMATERIALS

http://www.sathyabamauniversity.ac.in/uploads/notes/note_1437661719.pdf

# Semester : III & IV

## Allied Physics Practicals for Chemistry

**Semester : III & IV** **Hours / week : 2**

**Course Code : PAP409A** **Credits : 2**

**Any 12 Experiments**

**Objectives:**

1. To perform experiments on elasticity of materials and viscosity of liquids
2. To demonstrate an experiment to determine the frequency of ac mains
3. To perform experiments on interference of light waves and its applications.
4. To do calibration of voltmeter and ammeter using potentiometer
5. To design simple analog and digital electronic circuits.

**Learning outcomes:**

| Sl. No. | Course outcomes<br>On successful completion of the course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | Apply their knowledge on properties of matter to perform experiments to determine the Young's modulus and Rigidity modulus of materials and viscosity of liquids | K3, K5 |
| CO2 | Perform an experiment to determine the frequency of ac mains using sonometer and analyze the result obtained. | K3, K4 |
| CO3 | Set up Newton's rings and air wedge experiments and apply their knowledge on interference of light waves to determine the refractive index of material of a lens and thickness of a wire. | K6, K3, K5 |
| CO4 | Use potentiometer to calibrate low range voltmeter and high range ammeter and explain the principle behind the experiment. | K3, K2 |
| CO5 | Recall the logic function of different logic gates and employ them to construct simple electronic circuits. | K1, K3 |

**Mapping of CO with PO and PSO**

| CO | Programme Outcome (PO) | | | | | | | Programme Specific Outcome (PSO) | | | | | Mean score of COs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 2.8 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2.6 |
| CO3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2.3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2.5 |
| CO5 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2.6 |
| Mean Overall Score | | | | | | | | | | | | | 2.6 |
| Results | | | | | | | | | | | | | High |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 5 | 5 | 10 |
| Understand | 5 | 5 | 10 |
| Apply | 15 | 15 | 30 |
| Analyze | 15 | 15 | 30 |
| Evaluate | 5 | 5 | 10 |
| Create | 5 | 5 | 10 |

1. Young's Modulus – Non-Uniform bending – Optic lever and Telescope.
2. Rigidity Modulus of the wire – Torsional Pendulum.
3. Co–efficient of viscosity of a liquid – graduated burette – Constant volume method.
4. Determining the AC frequency using sonometer
5. Construction of centre tap full wave rectifier using diodes.
6. Spectrometer – refractive index of the material of solid prism.
7. Air wedge – Determination of thickness of wire.
8. Zener diode regulated power supply.
9. Construction of AND, OR logic gates using diodes and NOT gate using transistor.
10. Logic gates using IC's (AND, OR, NOT, NOR, NAND, X–OR).
11. NAND as universal gate.
12. Potentiometer – Calibration of low range voltmeter.
13. Potentiometer – Calibration of high range ammeter.

14. Half adder and Full adder.

15. Newtons ring experiment to determine the focal length of the lens.

**Books for reference**


1. Department of Physics, Allied Practical Physics, (B. Sc Physics Main), Sacred Heart College, Tirupattur, 2015.
2. M. N. Srinivasan, S. Balasubramanian, and R. Ranganathan, A Text Book of Practical physics, 2nd revised edition, S. Sultan Chand & Sons publications, 2014.
3. R. Sasikumar, Practical Physics, PHI Learning Pvt. Ltd, New Delhi, 2011.
4. Dr.S.Somasundaram, Practical Physics, Apsara publications, Tiruchirapalli, 2012.


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2. https://www.electronics-tutorials.ws/diode/diode_7.html
3. https://www.youtube.com/watch?v=6dmfI_H5k7U
4. https://www.youtube.com/watch?v=Q8Otf6k3uGk
5. http://www.brainkart.com/article/Determination-of-coefficient-of-viscosity-of-water-by-Poiseuille-s-flow method_3059/#:~:text=Consider%20a%20liquid%20 of% 20co, the%20 pressure%20gradient%20p%2Fl.
6. https://vlab.amrita.edu/?sub=1&brch=281&sim=1513&cnt=2
7. https://www.electronics-tutorials.ws/logic/logic_1.html
8. youtube.com/watch?v=cdMJvFT-Afc
9. https://www.youtube.com/watch?v=x3VvjHVBGDU

# Semester: 4

# Allied Physics for Computer Science – II

**Semester: 4** **Hours/Week : 4**

**Course code:AP409B** **Credit: 3**

**Objectives**

- To introduce the fundamental concepts and working principles of various semiconductor devices and their applications.
- To introduce the basic concepts of operational amplifier and its various applications.
- To familiarize the switching characteristics of transistor, various multivibrators, applications of diode as integrator, differentiator, clipper and clamper.
- To familiarize with the different number systems and combinational circuits utilized in the digital circuits.
- To study the working of various flip-flops, registers, counters and their applications.

**Learning Outcomes**

| Sl. No. | Course outcomes<br>On successful completion of the course, the students will be able to | Knowledge level |
|---|---|---|
| CO1 | Understand the working principle of JFET and design rectifier circuits. | K2, K6 |
| CO2 | Apply knowledge on op-amp to design and analyze various applications of op-amps. | K3, K6, K4 |
| CO3 | Understand the working of multivibrators and design wave shaping circuits. | K2, K6 |
| CO4 | Gain knowledge of different types of number systems and their mutual conversions, State and prove DeMorgan's theorems and Explain the working principle of combinational circuits. | K1, K3, K2 |
| CO5 | Construct and evaluate the performance of flip-flops, registers and counters. | K6, K5 |

**Mapping of CO with PO and PSO**

| CO | Programme Outcome (PO) | | | | | | | Programme Specific Outcome (PSO) | | | | | Mean score of COs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | |
| CO1 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2.6 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2.7 |
| CO3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2.6 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2.7 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2.6 |
| Mean Overall Score | | | | | | | | | | | | | 2.6 |
| Results | | | | | | | | | | | | | High |

**Assessment Pattern**

| Bloom's Category | CA Tests (Marks Allotment) | | Term End Exam (100) Marks Allotment |
|---|---|---|---|
| | I CA (50) | II CA (50) | |
| Remember | 15 | 15 | 30 |
| Understand | 15 | 15 | 40 |
| Apply | 5 | 5 | 10 |
| Analyze | 5 | 5 | 10 |
| Evaluate | 5 | 5 | 5 |
| Create | 5 | 5 | 5 |

**Unit – I: Semiconductor Devices and Applications**

Half wave, full wave and bridge rectifiers–efficiency–ripple factor–Filter circuits - Types of filters:capacitor filters – π filters—JFET – construction and working of n–channel FET – characteristics – parameters of JFET – advantages of JFET over BJT- Common source FET amplifier.

**Unit – II: Operational Amplifiers and Applications**

Operational amplifiers – characteristics of ideal operational amplifier – CMRR – voltage gain of op–amp in inverting and non–inverting modes – Applications of OPAMPin invertingmode: voltage follower– summer – subtractor – integrator and differentiator.

**Unit – III: Switching and Wave Shaping Circuits**

Switching circuit – switch – types – mechanical – electro-mechanical – transistor as an electronic switch – advantages of electronic switches over electromechanical switches –multivibrators – types: Astable and Bistable multivibrators using transistors – working – differentiating circuits – output waveforms – integrating circuits – output waveforms-clipping and clamping circuits using diodes.

**Unit – IV: Combinational circuits**

Number system: Binary, Decimal, Octal, Hexa decimal and their mutual conversions – logic gates AND, OR using diodes –NOT gate using Transistor –EXOR gate - NAND as a Universal gate – De Morgan's laws and their circuit implications – arithmetic circuits: half adder – full adder – half subtractor-full subtractor-Multiplexer(2:1) – demultiplexer(1:2).

**Unit –V: Sequential circuits:**

Flip Flops – triggering in flip-flops-types – clocked RS flip flop – D flip flop – J-K flip flop. Shift registers: serial in serial out-serial in parallel out-parallel in parallel out-parallel in serial out - Counters: Synchronous and asynchronous counters-Modulus of a counter-Synchronous and asynchronous decade counter.

**Books for study**


1. V.K Methta, Principles of Electronics, S. Chand & Co, New Delhi, 2001.
2. M. Arul Thalapathi, Basic and Applied Electronics, Comtec Publisher, Chennai, 2005.
3. Malvino Leach, Digital Principles and Applications, Tata McGraw Hill,1992.


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1. Floyd, Digital Fundamentals, Pearson education, New Delhi, 2004.
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