# Department of Physics

## Program:  B.Sc.

| PSO No. | Programme Specific Outcomes<br>Upon completion of these courses the student would be able to: |
|---------|------------------------------------------------------------------------------------------------|
| PSO-1 | Analyse the concepts and theories of Physics. |
| PSO-2 | Analyse real world problems and develop mathematical equations to find acceptable solutions. |
| PSO-3 | Develop problem solving skills and scientific reasoning by learning laboratory skills. |
| PSO-4 | Develop written and oral communication skills in communicating with diverse stakeholders. |
| PSO- 5 | Create and collaborate in emergent physical, mathematical and computing technologies leading to innovative solutions for industry and academia. |
| PSO- 6 | Crack various competitive exams for higher studies and employment. |

## B.Sc III Sem

## 2023-24

## (Waves and Optics)

## Major & Minor

## Course Code: S2-PHYS1T

**Pre-requisite: To study this course, the student must have passed B.Sc. first year with Physics.**

**Max. Marks: 40+60**
**Min. Passing Marks: 35**
**Credit Value: 4 (60 hrs)**

## Course Objective

**The objectives of the course are:**

|        | Course Objectives | Cognitive Level |
|--------|-------------------|-----------------|
| CO -I | To make aware students about various aspects of harmonic oscillations and waves | U, R,  E |
| CO -II | To make aware students about various phenomena of daily life based on acoustic and optics | U, R, Ap, E |
| CO -III | To understand interference and interferometry | R, U, Ap, An, E |

| CO -IV | To learn about like diffraction, optical instruments depending on diffraction, Rayleigh's criterion | R, U, An, Ap, E, C |
| CO -V | To study polarization, double refraction in anisotropic media, Huygen's principle, optical instruments depending on polarization | U, An, Ap, E, R |

## Course Learning Outcome (CLO)

| CO No. | Course Outcomes | PSOs Addressed | Cognitive Level* |
|---|---|---|---|
| CLO -I | Students will be able to understand the various aspects of harmonic oscillations and waves specially superposition of collinear and perpendicular harmonic oscillations | 1,2,3,4 | U, R, E |
| CLO -II | Students will be able to explain various phenomena of daily life based on acoustic and optics | 1,2,3,4,5 | U, R, Ap, E |
| CLO -III | Students will be able to understand interference and its applications | 1,2,3,6 | R, U, Ap, An, E |
| CLO -IV | Students will understand diffraction and be able to outline the use of optical instruments depending on diffraction. Will be able to apply Rayleigh's criterion to optical instruments | 1,2,3,4,5 | R, U, An, Ap, E, C |
| CLO -V | Students will understand polarization, double refraction in anisotropic media and will be able to make use of optical instruments depending on polarization. Will be able to apply Huygen's principle to the phenomenon of polarization | 1,2,3,4,5 | U, An, Ap, E, R |

CO- Course Objective; CLO – Course Learning Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

**UNIT-I**                      **[No. of Lectures: 12]**

**Waves**

**1.1 Superposition of Two Collinear Harmonic Oscillations:**

Linearity and Superposition Principle- (i) Oscillations having equal frequencies and (ii) Oscillations having different frequencies (Beats).

**1.2 Superposition of Two Perpendicular Harmonic Oscillations:**

Graphical and Analytical Methods; Lissajous Figures (1:1 and 1:2 frequency ratio) and

their uses**.**

**1.3 Wave Motion :**

Transverse wave in Stretched string ; Travelling and standing waves; Normal modes of string; Phase velocity; Group velocity ; Plane and Spherical waves; wave intensity.

**Keywords/Tags:** Harmonic Oscillation, Superposition Principle, Wave Motion.

<div align="center">

**UNIT-II**        **[No. of Lectures: 12]**

</div>

**Sound and Light Waves**

**2.1 Sound:** Simple harmonic motion; Forced vibrations and resonance; Fourier Theorem; Application to saw tooth wave and square wave; Intensity and loudness of sound; Decibels, Intensity levels; Musical notes; Musical scale.

2.2 **Acoustics of buildings:** reverberation and time of reverberation; Absorption coefficient; Sabine's formula; Measurement of reverberation time; Acoustic aspects of halls and auditoria

2.3 **Wave optics:** Electromagnetic nature of light; Wave front; Huygens Principle.

2.4 Electro-optic, Magneto-optic and acousto-optic effects (elementary idea)

**Keywords/Tags**: Sound, Musical notes, Acoustics of buildings, Wave optics

<div align="center">

**UNIT-III**        **[No. of Lectures: 12]**

</div>

**Interference of light**

3.1 Interference: Conditions necessary for interference, Interference by Division of amplitude and division of wavefront; Young's Double Slit experiment; Lloyd's Mirror and Fresnel's Biprism.

3.2 Interference in Thin Films: Stokes' Law; Interference in parallel and wedge-shaped films; Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes); Applications of thin films interference: Antireflection coating; Dielectric Mirrors; Interference filter.

3.3 Newton's Ring: Measurement of wavelength and refractive index.

3.4 Michelson's Interferometer: (1) formation of fringes, (2) Determination of wavelength, (3) Wavelength difference, (4) Refractive index, (5) Visibility of fringes.

**Keywords/Tags:** Interference, Thin films interference, Michelson's Interferometer.

<div align="center">

**UNIT-IV**        **[No. of Lectures: 12]**

**Diffraction**

</div>

4.1 Introduction; Distinction between interference and diffraction; Types of diffraction; Distinction between Fresnel and Fraunhofer diffraction.

4.2 Fresnel's diffraction: Fresnel's Assumptions; Huygens Fresnel's Theory; Half period zone; Construction and theory of Zone plate; Diffraction at straight edge; Diffraction at a circular aperture.

4.3 Fraunhofer diffraction: Diffraction due to single, double and N slits; Plane diffraction grating.

4.4 Resolving and dispersive power: Rayleigh's criterion; Limit of resolution of the eye; Resolving power of Grating and Telescope; Expression for dispersive power of prism.

**Keywords/Tags:** Diffraction, Zone plate, Plane diffraction grating, Resolving power.

## UNIT-V [No. of Lectures: 12]

### Polarisation

5.1 Introduction: Polarized light and its representation; Difference in Polarized and unpolarized light; Types of Polarisation; Application of polarization: Sunglasses; Three-dimensional movies; Photography.

5.2 Production of polarized light: Production of polarized light by reflection, refraction, double refraction, scattering and selective absorption; Brewster's Law; Polaroid sheets; Polarizer and analyzer; Malus law.

5.3 Anisotropic Crystals: Doubly refracting crystals (Uniaxial); Extra-ordinary rays and Ordinary rays; Polarization by double refraction and Huygens theory; Nicol prism; Retardation plates: Quarter-wave plate and Half-wave plate.

5.4 Optical Activity: Optical rotation; Specific rotation; Half shade & Biquartz polarimeter.

**Keywords/Tags:** Polarized light, Anisotropic Crystals, Optical Activity.

**Learning Resources**

**Text Books, Reference Books, Other resources**

**Suggested Readings:**

1. **Fundamentals of Optics**, F.A. Jenkins and H.E. White,1996 ,McGraw Hill.
2. **The Physics of Waves and Oscillations,** N. K. Bajaj, 1998, McGraw Hill.
3. **Principles of Optics,** B. K. Mathur , 1995,Gopal Printing
4. **University Physics,** F.W. Sears, M.W.Zemansky and H.D.Young1986, Addison Wesley
5. **Optics,** A.K.Ghatak ,McGraw Hill
6. **Principles of Optics,** Max Born and Wolf ,Pregmon Press
7. **Optics and Atomic Physics,** D.P.Khandelwal Himalaya Publication
8. **Optics,** Brijlal and Subramaniyam , S.Chand Publications
9. **Physics for Degree Students,** C. L. Arora and P.S. Hemne, S.Chand Publications.
10. **The Physics of Vibrations and Waves,** H. J Pain, 2013 John Wiley and Sons,
11. **Fundamental of Optics,** A Kumar., H. R Gulati. and D. R Khanna., S. Chand Publications

**Evaluation Scheme:**
**Internal Assessment:** 15+15+10 =40 Marks
**Main (End Semester) Written Exam:** 60 Marks
**Total** : 100 Marks
**Written Exam**: 3 hours
**Very Short answer type question (50 words)** : 5 Marks (05 X 01= 05 Marks)
**Short answer type question (200 words)** : 10 Marks (05 X 02= 10 Marks)
**Long answer type question (500 words)** : 45 Marks (05 X 9 = 45 Marks)

**List of Experiments**

**Credit Value: 2**

**No. Of Practical hours: 30**

1) To determine the dispersive power of the material of prism using spectrometer.
2) To plot the i-δ curve for a given prism using spectrometer and then determines the refractive index of the material of the prism.
3) To determine the wavelength of main spectral lines of mercury light with the help of plane transmission grating.
4) To determine the wavelength of monochromatic light source with the help of Newton's ring method.
5) To determine the radius of curvature of a Plano-convex lens with the help of Newton's ring method.
6) To determine the wavelength of monochromatic light source using Fabry Perot Etalon.
7) To determine the dispersive power of plane transmission grating.
8) To determine the resolving power of grating.
9) To determine the diameter / thickness of a thin wire by diffraction method
10) Study of diffraction at Straight edge.
11) To determine the resolving power of telescope.
12) To determine the polarising angle of the prism and to determine the refractive index of the material of prism using Brewster's law.
13) To determine wavelength of sodium light using Fresnel Biprism.
14) To determine the specific rotation of a given sugar solution by bi-quartz polarimeter.
15) To determine the refractive indices of O-ray and E-ray for calcite prism using spectrometer.
16) To determine the refractive indices of O-ray and E-ray for quartz prism using spectrometer.
17) Study of Laser holography and Interferometry. **(SPONSARED BY DBT STAR)**
18) Study of Malus Law. **(SPONSARED BY DBT STAR)**
19) To study Lissajous Figures with the help of CRO

20) Verification of Faraday's law. **(SPONSARED BY DBT STAR)**

        ## Other experiments of the same difficulty level may be added.

        ## ## Student needs to perform at least 10 experiments.

**Learning Resources**

**Suggested Readings:**

1. Prakash I. & Ramakrishna, "**A Text Book of Practical Physics**", Kitab Mahal, 2011,11/e.
2. Squires G. L., **"Practical Physics"**, Cambridge University Press, 2015, 4/e.
3. Flint B. L. and Worsnop H. T., "**Advanced Practical Physics for students**", Asia Publishing House, 197.
4. Chattopadhyay D. & Rakshit P. C., "**An Advanced Course in Practical Physics**", New Central Book Agency.
5. Chattopadhyay D., Rakshit P.C. and Saha B., "**An Advanced Course in Practical Physics**", New Central Book Agency P. Ltd.
6. Singh S.P., "Advanced Practical Physics", Pragati Prakashan.
7. Tayal D. C., "**University Practical Physics**", Himalaya Publishing House
8. Kumar P. R. Sasi, " **Practical Physics**", PHI Publication
9. Srivastava Anchal, Shukla R. K., "**Practical Physics**", New Age International Publishers.
10. Agarwal D. C., "**Experimental electronics**", Technical Publishing House.
11. Srivastava J. P., "**Elements of Solid state Physics**", PHI Publication.
12. Instruction Manual for doing experiments in Physics by R.Shrinivasan and K.R. Pariolkar

    **Suggestive digital platforms web links**

1. https:/www.vlab.co.in/broad-area-physical-sciences , Virtual Labs (Physical Sciences),Ministry of Education

2. [https://storaye.yoouleapis.com/uniguecourses/online](https://storaye.yoouleapis.com/uniguecourses/online). html, SWAYAM Online Courses

## Evaluation Scheme: Practical Examination

(A) **Internal Assessment** :

   **Question answer during class (Oral)**  **:** 15 Marks
   **Attendance**  : 10 Marks
   **Assignment/Presentation/Sessional viva :** 15 Marks
  **Total (Each Paper)**  : 40 Marks

**(B)** Ex**ternal Assessment** :

      **Practical Viva**  : 15 Marks
      **Practical File/Record** : 05 Marks
      **Experimental work**  : 40 Marks
      **Total ( Each Paper)**  **:** 60 Marks
      **Grand Total**  : 100 Marks

      **Min. Passing Marks**  :35 Marks

**Mode of Evaluation**: Digital Assignments, Quiz, CCE, Presentation, Tutorial, Class / Lab Activity, Final examination

**B.Sc III Sem**

**2023-24**

**(Waves and Optics)**

**Elective**

**Course Code: S2-PHYS1T**

**Pre-requisite: To study this course, the student must have passed B.Sc. first year with Physics.**

**Max. Marks: 40+60**
**Min. Passing Marks: 35**
**Credit Value: 3 (45 hrs)**

# Course Objective

**The objectives of the course are:**

|  | **Course Objectives** | **Cognitive Level** |
|---|---|---|
| Cob -I | To make aware students about various aspects of harmonic oscillations and waves | U, R, E |
| Cob -II | To make aware students about various phenomena of daily life based on acoustic and optics | U, R, Ap, E |
| Cob -III | To understand interference and interferometry | R, U, Ap, An, E |
| Cob -IV | To learn about like diffraction, optical instruments depending on diffraction, Rayleigh's criterion | R, U, An, Ap, E, C |
| Cob -V | To study polarization, double refraction in anisotropic media, Huygen's principle, optical instruments depending on polarization | U, An, Ap, E, R |

# Course Learning Outcome (CLO)

| CO No. | Course Outcomes | PSOs Addressed | Cognitive Level* |
|---|---|---|---|
| COt -I | Students will be able to understand the various aspects of harmonic oscillations and waves specially superposition of collinear and perpendicular harmonic oscillations | 1,2,3,4 | U, R, E |
| COt -II | Students will be able to explain various phenomena of daily life based on acoustic and optics | 1,2,3,4,5 | U, R, Ap, E |
| COt -III | Students will be able to understand interference and its | 1,2,3,6 | R, U, Ap, |

| | applications | | An, E |
|---|---|---|---|
| COt -IV | Students will understand diffraction and be able to outline the use of optical instruments depending on diffraction. Will be able to apply Rayleigh's criterion to optical instruments | 1,2,3,4,5 | R, U, An, Ap, E, C |
| COt -V | Students will understand polarization, double refraction in anisotropic media and will be able to make use of optical instruments depending on polarization. Will be able to apply Huygen's principle to the phenomenon of polarization | 1,2,3,4,5 | U, An, Ap, E, R |

COb- Course Objective; COt – Course Outcome; R- Remember; U- Understand; Ap – Apply; An – Analyse; E- Evaluate; C – Create

<div align="center">

**UNIT-I**         **[No. of Lectures: 12]**

**Waves**

</div>

**1.1 Superposition of Two Collinear Harmonic Oscillations:**

Linearity and Superposition Principle- (i) Oscillations having equal frequencies and (ii) Oscillations having different frequencies (Beats).

**1.2 Superposition of Two Perpendicular Harmonic Oscillations:**

Graphical and Analytical Methods; Lissajous Figures (1:1 and 1:2 frequency ratio) and

their uses**.**

**1.3 Wave Motion :**

Transverse wave in Stretched string ; Travelling and standing waves; Normal modes of string; Phase velocity; Group velocity ; Plane and Spherical waves; wave intensity.

**Keywords/Tags:** Harmonic Oscillation, Superposition Principle, Wave Motion.

<div align="center">

**UNIT-II**         **[No. of Lectures: 12]**

**Sound and Light Waves**

</div>

**2.1 Sound:** Simple harmonic motion; Forced vibrations and resonance; Fourier Theorem; Application to saw tooth wave and square wave; Intensity and loudness of sound; Decibels, Intensity levels; Musical notes; Musical scale.

2.2 **Acoustics of buildings:** reverberation and time of reverberation; Absorption coefficient; Sabine's formula; Measurement of reverberation time; Acoustic aspects of halls and auditoria

2.3 **Wave optics:** Electromagnetic nature of light; Wave front; Huygens Principle.

2.4 Electro-optic, Magneto-optic and acousto-optic effects (elementary idea)

**Keywords/Tags**: Sound, Musical notes, Acoustics of buildings, Wave optics

## UNIT-III      [No. of Lectures: 12]

### Interference of light

1.1 Interference: <mark>Conditions necessary for interference</mark>, Interference by Division of amplitude and division of wavefront; Young's Double Slit experiment; Lloyd's Mirror and Fresnel's Biprism.

1.2 Interference in Thin Films: Stokes' Law; Interference in parallel and wedge-shaped films; Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes); Applications of thin films interference: Antireflection coating; Dielectric Mirrors; Interference filter.

1.3 Newton's Ring: Measurement of wavelength and refractive index.

1.4 Michelson's Interferometer: (1) formation of fringes, (2) Determination of wavelength, (3) Wavelength difference, (4) Refractive index, (5) Visibility of fringes.

**Keywords/Tags:** Interference, Thin films interference, Michelson's Interferometer.

## UNIT-IV      [No. of Lectures: 12]

### Diffraction and Polarisation

5.5 **Diffraction**: Distinction between interference and diffraction; Types of diffraction; Distinction between Fresnel and Fraunhofer diffraction.

5.6 Fresnel's diffraction: Fresnel's Assumptions; Huygens Fresnel's Theory; Half period zone.

5.7 Fraunhofer diffraction: Diffraction due to single, N slits; Plane diffraction grating.

5.8 **Polarisation**: Polarized light and its representation; Difference in Polarized and unpolarized light; Types of Polarisation; Application of polarization: Sunglasses; Three-dimensional movies; Photography.

5.9 Production of polarized light: Production of polarized light by reflection, refraction, <mark>double refraction,</mark> scattering and selective absorption; Brewster's Law; Polaroid sheets; Polarizer and analyzer; Malus law.

**Keywords/Tags:** Diffraction, Zone plate, Plane diffraction grating Polarized light.

### Learning Resources

### Text Books, Reference Books, Other resources

### Suggested Readings:

1. **Fundamentals of Optics**, F.A. Jenkins and H.E. White,1996 ,McGraw Hill.
2. **The Physics of Waves and Oscillations,** N. K. Bajaj, 1998, McGraw Hill.
3. **Principles of Optics,** B. K. Mathur , 1995,Gopal Printing

4. **University Physics,** F.W. Sears, M.W.Zemansky and H.D.Young1986, Addison Wesley
5. **Optics,** A.K.Ghatak ,McGraw Hill
6. **Principles of Optics,** Max Born and Wolf ,Pregmon Press
7. **Optics and Atomic Physics,** D.P.Khandelwal Himalaya Publication
8. **Optics,** Brijlal and Subramaniyam , S.Chand Publications
9. **Physics for Degree Students,** C. L. Arora and P.S. Hemne, S.Chand Publications.
10. **The Physics of Vibrations and Waves,** H. J Pain, 2013 John Wiley and Sons,
11. **Fundamental of Optics,** A Kumar., H. R Gulati. and D. R Khanna., S. Chand Publications

**Suggested equivalent online courses:**

1. https://youtu.be/olTD-mpsU4E  Waves and Oscillations by Prof. M S Santhanam, Department of Physics, IISER Pune.

2. https://youtu.be/SUVXHfUVSY Video Demonstrations in Laser and Optics by Professor Shaoul Ezekiel, MIT.

## Evaluation Scheme:
**Internal Assessment:** 15+15+10 =40 Marks
**Main (End Semester) Written Exam:** 60 Marks
**Total**                    : 100 Marks
**Written Exam**: 3 hours
**Very Short answer type question (50 words)**  : 5 Marks (05 X 01= 05 Marks)
**Short answer type question (200 words)**        : 10 Marks (05 X 02= 10 Marks)
**Long answer type question (500 words)**        : 45 Marks (05 X 9 = 45 Marks)

## List of Experiments

**Credit Value: 1**

**No. Of Practical hours: 15**

**1.** To determine the dispersive power of the material of prism using spectrometer.

**2.** To plot the i-δ curve for a given prism using spectrometer and then determines the refractive index of the material of the prism.

**3.** To determine the wavelength of main spectral lines of mercury light with the help of plane transmission grating.

**4.** To determine the wavelength of monochromatic light source with the help of Newton's ring method.

**5.** To determine the radius of curvature of a Plano-convex lens with the help of Newton's ring method.

**6.** To determine the wavelength of monochromatic light source using Fabry Perot Etalon.

**7.** To determine the dispersive power of plane transmission grating.

8. To determine the resolving power of grating.

9. To determine the diameter / thickness of a thin wire by diffraction method

10. Study of diffraction at Straight edge.

11. To determine the resolving power of telescope.

12. To determine the polarising angle of the prism and to determine the refractive index of the material of prism using Brewster's law.

13. To determine wavelength of sodium light using Fresnel Biprism.

14. To determine the specific rotation of a given sugar solution by bi-quartz polarimeter.

15. To determine the refractive indices of O-ray and E-ray for calcite prism using spectrometer.

16. To determine the refractive indices of O-ray and E-ray for quartz prism using spectrometer.

17. Study of Laser holography and Interferometry. **(SPONSARED BY DBT STAR)**

18. Study of Malus Law. **(SPONSARED BY DBT STAR)**

19. To study Lissajous Figures with the help of CRO

20. Verification of Faraday's law. **(SPONSARED BY DBT STAR)**


## Other experiments of the same difficulty level may be added.
## Student needs to perform at least 06 experiments.


### Learning Resources

**Suggested Readings:**

1. Prakash I. & Ramakrishna, "**A Text Book of Practical Physics**", Kitab Mahal, 2011,11/e.
2. Squires G. L., **"Practical Physics"**, Cambridge University Press, 2015, 4/e.
3. Flint B. L. and Worsnop H. T., "**Advanced Practical Physics for students**", Asia Publishing House, 197.
4. Chattopadhyay D. & Rakshit P. C., "**An Advanced Course in Practical Physics**", New Central Book Agency.
5. Chattopadhyay D., Rakshit P.C. and Saha B., "**An Advanced Course in Practical Physics**", New Central Book Agency P. Ltd.
6. Singh S.P., "Advanced Practical Physics", Pragati Prakashan.
7. Tayal D. C., "**University Practical Physics**", Himalaya Publishing House
8. Kumar P. R. Sasi, " **Practical Physics**", PHI Publication
9. Srivastava Anchal, Shukla R. K., "**Practical Physics**", New Age International Publishers.
10. Agarwal D. C., "**Experimental electronics**", Technical Publishing House.
11. Srivastava J. P., "**Elements of Solid state Physics**", PHI Publication.

12. Instruction Manual for doing experiments in Physics by R.Shrinivasan and K.R. Pariolkar

**Suggestive digital platforms web links**

1. https:/www.vlab.co.in/broad-area-physical-sciences , Virtual Labs (Physical Sciences),Ministry of Education

2. [https://storaye.yoouleapis.com/uniguecourses/online](https://storaye.yoouleapis.com/uniguecourses/online). html, SWAYAM Online Courses

## Evaluation Scheme: Practical Examination

(A) **Internal Assessment** :

| | |
|---|---|
| **Question answer during class (Oral)** | **:** 15 Marks |
| **Attendance** | : 10 Marks |
| **Assignment/Presentation/Sessional viva :** | 15 Marks |
| **Total (Each Paper)** | : 40 Marks |

**(B)** Ex**ternal Assessment** :

| | |
|---|---|
| **Practical Viva** | : 15 Marks |
| **Practical File/Record** | : 05 Marks |
| **Experimental work** | : 40 Marks |
| **Total ( Each Paper)** | **:** 60 Marks |
| **Grand Total** | : 100 Marks |
| **Min. Passing Marks** | :35 Marks |

**Mode of Evaluation**: Digital Assignments, Quiz, CCE, Presentation, Tutorial, Class / Lab Activity, Final examination.

**B.Sc IV Sem**

**2023-24**

**(Electricity, Magnetism and Electromagnetic theory)**

**Major & Minor**

**Course Code: S2-PHYS2T**

**Pre-requisite: To study this course, the student must have passed B.Sc. III Sem with Physics.**

**Max. Marks: 40+60**
**Min. Passing Marks: 35**
**Credit Value: 4 (60 hrs)**

## Course Objective

**The objectives of the course are:**

|  | **Course Objectives** | **Cognitive Level** |
|---|---|---|
| CO -I | To study electrostatics, Gauss's theorem and its application, to arrive at various mathematical models in electrostatics. | U, R, E, Ap |
| CO -II | To understand Magnetostatistics with emphasis on Lorentz force, Biot-Savart law ant its application, Ampere's law, free and bound currents, magnetic substances. | U, Ap, R, E |
| CO -III | To understand steady and ac, dc current circuits and various network theorem. | R, U,  C |
| CO -IV | To understand the motion of charged particles in electric and magnetic fields, the relevant equipment's and their use | U, R, Ap |
| CO -V | To understand electrodynamics with emphasis on Faraday's laws, Maxwell equations and their application, Fresnel's equations. | U, R, Ap, C |
| CO -VI | To study electromagnetic waves with emphasis on, reflection, refraction and polarization at different media. | U, Ap, E, C, An |

## Course Learning Outcome

| **CO No.** | **Course Learning Outcomes** | **PSOs Addressed** | **Cognitive Level\*** |
|---|---|---|---|

| CLO -I | The student will arrive at an understanding of electrostatics, Gauss's theorem, Gauss's law and their application, | 1,2,3,4 | U, R, E, Ap |
|---|---|---|---|
| CLO -II | The student will arrive at an understanding of Magnetostatistics with emphasis on Lorentz force, Biot-Savart law ant its application, Ampere's law, free and bound currents, magnetization vector, magnetic substances. | 1,2,3,4,5 | U, Ap, R, E |
| CLO -III | The student will arrive at an understanding of steady & non steady current, a-c & dc circuits, and various network theorem. | 1,2,3,4 | R, U, C |
| CLO -IV | The student will arrive at an understanding of the motion of charged particles in electric and magnetic fields, the relevant equipment and their use | 1,2,3,4 | U, R, Ap |
| CLO -V | The student will arrive at an understanding of electrodynamics with emphasis on Faraday's laws, Maxwell equations and their application, Fresnel's equations, | 1,2,3,4 | U, R, Ap, C |
| CLO -VI | The student will arrive at an understanding of electromagnetic waves with emphasis on, reflection, refraction and polarization at different media | 1,2,3 | U, Ap, E, C, An |

CO- Course Objective; CLO – Course Learning Outcome; R- Remember; U- Understand; Ap – Apply;  An – Analyse; E- Evaluate; C – Create

**UNIT-I**                    [**No. of Lectures: 12**]

**Electrostatics**

1. An overview of thermal and hydroelectric power plants in Madhya Pradesh.

2. Electrostatic field; Electric flux; Gauss's theorem of electrostatics; Applications of Gauss theorem: Electric field due to infinite long charged wire; Uniformly charged spherical shell and solid sphere; Charged plate; Conservative nature of electrostatic field Laplace and Poisson's equations; Uniqueness theorem.

3. Dielectrics; Polar and non-polar molecules; Parallel plate capacitor with a dielectric; Electrical susceptibility and dielectric constant; Polarization and Polarization vector (P); Displacement vector (D); Intensity of Electric field (E); Relationship between D, E and P.

4. Gauss's law in dielectrics; Clausius-Mossotti relation, Langevin-Debye formula; Ferroelectric and Paraelectric materials; Hysteresis loop for ferroelectrics.

**Keywords/Tags:.** Hydroelectric power plant, Electrostatic field, Dielectrics, Polarization vector Displacement vector

**Magnetostatics**

1. Lorentz force equation and magnetic field B; Biot-Savart's law; Calculation of magnetic intensity H for solenoid and anchor ring.

2. Ampere's circuital law and its applications for solenoid and Toroid; Basic law of magnetostatics in differential form $\nabla \times B = \mu_0 J$, $\nabla . B = 0$ ; Free and bound currents; Magnetization and magnetization vector **M;** Magnetic permeability and susceptibility; Derivation of $\nabla \times M = J_b$ for a non-uniformly magnetized substance; Relationship between **B, H** and **M.**

3. Diamagnetic, Paramagnetic and Ferromagnetic substances; B-H Curve and Hysteresis loss.

4. General idea about AC and DC motors, Motor winding.

**Keywords/Tags:** Magnetic field, Magnetization, Hysteresis loss, Motor winding.

**UNIT-III**          **[No. of Lectures: 12]**

**Current electricity**

1. Network theorems: Concept of ideal current and voltage sources; Thevenin's theorem; Norton's theorem; Millman's theorem; Maximum power transfer theorem.

2. Transient current: Growth and decay of current in LR circuit; Charging and discharging of a capacitor through resistor; Measurement of high resistance by leakage; Charging and discharging of a condenser through an inductance and resistance.

3. Alternating current: Complex number and their applications in alternating current circuits (RL, RC and LC); Series LCR (acceptor) and parallel LCR (rejector) circuits; Power factor.

4. A.C. bridges: Maxwell's bridge; Owen'sbridge; Anderson's bridge; Kelvin's bridge.

**Keywords/Tags:** Network theorems, Transient current, A.C. bridges.

**UNIT-IV**          **[No. of Lectures: 12]**

**Motion of charged particles in electric and magnetic field**

1. Motion of charged particles in electric and magnetic field, Construction and working principle of Cyclotron and Betatron; Thomson's method for the determination of specific charge (e/m) of electron.

2. Ballistic galvanometer: Torque on a current loop; Current and charge sensitivity; Electromagnetic damping, Logarithmic damping; CDR.

3. Introduction to CRO: Block Diagram of CRO; Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.

4. Electromagnetic induction: Faraday's law; Lenz's law; <mark>Integral and differential forms of Faraday's law,</mark> Self and mutual inductance; Reciprocity theorem; Self-mutual of coil; Mutual inductance of two coils; Energy stored in magnetic field.

**Keywords/Tags:** Motion of charged particles, specific charge, Ballistic galvanometer, CRO, Electromagnetic induction.

<div align="center">

**UNIT-V**            **[No. of Lectures: 12]**

</div>

**Electrodynamics**

1. Equation of Continuity for current; Maxwell's displacement current; Derivation of Maxwell's equations; Poynting theorem.

2. Electromagnetic wave equations; Plane electromagnetic wave in vacuum and dielectric media; Reflection and refraction at a plane boundary of dielectric; Polarization by reflection and Fresnel's equation; Brewster's Law.

3. Electromagnetic Waves in conducting medium; Reflection and refraction of Electromagnetic wave by the ionosphere; Secant law; Skip distance and maximum usable frequency.

**Keywords/Tags:** Displacementcurrent, Poynting vector, Electromagnetic wave, Polarization by reflection.

**Learning Resources**

**Text Books, Reference Books, Other resources**

**Suggested Readings:**

1. Electricity, Magnetism & Electromagnetic Theory: Mahajan S. and Choudhury, ,2012, Tata McGraw.

2. Electricity and Magnetism: Griffiths D.J.,3rd Edn., 1998, Benjamin Cummings.

3. Electricity and magnetism: Murugesan, S. Chand & Co.

4. Feynman Lectures Vol.2: Feynman R. P., Leighton R.B., Sands M., 2008, Pearson Education

5. Electromagnetic field theory: Kshetrimayun R. S., 2012, Cengage Learning.

6. Physics For Degree Students: C.L. Arora and P.S. Hemne, S.Chand Publications.

**7.** Electrodynamics : Gupta, Kumar and Singh, Pragati Prakashan

8.  Electricity and Magnetism : S.S.Atwood, Dover Publication

**Suggested equivalent online courses:**
1.  https://youtu.beiNED2C18u9Q0 Electromagnetic Theory by Prof D.K. Ghosh, Department of Physics, IIT Bombay
2.  https://storaye.yoouleapis.com/uniguecourses/online. html, SWAYAM Online Courses
3.  https://www.vlab.co.in/broad-area-physical-sciences, Virtual Labs (Physical Sciences),

**Evaluation Scheme:**
**Internal Assessment:** 15+15+10 =40 Marks
**Main (End Semester) Written Exam:** 60 Marks
**Total** : 100 Marks

**Written Exam**: 3 hours
**Very Short answer type question (50 words)** : 5 Marks (05 X 01= 05 Marks)
**Short answer type question (200 words)** : 10 Marks (05 X 02= 10 Marks)
**Long answer type question (500 words)** : 45 Marks (05 X 9 = 45 Marks)

**List of Experiments**

**Credit Value: 2**

**No. Of Practical hours: 30**

1)  To study the frequency response curve of series LCR Circuit. and determination of resonant frequency, Quality factor and Band width.
2)  To study the charging and discharging of a capacitor through high resistance.
3)  To determine the frequency of A.C. Mains with the help of wire vibrating under Lorentz force.
4)  To Plot Graph showing variation of magnetic field with distance along axis of a circular coil carrying current.
5)  To draw the B-H curve and determination of Hysteresis loss. (SPONSARED BY DBT STAR)
6)   Determination of voltage, frequency and phase difference using CRO.
7)  Study of sensitivity of CRO.
8)  Verification of the Thevenin's theorem.
9)  Verification of the Norton's Theorem.
10) Verification of the maximum power transfer theorem
11) Verification of the superposition theorem.

12) Measurement of self-inductance using Maxwell's bridge.

13) Measurement of unknown inductance using Kelvin's bridge.

14) Determination of self-inductance by Anderson's bridge.

15) Determination of impedance and power factor using LCR Circuit.

16) To study of frequency response curve of a parallel LCR circuit and determination of anti-resonant frequency and Quality factor.

17) Determination of Dielectric constant of Kerosene by resonance method.

18) Determination of Self Inductance of a Coil by Rayleigh's

19) Method using Ballistic Galvanometer.

20) Verification of Millman's theorem

21) To study the magnetic field along the axis of a circular coil.

22) Determination of M and H using vibrational Magnetometer and Deflection Magnetometer.

23) Comparison of capacity of two capacitors using Ballistic Galvanometer.

24) Serial and Parallel Resonant Circuits (SPONSARED BY DBT STAR)

25) Maxwell's Bridge : Determination of Self-inductance of a coil (SPONSARED BY DBT STAR)

26) Dipole Moment of an organic Molecule Acetone (SPONSARED BY DBT STAR)

27) Measurement of low resistance.(SPONSARED BY DBT STAR)

28) To study the Faraday Effect & to determine Verdet's constant(SPONSARED BY DBT STAR)

29) Study of LCR transient response(SPONSARED BY DBT STAR)

## Other experiments of the same difficulty level may be added.
## Student needs to perform at least 06 experiments.

## Part C-Learning Resources

**Suggested Readings:**

1. Prakash I. & Ramakrishna, "**A Text Book of Practical Physics**", Kitab Mahal, 2011,11/e.

2. Squires G. L., "**Practical Physics**", Cambridge University Press, 2015, 4/e.

3. Flint B. L. and Worsnop H. T., "**Advanced Practical Physics for students**", Asia Publishing House, 197.

4. Chattopadhyay D. & Rakshit P. C., "**An Advanced Course in Practical Physics**", New Central Book Agency.

5. Chattopadhyay **D.,** Rakshit P.C. and Saha B., "**An Advanced Course in Practical Physics**", New Central Book Agency P. Ltd.

6. Singh S.P., "**Advanced Practical Physics**", Pragati Prakashan.

7. Tayal D. C., "**University Practical Physics**", Himalaya Publishing House

8. Kumar P. R. Sasi, " **Practical Physics**", PHI Publication

9. Srivastava Anchal, Shukla R. K., "**Practical Physics**", New Age International Publishers.

10. Agarwal D. C., "**Experimental electronics**", Technical Publishing House.

11. Srivastava J. P., "**Elements of Solid state Physics**", PHI Publication.

12. Advanced Practical Physics (Vol. 1 & Vol. 2) B.Ghosh and K.G.Mazumder, Sreedhar Publ.

13. Instruction Manual for doing experiments in Physics by R.Shrinivasan and K.R. Pariolkar

**Suggestive digital platforms web links**

https://www.vlab.co.in/broad-area-physical-sciences, Virtual Labs (Physical Sciences),

   Ministry of Education

https://storage.googlecapis.com/uniquecourses/online.html, SWAYAM Online Courses

### Evaluation Scheme: Practical Examination

(A) **Internal Assessment** :
    **Question answer during class (Oral)** **:** 15 Marks
    **Attendance** : 10 Marks
    **Assignment/Presentation/Sessional viva :** 15 Marks
    **Total (Each Paper)** : 40 Marks

(B) Ex**ternal Assessment** :
        **Practical Viva** : 15 Marks
        **Practical File/Record** : 05 Marks
        **Experimental work** : 40 Marks
        **Total ( Each Paper)** **:** 60 Marks
        **Grand Total** : 100 Marks

      **Min. Passing Marks** :35 Marks

**Mode of Evaluation**: Digital Assignments, Quiz, CCE, Presentation, Tutorial, Class / Lab Activity, Final examination.

# B.Sc IV Sem

## 2023-24

## (Electricity, Magnetism and Electromagnetic theory)

### Elective

### Course Code: S2-PHYS2T

**Pre-requisite: To study this course, the student must have passed B.Sc. III Sem with Physics.**

**Max. Marks: 40+60**
**Min. Passing Marks: 35**
**Credit Value: 3 (45 hrs)**

### Course Objective

**The objectives of the course are:**

|  | Course Objectives | Cognitive Level |
|---|---|---|
| CO -I | To study electrostatics, Gauss's theorem and its application, to arrive at various mathematical models in electrostatics | U, R, E, Ap |
| CO -II | To understand Magnetostatistics with emphasis on Lorentz force, Biot-Savart law ant its application, Ampere's law, free and bound currents, magnetic substances | U, Ap, R, E |
| CO -III | To understand steady and a.c, d.c current circuits and various network theorem | R, U, C |
| CO -IV | To understand the motion of charged particles in electric and magnetic fields, the relevant equipment's and their use | U, R, Ap |

## Course Learning Outcome

| CO No. | Course Learning Outcomes | PSOs Addressed | Cognitive Level* |
|---|---|---|---|
| CLO -I | The student will arrive at an understanding of electrostatics, Gauss's theorem, Gauss's law and their application, | 1,2,3,4 | U, R, E, Ap |
| CLO -II | The student will arrive at an understanding of Magnetostatistics with emphasis on Lorentz force, Biot-Savart law ant its application, Ampere's law, free | 1,2,3,4,5 | U, Ap, R, E |

| | | | |
|---|---|---|---|
| | and bound currents, magnetization vector, magnetic substances. | | |
| CLO -III | The student will arrive at an understanding of steady & non steady current, a-c & dc circuits, and various network theorem. | 1,2,3,4 | R, U, C |
| CLO -IV | The student will arrive at an understanding of the motion of charged particles in electric and magnetic fields, the relevant equipment and their use | 1,2,3,4 | U, R, Ap |

CO- Course Objective; CLO – Course Learning Outcome; R- Remember; U- Understand; Ap – Apply;  An – Analyse; E- Evaluate; C – Create

<div align="center">

**UNIT-I**            **[No. of Lectures: 12]**
</div>

**Electrostatics**

5. An overview of thermal and hydroelectric power plants in Madhya Pradesh.

6. Electrostatic  field;  Electric flux;  Gauss's theorem of electrostatics; Applications of Gauss theorem: Electric field due to infinite long charged wire; Uniformly charged spherical shell and solid sphere; Charged plate; Conservative nature of electrostatic field Laplace and Poisson's equations; Uniqueness theorem.

7. Dielectrics; Polar and non-polar molecules; Parallel plate capacitor with a dielectric; Electrical susceptibility and dielectric constant; Polarization and Polarization vector (P); Displacement vector (D); Intensity of Electric field (E); Relationship between D, E and P.

8. Gauss's law in dielectrics; Clausius-Mossotti relation, Langevin-Debye formula; Ferroelectric and Paraelectric materials; Hysteresis loop for ferroelectrics.

   **Keywords/Tags:.** Hydroelectric power plant, Electrostatic field, Dielectrics, Polarization vector Displacement vector

<div align="center">

**UNIT-II**            **[No. of Lectures: 12]**
</div>

**Magnetostatics**

5. Lorentz force equation and magnetic field B; Biot-Savart's law; Calculation of magnetic intensity H for solenoid and anchor ring.

6. Ampere's circuital law and its applications for solenoid and Toroid; Basic law of magnetostatics in differential form $\nabla \times B = \mu_0 J$, $\nabla . B = 0$ **;** Free and bound currents; Magnetization and magnetization vector **M;** Magnetic permeability and susceptibility; Derivation of $\nabla \times M = J_b$  for a non-uniformly magnetized substance; Relationship between **B, H** and **M.**

7. Diamagnetic, Paramagnetic and Ferromagnetic substances; B-H Curve and Hysteresis loss.

8. General idea about AC and DC motors, Motor winding.

**Keywords/Tags:** Magnetic field, Magnetization, Hysteresis loss, Motor winding.

<div align="center">

**UNIT-III**          **[No. of Lectures: 12]**

</div>

### Current electricity

5. Network theorems: Concept of ideal current and voltage sources; Thevenin's theorem; Norton's theorem; Millman's theorem; Maximum power transfer theorem.

6. Transient current: Growth and decay of current in LR circuit; Charging and discharging of a capacitor through resistor; Measurement of high resistance by leakage; Charging and discharging of a condenser through an inductance and resistance.

7. Alternating current: Complex number and their applications in alternating current circuits (RL, RC and LC); Series LCR (acceptor) and parallel LCR (rejector) circuits; Power factor.

8. A.C. bridges: Maxwell's bridge; Owen'sbridge; Anderson's bridge; Kelvin's bridge.

**Keywords/Tags:** Network theorems, Transient current, A.C. bridges.

<div align="center">

**UNIT-IV**          **[No. of Lectures: 12]**

</div>

### Motion of charged particles in electric and magnetic field

5. Motion of charged particles in electric and magnetic field, Construction and working principle of Cyclotron and Betatron; Thomson's method for the determination of specific charge (e/m) of electron.

6. Ballistic galvanometer: Torque on a current loop; Current and charge sensitivity; Electromagnetic damping, Logarithmic damping; CDR.

7. Introduction to CRO: Block Diagram of CRO; Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.

8. Electromagnetic induction: Faraday's law; Lenz's law; Integral and differential forms of Faraday's law, Self and mutual inductance; Reciprocity theorem; Self-mutual of coil; Mutual inductance of two coils; Energy stored in magnetic field.

**Keywords/Tags:** Motion of charged particles, specific charge, Ballistic galvanometer, CRO, Electromagnetic induction.

**Learning Resources**

**Text Books, Reference Books, Other resources**

**Suggested Readings:**

1 **Electricity, Magnetism & Electromagnetic Theory:** Mahajan S. and Choudhury, ,2012, Tata McGraw.

2 **Electricity and Magnetism:** Griffiths D.J.,3rd Edn., 1998, Benjamin Cummings.

3 **Electricity and magnetism**: Murugesan, S. Chand & Co.

4 **Feynman Lectures Vol.2:** Feynman R. P., Leighton R.B., Sands M., 2008, Pearson Education

5 **Electromagnetic field theory:** Kshetrimayun R. S., 2012, Cengage Learning.

6 **Physics for Degree Students:** C.L. Arora and P.S. Hemne, S.Chand Publications.

7 **Electricity and Magnetism** : S.S.Atwood, Dover Publication

**List of Experiments**

**Credit Value: 1**

**No. Of Practical hours: 15**

1. To study the frequency response curve of series LCR Circuit. and determination of resonant frequency, Quality factor and Band width.

2. To study the charging and discharging of a capacitor through high resistance.

3. To determine the frequency of A.C. Mains with the help of wire vibrating under Lorentz force.

4. To Plot Graph showing variation of magnetic field with distance along axis of a circular coil carrying current.

5. To draw the B-H curve and determination of Hysteresis loss. (SPONSORED BY DBT STAR)

6. Determination of voltage, frequency and phase difference using CRO.

7. Study of sensitivity of CRO.

8. Verification of the Thevenin's theorem.

9. Verification of the Norton's Theorem.

10. Verification of the maximum power transfer theorem

11. Verification of the superposition theorem.

12. Measurement of self-inductance using Maxwell's bridge.

13. Measurement of unknown inductance using Kelvin's bridge.

14. Determination of self-inductance by Anderson's bridge.

15. Determination of impedance and power factor using LCR Circuit.

16. To study of frequency response curve of a parallel LCR circuit and determination of anti-resonant frequency and Quality factor.

17. Determination of Dielectric constant of Kerosene by resonance method.

18. Determination of Self Inductance of a Coil by Rayleigh's

19. Method using Ballistic Galvanometer.

20. Verification of Millman's theorem

21. To study the magnetic field along the axis of a circular coil.

22. Determination of M and H using vibrational Magnetometer and Deflection Magnetometer.

23. Comparison of capacity of two capacitors using Ballistic Galvanometer.

24. Serial and Parallel Resonant Circuits (SPONSARED BY DBT STAR)

25. Maxwell's Bridge : Determination of Self-inductance of a coil (SPONSARED BY DBT STAR)

26. Dipole Moment of an organic Molecule Acetone (SPONSARED BY DBT STAR)

27. Measurement of low resistance.(SPONSARED BY DBT STAR)

28. To study the Faraday Effect & to determine Verdet's constant(SPONSARED BY DBT STAR)

29. Study of LCR transient response(SPONSARED BY DBT STAR)

## Other experiments of the same difficulty level may be added.
## Student needs to perform at least 06 experiments.

**Suggested Readings:**

14. Prakash I. & Ramakrishna, "**A Text Book of Practical Physics**", Kitab Mahal, 2011,11/e.

15. Squires G. L., "**Practical Physics**", Cambridge University Press, 2015, 4/e.

16. Flint B. L. and Worsnop H. T., "**Advanced Practical Physics for students**", Asia Publishing House, 197.

17. Chattopadhyay D. & Rakshit P. C., "**An Advanced Course in Practical Physics**", New Central Book Agency.

18. Chattopadhyay **D.,** Rakshit P.C. and Saha B., "**An Advanced Course in Practical Physics**", New Central Book Agency P. Ltd.

19. Singh S.P., "**Advanced Practical Physics**", Pragati Prakashan.

20. Tayal D. C., "**University Practical Physics**", Himalaya Publishing House

21. Kumar P. R. Sasi, " **Practical Physics**", PHI Publication

22. Srivastava Anchal, Shukla R. K., "**Practical Physics**", New Age International Publishers.

23. Agarwal D. C., "**Experimental electronics**", Technical Publishing House.

24. Srivastava J. P., "**Elements of Solid state Physics**", PHI Publication.

25. Advanced Practical Physics (Vol. 1 & Vol. 2) B.Ghosh and K.G.Mazumder, Sreedhar Publ.

26. Instruction Manual for doing experiments in Physics by R.Shrinivasan and K.R. Pariolkar

**Suggestive digital platforms web links**

https://www.vlab.co.in/broad-area-physical-sciences, Virtual Labs (Physical Sciences),

 Ministry of Education

https://storage.googlecapis.com/uniquecourses/online.html, SWAYAM Online Courses

### Evaluation Scheme: Practical Examination

(A) **Internal Assessment** :
    **Question answer during class (Oral)** **:** 15 Marks
    **Attendance** : 10 Marks
    **Assignment/Presentation/Sessional viva :** 15 Marks
    **Total (Each Paper)** : 40 Marks

(B) Ex**ternal Assessment** :
    **Practical Viva** : 15 Marks
    **Practical File/Record** : 05 Marks
    **Experimental work** : 40 Marks
    **Total ( Each Paper)** **:** 60 Marks
    **Grand Total** : 100 Marks

    **Min. Passing Marks** :35 Marks

**Mode of Evaluation**: Digital Assignments, Quiz, CCE, Presentation, Tutorial, Class / Lab Activity, Final examination.

# Course Title: Electrical Technology (Module I)
# Course Type: Vocational
### 2023-24

**Pre-requisite (if any):** To study this course, a student must have had the subject Science in class10th.

**Course Learning outcomes (CLO) On completion of this course, learners will be able to:**

1. To understand maintenance of electrical equipment

2. Able to safe himself from any electrical shock

3. Able to work in Service centre to repair latest useful domestic and office use equipment

**Expected Job role /career opportunity: After completing this course**

1. Student can work in Electric goods shops and service centres.

2. He can start his own Electric goods shops

3. He can start Electric goods repair service by investing vary small fund.

**Credit Value:** 4(60 hrs)

# Unit 1

**1 Current Electricity:**

Electricity as a source of energy, definition of resistance, voltage, current power, Energy and their units, relation between electrical, mechanicaland thermal units, factors affecting resistance of a conductor, temperature co-efficient of resistance, principle of thermostat, difference between AC and DC voltage and current

**2. D.C Circuits :**

Ohm's Law, series- parallel resistance circuits, calculation of equivalent resistance,

Kirchoff's Laws and their applications.

**3. Electric Cells:**

Primary cell, wet cell, dry cell, batteries , series and parallel connections of cells, secondary cells, Lead acid cell, Discharging and . recharging of cells, common charging methods preparation of electrolyte, care and maintenance of secondary cells.

## 4. Heating and Lighting Effects of Current :

Joule's Law of electric heating and its domestic applications, heating efficiency, lighting effect of electric current, filaments used in lamps, and gaseous discharge lamps, their working and applications.

## 5. Capacitor :

Capacitor and its capacity, concept of charging and discharging of capacitors, types of capacitors and their use in circuits series and parallel connection of capacitors, Energy stored in a capacitor.

# Unit 2

## 1. Electromagnetic Effects

Permanent magnets and electromagnets, their construction and use, polarities of an electromagnet and rules of finding them Faraday's Lawof Electromagnetic induction, dynamically induced e.m.f, its magnitude and induction, Static induction, self-induced e.m.f, its magnitude and direction, inductance and its unit, mutually induced e.m.f, its magnitude n direction, Energy stored in an inductance.

Force acting on a current carrying conductor in magnetic field, its magnitude and direction, torque produced on a current carrying coil in magnetic field, principles and construction of dynamo. A.C and D.C motor, construction and working of single phase motor, principle of transformer and its type.

## 2. A.C Circuits

Generation of A.C voltage, its generation and wave shape. Cycle, frequency, peak value (maximum value), average value, instantaneous value, R.M.S value form factor, crest factor, phase , phase difference , power and power factor, A.C Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C series circuits

### Part C-Learning Resources

**Text Books, Reference Books, Other resources**

Suggested Readings:

1. Tata M.CGraw HilI,2004 ,Electc circuits, Schaum'soutline series ,.Nasar S.A

2. Nahvi M. and Edminister J., Electrical Circuits, Schaum's Outline Series, Tata McGraw Hill 2005 .

3. Chakrabarti A., Circuit theory, Dhanpat Rai & Co.

4. Tharaja **B.L.,** A Textbook of Electrical Technology volume 1. S Chand and Company New Delhi, 2005.

5. Mehta V.K, Mehta Rohit, Principle of Electrical Engineering. S Chand and Company New Delhi, 2005.

6. Gupta J.B,Text book of Electrical Technology, SK Kalaria and sons, 2012.

7. Kulshreshtra D.C, Basic Electrical Engineering, McGraw Hill first edition.

# Part D-Assessment and Evaluation

**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100

Continuous Comprehensive Evaluation (CCE) Marks: 30

Main Exam Marks: 70

| Internal Assessment Continuous Comprehensive Evaluation (CCE): | Total Marks :30 |
|---|---|
| External Assessment | Total Marks :70 |

## Practical (Vocational)

1. Manufacturing of series lighting
2. Study about safety measure and tools
3. Fan repairing and its study
4. Mixer repairing and its study
5. Geezer repairing and its study
6. Cooler repairing and its study
7. Invertor repairing and its study
8. Electrical iron repairing and its study
9. Electric kettle repairing and its study
10. Induction cooker repairing and its study
11. Water purifier repairing and its study
12. Solar panel maintenance - Basic knowledge
13. Study of MCB , ELCB
14. To find out unknown resistance
15. Soldering of wire by using soldering rod.

16. To detect and fix the problem in Doorbell.

17. To detect and fix the problem in Blender.

18. To understand the working and fix the problem in Regulator.

19. To detect and fix the problem in Mosquito Racquet.

20. To learn the working of Heater and how to construct it.

21. To detect and fix the problem in Hair Dryer

22. To detect and fix the problem in Heater blower.

## Student needs to perform at least 10 experiments.

**Project / Field trip -** Student will visit Electrical Equipment Service Centres

### Part C-Learning Resources

**Text Books, Reference Books, Other resources**

**Suggested Readings:**

1. Tata M.CGraw HilI,2004 ,Electc circuits, Schaum'soutline series ,.Nasar S.A
2. Nahvi M. and Edminister J., Electrical Circuits, Schaum's Outline Series, Tata McGraw Hill 2005 .
3. Chakrabarti A., Circuit theory, Dhanpat Rai & Co.
4. Tharaja **B.L.,** A Textbook of Electrical Technology volume 1. S Chand and Company New Delhi, 2005.
5. Mehta V.K, Mehta Rohit, Principle of Electrical Engineering. S Chand and Company New Delhi, 2005.
6. Gupta J.B,Text book of Electrical Technology, SK Kalaria and sons, 2012.
7. Kulshreshtra D.C, Basic Electrical Engineering, McGraw Hill first edition.

Suggested equivalent online courses:

National Digital Library —https://ndl.iitkgp.ac.in/
Lectures - https://ocw.mit,edu.index.htm
Video:http://www,youtube.com.c.mitcw.search/query=
circuit/020theory

## Part D-Assessment and Evaluation

## Evaluation Scheme: Practical Examination

(A) **Internal Assessment** : 50 Marks

**(B)** Ex**ternal Assessment** :

**Practical Viva** : 10 Marks

**Experimental work**: 40 Marks

**Total** : 100 Marks

**Min. Passing Marks**: 35