Bachelor of Science
B.Sc. Physics (Semester -III)
(Syllabus effective from the Academic Year 2025-2026)

Course Code	US03MAPHY01	Title of the Course	Optics
Total Credits of the Course	04	Hours per Week	04

Course Objectives	Students will be gaining the basic concept of: 1. the different optical system phenomena. 2. the different optical principles and its applications in optical instruments. 3. the fundamental principles of Interference and Diffraction and itsapplications. 4. polarization and different types of polarized lights. 5. the basic working of Optical fibre system and Optical fibre cable and itsapplications.

Course Content		
Unit	**Description**	**Weightage (%)**
1	**Geometrical Optics:** **Lens System:** Introduction to lenses, Equivalent focal length of two thin lenses, Focal length of the equivalent lens, Distance of equivalent lens from L_2 and L_1, Powers, Cardinal points, Principal point and Principal planes, Focal points and Focal planes, Nodal points and Nodal planes, Construction of image using cardinal points, Newton's formula, Cardinal points of a coaxial system of two thin lenses- object at infinity. **Lens Aberrations:** Introduction, Types of aberration, Spherical aberration, Reducing spherical aberration, Coma, Astigmatism, Curvature of field, Distortion, Chromatic aberration, Chromatic aberration in a lens – Object at infinity and Object at finite distance. **Eyepieces:** Introduction to objective and eyepiece, Huygens eyepiece, Cardinal points of Huygens eyepiece, Ramsden eyepiece, Cardinal points of Ramsden eyepiece, comparison of Ramsden and Huygens eyepiece.	**25%**
2	**Interference and Diffraction:** **Interference:** Introduction, Techniques for obtaining interference, Fresnel's biprism, Experimental arrangement, Determination of wavelength of light, Interference fringes with white light, Lateral displacement of fringes, Lloyd's single mirror, Determination of wavelength, Newton's ring, Condition for bright and dark rings, Circular fringes, Radii of dark fringes, Dark central spot, Determination of wavelength of light, Multiple beam interference, Fabry-Perot interferometer and Etalon, Formation of fringes, Determination of wavelength, Measurement of difference in	**25%**

	wavelength, Lummer and Gehrcke plate. **Diffraction:** Introduction, Distinction between interference and diffraction, Fresnel and Fraunhofer types of diffraction, Diffraction pattern due to a narrow slit, Diffraction due to a narrow wire, Fraunhoffer diffraction at a circular aperture, Fraunhoffer diffraction at double slit, Interference and diffraction maxima and minima	
3	**Polarization:** Introduction, Polarized light, Production of linearly polarized light, Polarization by reflection from dielectric surfaces, Brewster's law, Polarization of refraction-pile of plates, Polarization by scattering, Polarization by selective absorption, Polarization by double refraction, Polaroid sheets, Polarizer and analyzer, Production of linearly polarized light using a polarizer, Detection of linearly polarized light, Malus' law, Anisotropic crystals, Calcite crystal, Optic axis, Principle section, Double refraction in Calcite crystal, o-Ray and e-Ray, Positive crystals and negative crystals, Nicol prism, Retarders or Wave plates, Quarter wave plate, Half wave plate, Babinet compensator-construction, LCDs Specific rotation, Laurent's half shade polarimeter	**25%**
4	**Fibre Optics:** Introduction, Optical fibre, Necessity of cladding, Optical fibre system, Optical fibre cable, Total internal reflection, Propagation of light through an optical fibre, Critical angle of propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Modes of propagation, Classification of optical fibres, Single mode step Index fibre,Multi-mode step index fibre, Graded index fibre, Materials, All glass fibres, All plastic fibres, PCS fibres, Bandwidth, Characteristics of the fibers, Applications, Illumination and image transmission, Optical communications, Medical applications, Military applications, Fibre optic communication system, Merits and demerits of optical fibers	**25%**

Teaching-Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Project Based Learning Flipped Classroom Concept Mapping

Evaluation Pattern		
Sr. No.	**Details of the Evaluation**	**Weightage**
1.	Internal Written / Practical Examination	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce,Quizzes, Seminars, Assignments, Attendance	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the different types of optical Lens system and Lens Aberrations and optical instrument Eyepiece.
2.	Understand the Interference and Diffraction laws and determination of wavelength oflight and Fresnel and Fraunhoffer diffraction
3.	Learn About Polarization laws and different related crystal Property and production ofpolarized light and its application like LCD

Reference Books	
Sr. No	**References**
1.	A Textbook of Optics, By N Subrahmanyam, Brij Lal and M N Avadhanulu S Chand and Company Ltd. (25th Edition Reprint 2022)
2.	Optics Ajoy Ghatak, McGraw-Hill Publishing Co. Ltd.
3.	Textbook of Light D N Vasudev Atma Ram and Sons, New Delhi
4.	Fundamental of Optics F A Jenkins and H E White Tata McGraw Hill Book Co. Ltd.

On-line Resources:

https://en.wikipedia.org/wiki/Lens#References
https://www.livephysics.com/problems-and-answers/optics/lens-system-image-distance- magnification/
https://www.thefreedictionary.com/lens+system
https://languages.oup.com/google-dictionary-en
https://www.youtube.com/watch?v=Ib9rCDTOAPU
https://www.youtube.com/watch?v=vZjGa49xfI0
https://www.youtube.com/watch?v=oYFEWoxuB1I
https://www.youtube.com/watch?v=8YkfEft4p-w
https://www.youtube.com/watch?v=GuYX-UWt_bM
https://en.wikipedia.org/wiki/Wave_interference
https://www.olympus-lifescience.com/en/microscope resource/primer/lightandcolor/polarization/
https://en.wikipedia.org/wiki/Optical_fiber

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Bachelor of Science
B.Sc. Physics (Semester -III)
(Syllabus effective from the Academic Year 2025-2026)

Course Code	US03MAPHY02	Title of the Course	Basic Solid-State Electronics
Total Credits of the Course	04	Hours per Week	04

Course Objectives	Students will gain 1. the basic biasing concepts useful for transistor amplifier circuits. 2. understanding of the single and multi-stage transistor amplifiers alongwith h-parameter formulations and coupling mechanism. 3. concept of feedback circuits used in electronic circuits and there by learnvarious electronic oscillator circuits. 4. high-speed switching devices like FET and MOSFET.

Course Content		
Unit	**Description**	**Weightage* (%)**
1	**DC Load Line, Transistor Biasing and Stabilization of Operating Point:** Introduction, Basic CE amplifier circuit, DC load line, Bias a Transistor, Selection of operating point, Need for bias stabilization, Requirement of biasing circuit, Different biasing circuits, Fixed bias circuit, Collector to base bias circuit, Bias circuit with emitter resistor, Voltage divider biasing circuit, Approximate analysis, Accurateanalysis, Emitter bias circuit, PNP transistor biasing circuit	**25 %**
2	**Small Signal Amplifiers, h-parameters and Multi-Stage Amplifiers:** Introduction, Single Stage transistor amplifier, Amplifier performance analysis methods, Graphical method, DC and AC load line, Calculation of gain, input and output phase relationship, Equivalent circuit method, Development of transistor AC equivalent circuit, h-parameter equivalent circuit, Amplifier analysis, Requirement of more than one stages, Gain of multi-stage amplifier, Decibel, Gain of multi-stageamplifier in dB, why dB is used. How to couple two stages, Resistance-Capacitance coupling, Transformer coupling, Directcoupling.	**25 %**
3	**Feedback in Amplifiers and Oscillators:** **Feedback in Amplifiers:** Concepts of feedback in amplifiers, Types of feedback, Voltage gain of feedback amplifier, Advantages of negative feedback, Stabilization of gain, Reduction in distortion and noise, Increase in input impedance, Decrease in output impedance, Increase in bandwidth, Amplifier circuit with negative feedback, RC coupled amplifier without bypass capacitor, Emitter follower	**25 %**

	Oscillators: Need of an oscillator, Classification of oscillators, Tuned circuit for generation of sine waves, Frequency of oscillation in LC circuit, Sustained oscillations, Positive feedback amplifier as an oscillator, The starting voltage, Hartley oscillator, Colpitts oscillator, Basic principles of RC oscillators, Phase shift oscillator, Wien bridge oscillator.	
4	**FET and MOSFET:** **FET:** Basic ideas, Drain curves, Transconductance curves, Biasing in the ohmic region, Biasing in the active region, Transconductance, JFET amplifiers, The JFET analog switch, Other JFET applications (Multiplexing Chopper amplifiers, Voltage control resistance,Automatic gain control). **MOSFET:** The depletion mode MOSFET, The enhancement mode MOSFET, The ohmic region, Passive load switching, Active load switching CMOS.	**25 %**

Teaching-Learning Methodology	Direct Teaching – Chalk & Duster technique Interrogative sessions Teaching using Audio-Visual aids ICT enabled teaching Problem solving Seminar talks Learning through experiment and models Educational Tours

Evaluation Pattern		
Sr. No.	**Details of the Evaluation**	**Weightage**
1.	Internal Written / Practical Examination	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce,Quizzes, Seminars, Assignments, Attendance	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the concepts of Transistor biasing using various biasing circuits
2.	Get familiarize with small signal amplifiers based on h-parameter analysis
3.	Acquire knowledge of Feedback in amplifier circuits and Oscillators
4.	Learn importance of FET and MOSFET in electronic circuits

Reference Books	
Sr. No.	**References**
1.	Basic Electronics and Linear Circuits (2nd Edition) N N Bhargava, D C Kulshreshtha and S C Gupta Tata McGraw Hill Publishing Co. Ltd., New Delhi
2.	Electronic Principles (7th Edition) A P Malvino Tata McGraw Hill Publishing Co. Ltd., New Delhi
3.	Basic Electronics (Solid State) B L Theraja S Chand, New Delhi
4.	Principle of Electronics V K Mehta and Rohit Mehta S Chand & Co., New Delhi

On-line resources:
https://www.freebookcentre.net/Electronics/Solid-State-Devices-Books.html
https://www.electronics-tutorials.ws/amplifier/transistor-biasing.html
https://www.electronics-tutorials.ws/amplifier/amp_2.html https://www.electronics-tutorials.ws/oscillator/oscillators.html https://en.wikipedia.org/wiki/Field-effect_transistor

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Bachelor of Science
B.Sc. Physics (Semester -III)
(Syllabus effective from the Academic Year 2025-2026)

Course Code	US03MAPHY03	Title of the Course	Physics Practical
Total Credits of the Course	04	Hours per Week	08

Course Objectives	The course aims at developing the following abilities in the learner: 1. acquire knowledge and develop understanding of concepts, fundamental laws, principles and processes in the area of physics so that relationship between cause and effects of physical phenomenon can be understood; 2. Experimental skills (like taking observations, manipulation of equipment) and communicative skills such as reporting of observations and experimental result. 3. problems solving ability, e.g., analyzing a situation or data and ensure the justification of results. 4. Scientific temper of mind by making judgment on verified facts and not opinions, by showing willingness to accept new ideas and discoveries.

Course Content	
Description	**Weightage* (%)**
Section A **1.** Determination of 'g' by Kater's pendulum (fixed distance) **2.** 'Y' by Koenig's method **3.** Cardinal points of two lens system **4.** Dispersive curve and power of a prism **5.** Resolving power of a telescope **6.** Determination of wavelength of monochromatic light using Biprism **7.** Velocity of sound by resonance tube **8.** Determination of unknown wavelength of spectra using Hartmann's formula **9.** Determination of specific rotation of optically active substance using Laurent's half shade Polari meter **10.** Numerical differentiation	**50%**
Section B **1.** Load line and determination of Q-point for BJT **2.** Frequency response of a RC coupled amplifier (without feedback) **3.** Study of transformer parameters **4.** Variation of Ic and Vce with temperature for Fixed bias/ Potential divider Circuit **5.** Impedance by voltage drop method **6.** Inductance L by Maxwell's bridge **7.** Study of L-C-R series resonance circuit **8.** RC Phase shift oscillator **9.** Planck's constant 'h' using photocell **10.** Exponential least square fitting	**50%**

Note:

[1] To provide flexibility, up to the maximum of **20%** of total experiments can bereplaced/added by college to this list prepared by the Board of Studies.

[2] A minimum of **80%** experiments must be performed in practical course.

[3] To maintain uniformity in assessment of practical examination the below mentionedmarks distribution pattern is followed:

Sr. No.	Work done	Weightage as per 100 Marks
1.	Writing Principle / Statement/ Formula with explanation of symbols and units	16 Marks
2.	Diagram/Circuit Diagram / Expected Graph	16 Marks
3.	Setting up of the experiment + Tabular Columns + taking readings	28 Marks
4.	Calculations (explicitly shown) + Graph	20 Marks
5.	Accuracy of results with units	08 Marks
6.	Round the year Performance/ Records (to be valued at the time of practical Examination through oral viva)	12 Marks
		100 Marks

Note:

- Weightage of both the sections A and B are 50%. Students are required to obtain 40% of total marks.
- Wherever explicit setting up of experiments does not exist like in the case of spectral charts or pre–acquired data is involved, the marks for setting up of experiment may be provided for additional graphs and formulae.

Teaching-Learning Methodology	Direct Teaching through Demonstration, Chalk-Walk and Talk ICT enabled teaching Question-Answer Group discussion led by teacher/students Problem solving activities Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Viva voce Blended Learning designs

Evaluation Pattern		
Sr. No.	**Details of the Evaluation**	**Weightage**
1.	Internal Written / Practical Examination	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce,Quizzes, Seminars, Assignments, Attendance	15%
3.	University Examination	70%

Course Outcomes: On the successful completion of the course, the students will be able to	
1.	Apply the various procedures and techniques for the experiments.
2.	Use the different measuring devices and meters to record the data with precision
3.	Apply the mathematical concepts/equations to obtain quantitative results
4.	Develop basic communication skills through working in groups in performing thelaboratory experiments and by interpreting the results.

Reference Books	
Sr. No.	**References**
1.	Advanced Practical Physics for students B. L. Worsnop and H. T. Flint Methuen and Co, Ltd., London.
2.	B. Sc. Practical Physics C. L. Arora S. Chand & Co. Ltd., New Delhi.
3.	Advanced Practical Physics M. S. Chauhan and S. P. Singh Pragati Prakashan, Meerut.
4.	Advanced Practical Physics S. L. Gupta and V. Kumar Pragati Prakashan, Meerut.

On-line resources to be used if available as reference material
On-line Resources:
https://www.futurelearn.com/courses/teaching-practical-science-physics

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Bachelor of Science
B.Sc. Physics (Semester -III)
(Syllabus effective from the Academic Year 2025-2026)

Course Code	US03IDPHY01	Title of the Course	Optical Physics
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	Students will be gain the basic concept of: **1.** the different optical principles and its applications in optical instruments. **2.** the fundamental principles of Interference and Diffraction and itsapplications. **3.** polarization and different types of polarized lights.

Course Content		
Unit	**Description**	**Weightage (%)**
1	**Interference and Diffraction:** **Interference:** Introduction, Techniques for obtaining interference, Fresnel's biprism, Experimental arrangement, Determination of wavelength of light, Interference fringes with white light, Lateral displacement of fringes, Lloyd's single mirror, Determination of wavelength, Newton's ring, Condition for bright and dark rings, Circular fringes, Radii of dark fringes, Dark central spot, Determination of wavelength of light, Multiple beam interference, Fabry-Perot interferometer and Etalon, Formation of fringes, Determination of wavelength, Measurement of difference in wavelength, Lummer and Gehrcke plate. **Diffraction:** Introduction, Distinction between interference and diffraction, Fresnel and Fraunhofer types of diffraction, Diffraction pattern due to a narrow slit, Diffraction due to a narrow wire, Fraunhoffer diffraction at a circular aperture, Fraunhoffer diffraction at double slit, Interference and diffraction maxima and minima	**50%**
2	**Polarization:** Introduction, Polarized light, Production of linearly polarized light, Polarization by reflection from dielectric surfaces, Brewster's law, Polarization of refraction-pile of plates, Polarization by scattering, Polarization by selective absorption, Polarization by double refraction, Polaroid sheets, Polarizer and analyzer, Production of linearly polarized light using a polarizer, Detection of linearly polarized light, Malus' law, Anisotropic crystals, Calcite crystal, Optic axis, Principle section, Double refraction in Calcite crystal, o-Ray and e-Ray, Positive crystals and negative crystals, Nicol prism, Retarders or Wave plates, Quarter wave plate, Half wave plate, Babinet compensator-construction, LCDs Specific rotation, Laurent's half shade polarimeter,	**50%**

Teaching-Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Case Studies Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Project Based Learning Flipped Classroom Blended Learning designs Concept Mapping

Evaluation Pattern		
Sr. No.	**Details of the Evaluation**	**Weightage**
1.	Internal Written / Practical Examination	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce,Quizzes, Seminars, Assignments, Attendance	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the Interference and Diffraction laws and determination of wavelength of light and Fresnel and Fraunhoffer diffraction
2.	Learn About Polarization laws and different related crystal Property and production ofpolarized light and its application like LCD

Reference Books	
Sr. No	**References**
1.	A Textbook of Optics, By N Subrahmanyam, Brij Lal and M N Avadhanulu S Chand and Company Ltd. (25th Edition Reprint 2022)
2.	Optics Ajoy Ghatak, McGraw-Hill Publishing Co. Ltd.
3.	Textbook of Light D N Vasudev Atma Ram and Sons, New Delhi
4.	Fundamental of Optics F A Jenkins and H E White Tata McGraw Hill Book Co. Ltd.

On-line resources to be used if available as reference material
On-line Resources
https://en.wikipedia.org/wiki/Lens#References This website contains Lens Basics laws and its different rules and Type of lenses and itsworking
https://www.livephysics.com/problems-and-answers/optics/lens-system-image-distance- magnification/ Live conversation about lens and its laws problems and answers
https://www.thefreedictionary.com/lens +system This website contains a glossary of Lens system
https://languages.oup.com/google-dictionary-en Dictionary
https://www.youtube.com/watch?v=Ib9rCDTOAPURelated videos of Huygens eyepiece https://www.youtube.com/watch?v=vZjGa49xfI0 Related videos of Ramsden eyepiece https://www.youtube.com/watch?v=oYFEWoxuB1IRelated videos of Interference and Diffraction
https://www.youtube.com/watch?v=8YkfEft4p-w Related videos of Polarization
https://www.youtube.com/watch?v=GuYX-UWt_bMRelated videos of fibre Optics
https://en.wikipedia.org/wiki/Wave_interferenceBasic information about Interference
https://www.olympus-lifescience.com/en/microscope resource/primer/lightandcolor/polarization/ polarization of light
https://en.wikipedia.org/wiki/Optical_fiberFibre Optics

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Bachelor of Science
B.Sc. Physics (Semester -III)
(Syllabus effective from the Academic Year 2025-2026)

Course Code	US03IDPHY02	Title of the Course	Physics Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives	The course aims at developing the following abilities in the learner: **1.** acquire knowledge and develop understanding of concepts, fundamental laws, principles and processes in the area of physics so that relationship between cause and effects of physical phenomenon can be understood; **2.** Experimental skills (like taking observations, manipulation of equipment) andcommunicative skills such as reporting of observations and experimental result. **3.** problems solving ability, e.g., analyzing a situation or data and ensure the justification of results. **4.** Scientific temper of mind by making judgment on verified facts and not opinions, by showing willingness to accept new ideas and discoveries.

Course Content	
Description	**Weightage* (%)**
1. Determination of 'g' by Kater's pendulum (fixed distance) **2.** Dispersive curve and power of a prism **3.** Resolving power of a telescope **4.** Velocity of sound by resonance tube **5.** Determination of unknown wavelength of spectra usingHartmann's formula **6.** Numerical differentiation **7.** Study of transformer parameters **8.** Inductance L by Maxwell's bridge **9.** Study of L-C-R series/parallel resonance circuit **10.** Planck's constant 'h' using photocell **11.** Exponential least square fitting	**100%**

Note:

1. To provide flexibility, up to the maximum of 20% of total experiments can be replaced/ added by college to this list prepared by the Board of Studies.
2. A minimum of 80% experiments must be performed in practical course.
3. To maintain uniformity in assessment of practical examination the below mentioned marks distribution pattern is followed:

Sr. No.	Work done	Weightage as per 100 Marks
1.	Writing Principle / Statement/ Formula with explanation of symbols and units	08 Marks
2.	Diagram/Circuit Diagram / Expected Graph	08 Marks
3.	Setting up of the experiment + Tabular Columns + taking readings	14 Marks
4.	Calculations (explicitly shown) + Graph	10 Marks
5.	Accuracy of results with units	04 Marks
6.	Round the year Performance/ Records (to be valued at the time of practical Examination through oral viva)	06 Marks
		50 Marks

Note:

- Wherever explicit setting up of experiments does not exist like in the case of spectral charts or pre–acquired data is involved, the marks for setting up of experiment may be provided for additional graphs and formulae.

Teaching-Learning Methodology	Direct Teaching through Demonstration, Chalk-Walk and Talk ICT enabled teaching Question-Answer Group discussion led by teacher/students Problem solving activities Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Viva voce Blended Learning designs

Evaluation Pattern		
Sr. No.	**Details of the Evaluation**	**Weightage**
1.	Internal Written / Practical Examination	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce,Quizzes, Seminars, Assignments, Attendance	15%
3.	University Examination	70%

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Course Outcomes: On the successful completion of the course, the students will be able to	
1.	Apply the various procedures and techniques for the experiments.
2.	Use the different measuring devices and meters to record the data with precision
3.	Apply the mathematical concepts/equations to obtain quantitative results
4.	Develop basic communication skills through working in groups in performing thelaboratory experiments and by interpreting the results.

Reference Books	
Sr. No.	**References**
1.	Advanced Practical Physics for students B. L. Worsnop and H. T. Flint Methuen and Co, Ltd., London.
2.	B. Sc. Practical Physics C. L. Arora S. Chand & Co. Ltd., New Delhi.
3.	Advanced Practical Physics M. S. Chauhan and S. P. Singh Pragati Prakashan, Meerut.
4.	Advanced Practical Physics S. L. Gupta and V. Kumar Pragati Prakashan, Meerut.

On-line resources to be used if available as reference material

On-line Resources:

https://www.futurelearn.com/courses/teaching-practical-science-physics

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Bachelor of Science
B.Sc. Physics (Semester -III)
(Syllabus effective from the Academic Year 2025-2026)

Course Code	US03SEPHY01	Title of the Course	Instrumentation and Transducers
Total Credits of the Course	02	Hours per Week	02

Course Objectives	
	1. To learn the construction, working principle and applications of Cathode Ray Oscilloscope. **2.** To familiarize and acquaint the students with different types of analog transducers used for measurements of various physical parameters such as pressure at different levels.

Course Content		
Unit	**Description**	**Weightage* (%)**
1	**CRO and Transducers** **CRO:** Cathode Ray Oscilloscope, Block diagram of CRO, Applications of CRO: Study of waveforms, measurement of voltages, measurement of current, measurement of frequency, measurement of phase difference. **Transducers**: Analog Transducers: Electromechanical Type Transducer, Potentiometric resistance type, Inductive Type, Capacitive Type transducer.	**50%**
2	**Transducers and Pressure Measurements** **Transducers**: Resistance Strain Gauges, Unbonded Strain Gauge, Bonded Strain Gauge, Resistance Strain Gauge Bridges, Balanced Bridge. Ionization Transducers, Mechano-Electronic Transducer, Opto-Electrical Transducer, Photo-emissive transducer, Photoconductive Transducer, Photo-voltaic Transducer **Pressure Measurements**: Introduction, Moderate Pressure Measurements, Manometers, High Pressure Measurements, Low Pressure (Vacuum) Measurements: McLeod Gauge, Thermal conductivity or Pirani Gauge, Ionization Gauge.	**50%**

Teaching-Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Case Studies Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Project Based Learning Flipped Classroom Blended Learning designs Concept Mapping

Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce,Quizzes, Seminars, Assignments, Attendance	15%
3.	University Examination	70%

Course Outcomes: After the successful completion of the course, the students will be able to

1.	Understand the cathode ray oscilloscope for measurements of various quantities of electrical signals like, frequency, phase and amplitude.
2.	Identify and design the required transducers for measurements of various physical parameters like pressure at different level.

Reference Books

Sr. No.	References
1.	Basic Electronics and Linear Circuits N N Bhargava, D C Kulshreshtha and S C Gupta TMH Publishing Company Limited, New Delhi,
2.	Instrumentation Measurement and Analysis (3rd Edition) B C Nakra and K K Chaudhary Tata McGraw Hill, New Delhi
3.	Modern Electronic Instrumentation and Measurement Techniques W D Cooper and A D Helfrick PHI (Prentice Hall of India) learning Pvt. Ltd, New Delhi
4.	A Basic Electronics (Solid State) B L Theraja S. Chand Pub. Ltd, New Delhi

On-line resources to be used if available as reference material

1. https://www.youtube.com/watch?v=RumzvW_u5zs
2. https://www.youtube.com/watch?v=CeR1F_L4tSo
3. https://www.elprocus.com/cro-cathode-ray-oscilloscope-working-and-application/
4. https://circuitglobe.com/types-of-transducer.html
5. https://www.youtube.com/watch?v=CzafQ5GWz4s
6. https://www.youtube.com/watch?v=lUjBmV4wMtA
7. https://www.youtube.com/watch?v=Dqx1RftB_P0
8. https://www.youtube.com/watch?v=yUDOt5B5M_k
9. https://www.youtube.com/watch?v=L64BN122CxE
10. https://www.youtube.com/watch?v=zxYeJW9v6OU&list=PLwymdQ84KI-w5DwDzqO_4hWsB2Jc4_eBy
11. https://www.lkouniv.ac.in/site/writereaddata/siteContent/20200323174531150 2rajesh_shukla_FIBER_OPTIC_SENSORS.pdf

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Bachelor of Science
B.Sc. Physics Semester III
(Syllabus effective from the Academic Year 2025-2026)

Course Code	US03SEPHY02	Title of the Course	Instrumentation skills in Physics
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	**1.** The aim of this course is to enable the students to acquire the knowledge of design of simple electrical circuits and experience with various electrical, electronic and optical tools. **2.** To understand the basic concept of electricity and digital electronics. **3.** Gain the knowledge of various phenomena using hands on experiments.

Description	Weightage (%)
1. Identifying resistance and capacitance from color code/item code and compare the values using digital multimeter. Series, parallel combination and its value measurement. **2.** Use soldering iron to secure an electrical connection joint. **3.** Determine the characteristics (frequency, peak to peak voltage, rms voltage) of a continuous signal using CRO/ DSO. **4.** Designing electrical circuits having discrete components (R, L, C, diode) **5.** To investigate logic behavior of AND, OR and NOT gates. **6.** Comparison of absorption coefficients of liquids. **7.** Comparison of threshold voltages of color LEDs. **8.** Characteristics of photo conductive materials. **9.** Refractive index of liquid lens. **10.** Charging and discharging of RC circuit. (Theoretical)	100 %

Note:

1. To provide flexibility, up to the maximum of 20% of total experiments can be replaced/added by college to this list prepared by the Board of Studies.
2. A minimum of 80% experiments must be performed in practical course.
3. To maintain uniformity in assessment of practical examination the below mentioned marks distribution pattern is followed:

Sr. No.	Work done	Weightage as per 50 Marks
1.	Writing Principle / Statement/ Formula with explanation of symbols and units	08 Marks
2.	Diagram/Circuit Diagram / Expected Graph	08 Marks
3.	Setting up of the experiment + Tabular Columns + taking readings	14 Marks
4.	Calculations (explicitly shown) + Graph	10 Marks
5.	Accuracy of results with units	04 Marks
6.	Round the year Performance/ Records (to be valued at the time of practical Examination through oral viva)	06 Marks
	Total for Practical	**50 Marks**
Note: Wherever explicit setting up of experiments does not exist like in the case of spectral charts or pre–acquired data is involved, the marks for setting up of experiment may be provided for additional graphs and formulae.		

Teaching Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Case Studies Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Project Based Learning Flipped Classroom Blended Learning designs

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

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

1. Apply the various procedures and techniques for the experiments.
2. Use different measuring devices and meters to record the data with precision.
3. Apply the mathematical concepts/equations to obtain quantitative results.
4. Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

Suggested References:	
Sr. No.	**References**
1.	B.Sc. Practical Physics C L Arora S. Chand & Co. Ltd., New Delhi (2018)
2.	A text book in Electrical Technology; B L Theraja, S. Chand & Co. Ltd., New Delhi
3.	Electronic Devices and Circuits; S. Salivahanan & N. S.Kumar, Tata Mcgraw Hill
4.	Electrical Measurements And Measuring Instruments; R.K. Rajput, (S. Chand)
5.	Basic Electronics; J.B. Gupta, S.K. Kataria & Sons

On-line resources to be used if available as reference material
On-line Resources:
https://www.electronics-tutorials.ws/
https://www.electronicshub.org/tutorials/
http://www.allaboutcircuits.com/
https://nptel.ac.in/courses/115/105/115105110

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