जम्मू केंद्रीय विश्वविद्यालय
Central University of Jammu
राया – सूचानी; बागला, जिला सांबा – 181143 जम्मू; जम्मू एवं कश्मीर
Rahya – Suchani (Bagla), District Samba – 181143, Jammu (J&K)

No. CUJ/Acad./II-14/6/2022 456

01 Aug, 2022

NOTIFICATION No. 118 /2022

Sub: Course Scheme and Syllabus as per NEP-2020 of **Semesters I and II** of **Integrated B.Sc. (Hons.)– M.Sc. Course** in **Physics** w.e.f. Academic Session **2022 – 23** – Reg.

It is hereby notified for the information of all concerned that on the recommendation of the Board of Studies of Department of Physics and Astronomical Sciences and Dean, School of Basic & Applied Sciences, the Hon'ble Vice Chancellor in anticipation of Academic Council has approved the following **Course Scheme** and **Syllabus** as per NEP-2020 of **Semesters I and II** of **Integrated B.Sc.(Hons.) – M.Sc. Course** in **Physics** w.e.f. Academic Session **2022 – 23**:-

Semester – I

Course Code	Course Title	Credit	CIA	MSE	ESE	Max. Marks
	Core Courses					
IPHY1C001T	Mechanics (Theory + Practicals)	4	25	25	50	100
IPHY1C002T	Mathematical Physics-I (Theory + Practicals)	4	25	25	50	100
	Open Elective Courses					
#	Open Elective Course - 1	4	25	25	50	100
#	Open Elective Course - 2	4	25	25	50	100
#	Any course from the approved basket or by MOOC on SWAYAM platform (AEC)*	2	12.5	12.5	25	50
#	Any course from the approved basket or by MOOC on SWAYAM platform (SEC)**	2	12.5	12.5	25	50
Total		**20**	-	-	-	**500**

Semester – II

Course Code	Course Title	Credit	CIA	MSE	ESE	Max. Marks
	Core Courses					
IPHY1C003T	Electricity and Magnetism (Theory + Practicals)	4	25	25	50	100
IPHY1C004T	Waves and Optics (Theory + Practicals)	4	25	25	50	100
	Open Elective Courses					
#	Open Elective Course - 3	4	25	25	50	100
#	Open Elective Course - 4	4	25	25	50	100
#	Any Courses from the approved basket or by MOOC on SWAYAM platform (SEC)**	2	12.5	12.5	25	50
#	Any Courses from the approved basket or by MOOC on SWAYAM platform (VAC)***	2	12.5	12.5	25	50
Total		**20**	-	-	-	**500**

** Ability Enhancement Course (AEC)*
*** Skill Enhancement Course (SEC)*
**** Value Addition Course (VAC)*
# as provided by concerned department / Swayam portal.

List of Open Electives Courses offered by Department of Physics to other Departments								
Sr. No.	Level (UG/PG)	Course Code	Course Name	Nature of Open Elective	Credit	CIA	MSE	ESE	Max. Marks
1.	UG/PG	IPHY1O001T	General Physics-I	OEC	4	25	25	50	100
2.	UG/PG	IPHY1O002T	Renewable Energy and Energy Harvesting	OEC	4	25	25	50	100
3.	UG/PG	IPHY1O003T	Astronomy and Astrophysics	OEC	4	25	25	50	100
4.	UG/PG	IPHY1O004T	Basics of Atmospheric Physics	OEC	4	25	25	50	100
5.	UG/PG	IPHY1O005T	A Course on Matlab	SEC	4	25	25	50	100
6.	UG/PG	IPHY1O006T	Introduction to SciLab	SEC	4	25	25	50	100
7.	UG/PG	IPHY1O007T	Physics Workshop-I	VAC	4	25	25	50	100

01/08/2022

(Dr. Yashwant Singh)
Registrar (I/c)
registrar@cujammu.ac.in
01923-249658

Encl: Syllabus of Semester I and II

To: Head, Department of Physics and Astronomical Sciences

Copy to: Controller of Examinations

जम्मू केंद्रीय विश्वविद्यालय
Central University of Jammu

राया – सूचानी (बागला), जिला सांबा – 181143, जम्मू (जम्मू एवं कश्मीर)
Rahya - Suchani (Bagla), District: Samba – 181143, Jammu (J&K)

संख्या: CUJ/Acad/04-X/2023/ 338

20 जुलाई, 2023

शुद्धिपत्र / CORRIGENDUM

Sub: Course Scheme and Syllabus as per NEP-2020 of Semesters I and II of Integrated B.Sc. (Hons.) – M.Sc. Course in Physics w.e.f. Academic Session 2022-23 – Reg.

Ref: Notification No. 118/2022 dated 01.08.2022

संदर्भ के तहत विश्वविद्यालय अधिसूचना में आंशिक संशोधन में, पाठ्यक्रम कोड IPHY1O005T के साथ पाठ्यक्रम शीर्षक A Course on Matlab, पाठ्यक्रम कोड IPHY1O006T के साथ पाठ्यक्रम शीर्षक Introduction to SciLab और पाठ्यक्रम कोड IPHY1O007T के साथ पाठ्यक्रम शीर्षक Physics Workshop-I को निम्नलिखित के रूप में पढ़ा जाए:

In partial modification to University notification under reference, Course title **A Course on Matlab** with course code **IPHY1O005T**, Course title **Introduction to SciLab** with Course Code **IPHY1O006T**, Course title **Physics Workshop-I** with Course code **IPHY1O007T** may be read as following:

List of Open Elective Courses Offered by Department of Physics and Astronomical Sciences									
Sl. No.	**Level (UG/PG)**	**Course Code**	**Course Title**	**Nature of nature**	**Credit**	**CIA**	**MSE**	**ESE**	**Max. Marks**
			OPEN ELECTIVE COURSES						
1.	UG/PG	IPHY1O005T	A Course on Matlab	SEC	2	12.5	12.5	25	50
2.	UG/PG	IPHY1O006T	Introduction to SciLab	SEC	2	12.5	12.5	25	50
3.	UG/PG	IPHY1O007T	Physics Workshop-I	VAC	2	12.5	12.5	25	50

Rest of the contents of the notification remain same.

20/07/23

प्रो० (डॉ) यशवंत सिंह
कुलसचिव (I/c)
ईमेल: registrar@cujammu.ac.in
दूरभाष: 0191-249658

विभागाध्यक्ष / Head
भौतिकी एवं खगोल विज्ञान विभाग / Department of Physics and Astronomical Sciences

प्रतिलिपि / Copy to:
परीक्षा नियंत्रक / Controller of Examinations

B.Sc.(H)-M.Sc. Physics			
Semester:	II	**Type:**	Core
Course Name:	Electricity and Magnetism	**Course Code:**	IPHY1C003T
Credits:	3	**L T P:**	3-0-0

Course learning outcome: *After going through the course, the student should be able to*

CO1	*Demonstrate Gausslaw, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges.*
CO2	*Explainanddifferentiatethevector(electricfields,Coulomb'slaw)andscalar(electricpotential,electric potential energy)formalisms of electrostatics*
CO3	*Apply Gauss's law of electrostatics to solve a variety of problems*
CO4	*Describe the magnetic field produced by magnetic dipoles and electric currents.*
CO5	*Explain Faraday - Lenz and Maxwelllaws to articulate the relationship between electric and magnetic fields*
CO6	*Understand the dielectric properties, magnetic properties of materials and phenomena of electromagnetic induction*
CO7	*In the laboratory course the student will get an opportunity to verify various laws in electricity and magnetism such as Lenz's law, Faraday's law and learn about the construction, working of various measuring instruments. Student Should be able to verify of various circuit laws, network theorems elaborated above, using simple electric circuits*

Old Syllabus	Rationalized syllabus
Unit-I	**Unit-I**
Electrostatics: Gradient, Divergence, Curl, second derivatives and fundamental theorems for divergence and curl. Electrostatics: Coulomb's law, principle of superposition, Concept of electric field, electric potential, Electric field and potential due to discrete and continuous charge distribution, relation between electric intensity and potential, electric dipole and dipole moment,	Electrostatics: Gradient, Divergence, Curl, second derivatives and fundamental theorems for divergence and curl. Electrostatics: Coulomb's law, principle of superposition, Concept of electric field, electric potential, Electric field and potential due to discrete and continuous charge distribution, relation between electric intensity and potential, electric dipole and dipole moment,
Unit-II	**Unit-II**
Dielectrics: non-polar molecules, Polar molecules, Polar and non-polar molecules in an electric field, polarization,Electric polarization of matter, polarization charges and polarization vector, electric susceptibility Electric polarization vector, Electric field in dielectric, Gauss law in dielectric, Relation between three electric vectors: displacement vector (D), electric vectors (E), and polarization vectors (P).	Dielectrics: non-polar molecules, Polar molecules, Polar and non-polar molecules in an electric field, polarization,Electric polarization of matter, polarization charges and polarization vector, electric susceptibility Electric polarization vector, Electric field in dielectric, Gauss law in dielectric, Relation between three electric vectors: displacement vector (D), electric vectors (E), and polarization vectors (P).

Unit-III

Magnetostatics: Concept of magnetic field,Biot-Savart's law, application of Biot-Savart's law, Ampere's circuital law. Gauss's law of magnetism, Magnetic field: Magnetic field inside a toroid, solenoid, magnetic dipole moment, magnetisation of matter, relation between magnetic field (B), magnetism intensity(H) and magnetization vector (M), Magnetic susceptibility and permeability

Unit-IV

Electromagnetic induction: Magnetic flux, Faraday's experiments, Faraday's law of electromagnetic induction, Lenz's law, Self-induction, Mutual induction, energy stored in a magnetic field, Ballistic galvanometer: current and charge sensitivity, electromagnetic damping, logarithmic damping current density, Equation of continuity, surface charge density, Ohm's law, Relation between current density and resistivity, electric power, electric energy, current and power in an electrical circuit, Joule's law in electricity.

Text and Reference Books:

1. Edward M. Purcell, Electricity and Magnetism, (McGraw-Hill Education).
2. Arthur F. Kip, Fundamentals of Electricity and Magnetism, (Mc Graw-Hill).
3. J.H.Fewkes&John Yarwood, Electricity and Magnetism, (Oxford Univ. Press).
4. David J. Griffiths, Introduction to Electrodynamics, (Benjamin Cummings).

Unit-III

Magnetostatics: Concept of magnetic field,Biot-Savart's law, application of Biot-Savart's law, Ampere's circuital law. Gauss's law of magnetism, Magnetic field: Magnetic field inside a toroid, solenoid, magnetic dipole moment, magnetisation of matter, relation between magnetic field (B), magnetism intensity(H) and magnetization vector (M), Magnetic susceptibility and permeability

Unit-IV

Electromagnetic induction: Magnetic flux, Faraday's experiments, Faraday's law of electromagnetic induction, Lenz's law, Self-induction, Mutual induction, energy stored in a magnetic field,

UNIT-V

Ballistic galvanometer: current and charge sensitivity, electromagnetic damping, logarithmic damping current density, Equation of continuity, surface charge density, Ohm's law, Relation between current density and resistivity, electric power, electric energy, current and power in an electrical circuit, Joule's law in electricity.

Text and Reference Books:

1. Edward M. Purcell, Electricity and Magnetism, (McGraw-Hill Education).
2. Arthur F. Kip, Fundamentals of Electricity and Magnetism, (Mc Graw-Hill).
3. J.H.Fewkes&John Yarwood, Electricity and Magnetism, (Oxford Univ. Press).
4. David J. Griffiths, Introduction to Electrodynamics, (Benjamin Cummings).

B.Sc.(H)-M.Sc. Physics			
Semester:	II	**Type:**	Core
Course Name:	Electricity and Magnetism Lab	**Course Code:**	IPHY1C003L
Credits:	1	**L T P:**	0-0-2

List of Experiments

1. Resistance

(i) To test a diode and transistor using (a) a multimeter and (b) a CRO.

(ii) To measure (a) voltage, (b) frequency and (c) phase difference using a CRO.

(iii) To study the characteristics of a series RC circuit using R, L and C.

(iv) To determine a low resistance by Carey Foster's Bridge.

(v) To determine a low resistance by a potentiometer.

(vi) To determine high resistance by leakage of a capacitor.

2. Ballistic Galvanometer

(i) To determine the (a) charge sensitivity and (b) current sensitivity of B.G.

(ii) To determine the (a) logarithmic decrement and (b) CDR of a B.G.

3. Capacitance

(i) To determine the ratio of two capacitances by de Sauty's bridge.

(ii) To determine the dielectric constant of a dielectric placed inside a parallel plate capacitor using a B.G.

4. Self & Mutual Inductance

(i) To determine self-inductance of a coil by Anderson's bridge using AC.

(ii) To determine self-inductance of a coil by Rayleigh's method.

(iii) To determine the mutual inductance of two coils by absolute method using a B.G.

5. A.C Circuits

(i) To study the response curve of a series LCR circuit and determine its(a) resonant frequency, (b) impedance at resonance and (c) quality factor Q, and (d) band width.

(ii) To study the response curve of a parallel LCR circuit and determine its (a) anti-resonant frequency and (b) quality factor Q.

Text Book sand References:

1. GeetaSanon, B.Sc. Practical Physics, (R.Chand &Co).
2. B.L.Workshop and H.T. Flint, Advanced Practical Physics, (Asia Publishing House, New Delhi).
3. InduPrakash and Ramakrishna, A Text Book of Practical Physics, (Kitab Mahal, New Delhi).
4. D.P. Khandewal, A Laboratory Manual of Physics for Undergraduate Classes, (VaniPublication House, New Delhi).

B.Sc.(H)-M.Sc. Physics			
Semester:	II	Type:	Core
Course Name:	Waves and Optics	Course Code:	IPHY1C004T
Credits:	3	L T P:	3-0-0

Course learning outcome: This course will able the student to

CO 1	*Recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems*
CO 2	*Understand the principle of superposition of waves, so thus describe the formation of standing waves*
CO 3	*Apply basic knowledge of principles and theories about the behavior of light and the physical environment to conduct experiments*
CO 4	*Use the principles of wave motion and superposition to explain the Physics of polarisation, interference and diffraction.*
CO 5	*Understandtheworkingofselectedopticalinstrumentslikebiprism,interferometer, diffractiongrating, and holograms.*
CO 6	*In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. Resolving power of optical equipment can be learnt first hand*

Old Syllabus	Rationalized syllabus
Unit-I	**Unit-I**
Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences. Lissajous Figures with frequency ratio (1:1 and 1:2).	Linearity and Superposition Principle. Superposition of two collinear oscillations having (1) equal frequencies and (2) different frequencies (Beats). Superposition of N collinear Harmonic Oscillations with (1) equal phase differences and (2) equal frequency differences. Lissajous Figures with frequency ratio (1:1 and 1:2).
Plane and Spherical Waves. Longitudinal and Transverse Waves. Travelling Waves. Wave Equation. Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Standing (Stationary) Waves in a String. Normal Modes of Stretched Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes.	**Unit-II**
Unit-II	Plane and Spherical Waves. Longitudinal and Transverse Waves. Travelling Waves. Wave Equation. Velocity of Transverse Vibrations of Stretched Strings. Velocity of Longitudinal Waves in a Fluid in a Pipe. Standing (Stationary) Waves in a String. Normal Modes of Stretched Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes.
Electromagnetic nature of light. Huygens Principle. Temporal and Spatial Coherence. Interference: Division of amplitude and wavefront. Young's double slit, Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' relations. Interference in Thin	**Unit-III**
	Electromagnetic nature of light. Huygens Principle. Temporal and Spatial Coherence. Interference: Division of amplitude and wavefront. Young's double slit, Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' relations. Interference in Thin

Films, Fringes of equal inclination, Fringes of equal thickness, Newton's Rings. Michelson Interferometer, Visibility of Fringes. Fabry-Perot interferometer.

Unit-III

Diffraction: Fraunhofer and Fresnel, Single slit. Circular aperture, Resolving Power of a telescope. Double slit. Multiple slits. Diffraction grating. Resolving power of grating. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire.

Unit-IV

Introduction to polarization, Types of polarization- plane, circular, elliptical. Polarization by reflection of light, Brewster's law, Law of Malus, Polarisation by double refracting uniaxial crystal , Linear polarizer (Polaroid), Fabrication of linear polarizer by Nicol prism.

Text and Reference Books

1. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
2. Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
3. Principles of Optics, Max Born and Emil Wolf, 7thEdn., 1999, Pergamon Press.
4. Optics, AjoyGhatak, 2008, Tata McGraw Hill.
5. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
6. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.

Films, Fringes of equal inclination, Fringes of equal thickness, Newton's Rings. Michelson Interferometer, Visibility of Fringes. Fabry-Perot interferometer.

Unit-IV

Diffraction: Fraunhofer and Fresnel, Single slit. Circular aperture, Resolving Power of a telescope. Double slit. Multiple slits. Diffraction grating. Resolving power of grating. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire.

Unit-V

Introduction to polarization. Types of polarization- plane, circular, elliptical. Polarization by reflection of light. Brewster's law, Law of Malus. Polarisation by double refracting uniaxial crystal . Linear polarizer (Polaroid), Fabrication of linear polarizer by Nicol prism.

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1. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
2. Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
3. Principles of Optics, Max Born and Emil Wolf, 7thEdn., 1999, Pergamon Press.
4. Optics, AjoyGhatak, 2008, Tata McGraw Hill.
5. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
6. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.

B.Sc.(H)-M.Sc. Physics			
Semester:	II	Type:	Core
Course Name:	Waves and Optics Lab	Course Code:	IPHY2C004L
Credits:	1	L T P:	0-0-2

1. Springs

(i) To study the motion of a spring and calculate (a) spring constant (b) value of g, and modulus of rigidity.

(ii) To investigate the motion of coupled oscillators.

2. Melde's Experiment

(i) To determine the frequency of an electricity maintained tuning fork by Melde's experiment.

(ii) To verify λ^2-T law by Melde's experiment.

3. Interference

(i) To determine wavelength of sodium light using Fresnel bi-prism.

(ii) To determine wavelength of sodium light using Newton's rings.

(iii) To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped film.

(iv) To determination wavelength of sodium light Michelson's interferometer.

4. Diffraction

(i) To determine the diameter of a thin wire by studying the diffraction produced by it.

(ii) To determine the wavelength of laser light using diffraction of single slit.

(iii) To determine the wavelength of (1) sodium and (2) mercury light using plane diffraction grating.

(iv) To determine the dispersive power of a plane diffraction grating.

(v) To determine the resolving power of a plane diffraction grating.

(vi) To determine the (1) wavelength and (2) angular spread of He-Ne laser using plane- diffraction grating

(vii) To study the polarization of light by reflection and to determine the polarizing angle for air-glass interface.

(viii) To measure the intensity using photo sensor and laser in diffraction patterns of single and double slits.

Text Books and References:

1. B.L.Workshop and H.T. Flint, Advanced Practical Physics, (Asia Publishing House,New Delhi).
2. InduPrakash and Ramakrishna, A Text Book of Practical Physics, (Kitab Mahal, New Delhi).
3. D. P.Khandewal, A Laboratory Manual of Physics for Undergraduate Classes, (VaniPublication House, New Delhi).

Int. B.Sc.(H)-M.Sc. Physics			
Semester:	1 or 2	**Type:**	Open Elective
Course Name:	Astronomy and Astrophysics	**Course Code:**	IPHY1O002T
Credits:	4	**L T P:**	4-0-0

Old Syllabus	No Change in existing syllabus
Unit-I	**Unit-I**
Observational Data:celestial sphere, geometry of the sphere,spherical Trigonometry, astronomical coordinates-equatorial, horizon, ecliptic and galactic systems of coordinates, conversion from one system of co-ordinates to another; perturbations of coordinates, constellations, sidereal time & solar time, astronomical time systems, calendars.	**Observational Data:**celestial sphere, geometry of the sphere,spherical Trigonometry, astronomical coordinates-equatorial, horizon, ecliptic and galactic systems of coordinates, conversion from one system of co-ordinates to another; perturbations of coordinates, constellations, sidereal time & solar time, astronomical time systems, calendars.
Unit-II	**Unit-II**
Telescopes & instrumentation: Different optical configurations for aastronomical telescopes, mountings, plate scale and diffraction limits. Telescopes for gamma ray, X-ray, UV, IR; radio astronomy, stellarphotometry- solid state, photo-multiplier tube and CCD based photometers, spectroscopy and polarimetry using CCD detectors.	**Telescopes & iinstrumentation:** Different optical configurations for astronomical telescopes, mountings, plate scale and diffraction limits. Telescopes for gamma ray, X-ray, UV, IR; radio astronomy, stellarphotometry- solid state, photo-multiplier tube and CCD based photometers, spectroscopy and polarimetry using CCD detectors.
Unit-III	**Unit-III**
Photometric concepts: intensity, flux density, luminosity, magnitude scale-apparent and absolute magnitude, distance modulus; determination of mass, luminosity, radius, temperature and distance of a star, colour index; **Stellar classification:** Henry-Draper and modern M-K classification schemes, H-R diagram, empirical mass-luminosity relation.	**Photometric concepts:** intensity, flux density, luminosity, magnitude scale-apparent and absolute magnitude, distance modulus; determination of mass, luminosity, radius, temperature and distance of a star, colour index; **Stellar classification:** Henry-Draper and modern M-K classification schemes, H-R diagram, empirical mass-luminosity relation.
Unit-IV	**Unit-IV**
Stars: Ordinary stars, binary stars, variable stars,**Sun:** physical characteristics of sun-basic data, solar rotation, solar magnetic fields, photosphere- granulation, sunspots, Babcock model of sunspot formation, solar atmosphere-chromosphere and corona, **Variable stars:** classes of variable stars, pulsation mechanism, classical cepheids as distance indicators, **Compact Stars:** white dwarfs, neutron stars and black holes.	**Stars:** Ordinary stars, binary stars, variable stars,**Sun:** physical characteristics of sun-basic data, solar rotation, solar magnetic fields, photosphere- granulation, sunspots, Babcock model of sunspot formation, solar atmosphere-chromosphere and corona, **Variable stars:** classes of variable stars, pulsation mechanism, classical cepheids as distance indicators, **Compact Stars:** white dwarfs, neutron stars and black holes.

Unit-V

The Milky Way: Methods of Distance Measurement, Stellar Statistics, Structural Components of the Milky Way, The Rotation of the Milky Way

Galaxies: Classification of Galaxies, the Big Bang theory, the origin and evolution of galaxies

Text Books and References:

1. M. Zeilik, Astronomy-The Evolving Universe, (Cambridge Univ. Press).
2. Morrison, Introduction to Astronomy & Cosmology, (Wiley).
3. C.R. Kitchin, Telescopes and Techniques, (Springer).
4. A.A. Henden& R.H. Kaitchuk, Astronomical Photometry, (William-Bell).
5. E. Budding, An Introduction to Astronomical Photometry, (Cambridge Univ. Press).
6. R.A. Freedman & W.J. Kaufmann, Universe (W.H. Freeman & Co).
7. H. Karttunen et al.,Fundamental Astronomy, (Springer).
8. P.V. Foukal, Solar Astrophysics, (Wiley-VCH).
9. Bhatnagar & W.C. Livingston, Fundamentals of Solar Astronomy, (World Scientific).

Unit-V

The Milky Way: Methods of Distance Measurement, Stellar Statistics, Structural Components of the Milky Way, The Rotation of the Milky Way

Galaxies: Classification of Galaxies, the Big Bang theory, the origin and evolution of galaxies

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1. M. Zeilik, Astronomy-The Evolving Universe, (Cambridge Univ. Press).
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3. C.R. Kitchin, Telescopes and Techniques, (Springer).
4. A.A. Henden& R.H. Kaitchuk, Astronomical Photometry, (William-Bell).
5. E. Budding, An Introduction to Astronomical Photometry, (Cambridge Univ. Press).
6. R.A. Freedman & W.J. Kaufmann, Universe (W.H. Freeman & Co).
7. H. Karttunen et al.,Fundamental Astronomy, (Springer).
8. P.V. Foukal, Solar Astrophysics, (Wiley-VCH).
9. Bhatnagar & W.C. Livingston, Fundamentals of Solar Astronomy, (World Scientific).

B. Sc(H)-M. Sc. Physics			
Semester :	1 or 2	Type:	Open Elective
Course Name:	Basics of Atmospheric Physics	Course Code:	IPHY100041
Credits:	4	L T P:	4-0-0

COURSE OUTCOMES:

After study of this course, students will be able to:

CO 1	*Understand general features of earth's atmosphere*
CO 2	*Learn about the dynamics of atmosphere*
CO 3	*Learn about the RADAR and LIDAR*

Old Syllabus	No Change in existing syllabus
Unit-I	**Unit-I**
General features of Earth's atmosphere	**General features of Earth's atmosphere**
Thermal structure of the Earth's Atmosphere, Composition of atmosphere, Hydrostatic equation. Potential temperature, Atmospheric Thermodynamics, Greenhouse effect, Local winds, monsoons, fogs, clouds, precipitation, Atmospheric boundary layer, Sea breeze and land breeze. Instruments for meteorological observations including RS/RW, meteorological processes and convective systems, fronts, Cyclones and anticyclones, thunderstorms.	Thermal structure of the Earth's Atmosphere, Composition of atmosphere, Hydrostatic equation, Potential temperature, Atmospheric Thermodynamics, Greenhouse effect, Local winds, monsoons, fogs, clouds, precipitation, Atmospheric boundary layer, Sea breeze and land breeze. Instruments for meteorological observations including RS/RW, meteorological processes and convective systems, fronts, Cyclones and anticyclones, thunderstorms.
Unit-II	**Unit-II**
Atmospheric Dynamics:	**Atmospheric Dynamics:**
Scale analysis, Fundamental forces, Basic conservation laws, The Vectorial form of the momentum equation in rotating coordinate system, scale analysis of equation of motion, Applications of the basic equations, Circulations and vorticity, Atmospheric oscillations, Quasi biennial oscillation, annual and semi-annual oscillations, Mesoscale circulations, The general circulations, Tropical dynamics.	Scale analysis, Fundamental forces, Basic conservation laws, The Vectorial form of the momentum equation in rotating coordinate system, scale analysis of equation of motion, Applications of the basic equations, Circulations and vorticity, Atmospheric oscillations, Quasi biennial oscillation, annual and semi-annual oscillations, Mesoscale circulations, The general circulations, Tropical dynamics.
Unit-III	**Unit-III**
Atmospheric Waves	**Atmospheric Waves**
Surface water waves, wave dispersion, acoustic waves, buoyancy waves, propagation of atmospheric gravity waves (AGWs) in a nonhomogeneous medium, Lamb wave, Rossby waves and its propagation in three dimensions and in sheared flow, wave absorption, non-linear consideration	Surface water waves, wave dispersion, acoustic waves, buoyancy waves, propagation of atmospheric gravity waves (AGWs) in a nonhomogeneous medium, Lamb wave, Rossby waves and its propagation in three dimensions and in sheared flow, wave absorption, non-linear consideration

Unit-IV

Atmospheric Radar and Lidar

Radar equation and return signal, Signal processing and detection, Various type of atmospheric radars, Application of radars to study atmospheric phenomena, Lidar and its applications. Application of Lidar to study atmospheric phenomenon. Data analysis tools and techniques.

Unit-V

Atmospheric Aerosols

Spectral distribution of the solar radiation, Classification and properties of aerosols, Production and removal mechanisms, Concentrations and size distribution, Radiative and health effects, Observational techniques for aerosols. Absorption and scattering of solar radiation, Rayleigh scattering and Mie scattering, Bouguert-Lambert law, Principles of radiometry, Optical phenomena in atmosphere, Aerosol studies using Lidars.

Text books and references

1. Fundamental of Atmospheric Physics – Murry L Salby; Academic Press, Vol 61, 1996
2. The Physics of Atmosphere – John T. Houghton; Cambridge University press; 3 rdedn. 2002.
3. An Introduction to dynamic meteorology – James R Holton; Academic Press, 2004
4. Radar for meteorological and atmospheric observations – S Fukao and K Hamazu. Springer Japan, 2014

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Atmospheric Radar and Lidar

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B.Sc(H)-M.Sc. Physics			
Semester :	1 or 2	**Type:**	Open Elective
Course Name:	A course on MATLAB	**Course Code:**	IPHY1O004T
Credits:	2	**L T P:**	2-0-0

Course Outcomes:

CO	*The aim of this course is to enable the students to familiar and experience with tools of MATLAB*

Old Syllabus	Rationalized syllabus
UNIT -I Introduction to MATLAB, The MATLAB Environment, MATLAB Basics – Variables, Numbers, Operators, Expressions, Input and output. • Vectors, Arrays – Matrices **UNIT -II** MATLAB Functions , Built-in Functions User defined Functions Graphics with MATLAB. Files and File Management – Import/Export , Basic 2D, 3D plots , Graphic handling **UNIT -III** Programming with MATLAB 09 Hrs, Conditional Statements, Loops , MATLAB Programs – Programming and Debugging. ,Applications of MATLAB Programming. **UNIT -IV** Mathematical Computing with MATLAB, Algebraic equations , Basic Symbolic Calculus and Differential equations , Numerical Techniques and Transforms	**UNIT -I** Introduction to MATLAB, The MATLAB Environment, MATLAB Basics – Variables, Numbers, Operators, Expressions, **UNIT -II** Input and output. • Vectors, Arrays – Matrices MATLAB Functions , Built-in Functions User defined Functions Graphics with MATLAB. **UNIT -III** Files and File Management – Import/Export , Basic 2D, 3D plots , Graphic handlingProgramming with MATLAB 09 Hrs, Conditional Statements, Loops , **UNIT -IV** Mathematical Computing with MATLAB, MATLAB Programs – Programming and Debugging. , **UNIT-V** Applications of MATLAB Programming. Algebraic equations , Basic Symbolic Calculus and Differential equations , Numerical Techniques and Transforms
Text Books and References: 1. "A Guide to MATLAB - for Beginners and Experienced Users", 2nd Ed., Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Cambridge University Press, (2006). 2. "Essentials of MATLAB Programming", 2nd Ed., Stephen J. Chapman, Cengage Learning, (2009). 3. "MATLAB Demystified", David McMahon, The McGraw-Hill	**Text Books and References:** 1. "A Guide to MATLAB - for Beginners and Experienced Users", 2nd Ed., Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Cambridge University Press, (2006). 2. "Essentials of MATLAB Programming", 2nd Ed., Stephen J. Chapman, Cengage Learning, (2009). 3. "MATLAB Demystified", David McMahon, The McGraw-Hill

Companies, (2007).
4. "MATLAB® for Engineers", 3rd Ed., Holly Moore, Pearson Education, Inc., (2012).
5. "Engineering computation with MATLAB", 2nd Ed., David M. Smith, Pearson Education, Inc., (2010).

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4. "MATLAB® for Engineers", 3rd Ed., Holly Moore, Pearson Education, Inc., (2012).
5. "Engineering computation with MATLAB", 2nd Ed., David M. Smith, Pearson Education, Inc., (2010).

B.Sc(H)-M.Sc. Physics			
Semester :	1 or 2	**Type:**	Open Elective
Course Name:	Physics ~~Lab Skill~~ Workshop	**Course Code:**	IPHY1O007T
Credits:	2	**L T P:**	2-0-0

Course Outcomes:

CO	*The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode*

Old Syllabus	Rationalized syllabus
UNIT-I Introduction: Measuring units. conversion to SI and CGS. Familiarization with meterscale, Vernier calliper, Screw gauge and their utility.	**UNIT-I** Introduction: Measuring units. conversion to SI and CGS. Familiarization with meterscale, Vernier calliper, Screw gauge and their utility.
UNIT-II Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc. Mechanical Skill: Concept of workshop practice.	**UNIT-II** Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc. Mechanical Skill: Concept of workshop practice.
UNIT-III Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor and relay. Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel.	**UNIT-III** Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply.
UNIT-IV Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.	**UNIT-IV** Timer circuit, Electronic switch using transistor and relay. Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel.
	UNIT-V Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulley experiment.

Reference Books:

1. A text book in Electrical Technology - B L Theraja – S. Chand and Company.
2. Performance and design of AC machines – M.G. Say, ELBS Edn.3
3. Mechanical workshop practice, K.C. John, 2010, PHI Learning Pvt. Ltd.
4. Workshop Processes, Practices and Materials, Bruce J Black 2005, 3rd Edn., Editor Newnes
5. New Engineering Technology, Lawrence Smyth/Liam Hennessy, The Educational Company of Ireland

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