जम्मू केंद्रीय विश्वविद्यालय
Central University of Jammu
राया–सूचानी (बागला), जिला: सांबा–181143, जम्मू (जम्मू एवं कश्मीर)भारत
Rahya-Suchani (Bagla), District: Samba – 181143, Jammu (J&K), India
Department of Physics & Astronomical Sciences

CUJ/DPHY/2022/278

Date: 01-07-2022

To
The Assitant Registrar(Academics)
Central University of Jammu
Rahya- Suchani (Bagla)

Subject: Notification of items of 8th BOS of Department of Physics and Astronomical Sciences-Reg.

Sir,

It is requested to notify Item No. 1 & 2 of 8th BOS of Department of Physics and Astronomical Sciences duly approved by Chairman, School of Basic and Applied Sciences in anticipation to next School Board Meeting.

Dr. Suram Singh
Head
भौतिकी एवं खगोल विज्ञान विभाग
Deptt. of Physics and Astronomical Sc.
जम्मू केन्द्रीय विश्वविद्यालय, सांबा
Central University of Jammu, Samba

Enclosures:
1. Minutes of Meeting of 8th BOS duly approved by Dean.
2. Detailed Agenda and MOM with syllabus of Semester I & II.

जम्मू केंद्रीय विश्वविद्यालय
Central University of Jammu
राया–सूचानी (बागला), जिला: सांबा–181143, जम्मू (जम्मू एवं कश्मीर)भारत
Rahya-Suchani (Bagla), District: Samba – 181143, Jammu (J&K), India
Department of Physics & Astronomical Sciences

CUJ/DPHY/2022/263. **Date:** 22-06-2022

Note:

Subject: Approval of items of 8th BOS-Reg.

Dear Sir,

The 8th Board of Studies Meeting in Physics and Astronomical Sciences was held on 3rd June, 2022 at 11:00 A.M in the Department of Physics and Astronomical Sciences of Central University of Jammu. The Board of Studies recmmended the following decisions for approval by the School Board:

Agenda 1. : Recommendation on the Course Matrix for UG/PG programmes of the Department as per NEP-2020.

Decision: The BOS recommended the Course Matrix for UG/PG programmes of the Department as per NEP-2020 given in Annexure I and II.

Agenda 2. : Recommendation of Course Content for I and II Semester year of UG.

Decision: The BOS recommended the I and II Semester Syllabus for (B.Sc. Honours) under B.Sc.(H)-M.Sc. (Physics) programme as per annexure III.

It is also suggested that students joining M.Sc. Degree after obtaining four years B.Sc. (Hons. /Research) Degree may be given M.Sc.(H) Degree.

It is requested that the above mentioned items may be got approved by the School Board and forward the same to the Academic Section for needful.

Submitted for your needful.

Approved in anticipation by School Board 11/07/2022

Dean,
School of Basic Science sand Applied Sciences

22/06/22

Head
Dr. Suresh Singh

प्रमुख/Head
भौतिकी एवं खगोल विज्ञान विभाग
Deptt. of Physics and Astronomical Sc.
जम्मू केन्द्रीय विश्वविद्यालय, सांम्बा
Central University of Jammu, Samba

Minutes of the 8th Board of Studies, Department of Physics & Astronomical Sciences, Central University of Jammu, held on June 03, 2022

The 8th Board of Studies meeting was held in the Department of Physics & Astronomical Sciences, Central University of Jammu, Samba through online/offine mode on June 03, 2022. The following members were present in the meeting:

1.	Dr. Suram Singh, Associate Professor & Head of the Department	Chairman
2.	Prof. Arun Bharti, Department of Physics, University of Jammu	Subject Expert
3.	Prof. Manoj Kumar Sharma, Professor , SPMS, TIET, Patiala.	Subject Expert
4.	Dr. Shiv Kumar, Director ERIPR, DRDO HQ, New Delhi	Subject Expert
5.	Dr. Vinay Kumar, Associate Professor	Member
6.	Dr. Tapta K Roy, Assistant Professor, Department of Chemistry and Chemical Sciences	Member

In the beginning, Dr. Suram Singh, Head, Department of Physics and Astronomical Sciences, expressed his deep sense of happiness and gratitude for presence of all members in the meeting. He has given the introduction of all members to the board. He welcomes all external members who have attended the meeting despite of various busy schedules. Dr. Suram Singh also individually welcomes all other members, who have joined the meeting through online mode and hence to make the event academically successful and productive.

All agenda items were thoroughly discussed, and the following decisions were pointed:

Agenda 1. : Recommendation on the course matrix for UG/PG programmes of the department as per NEP-2020.

Decision: The BOS recommended the course matrix for UG/PG programmes of the department as per NEP-2020 given in Annexure I and II.

Agenda 2. : Recommendation of course content for I and II Semester year of UG.

Decision: The BOS recommended the I and II Semester Syllabus for (B.Sc. Honours) under B.Sc.(H)-M.Sc. (Physics) programme as per annexure III.

Suggestion:

1. Prof. Manoj Sharma suggested that Students joining M. Sc degree after obtaining four years B. Sc (Hons./Research) degree may be given M.Sc(Hons) degree.

The meeting ends with votes of thanks.

Prof. Arun Bharti, (External Expert) Department of Physics, University of Jammu

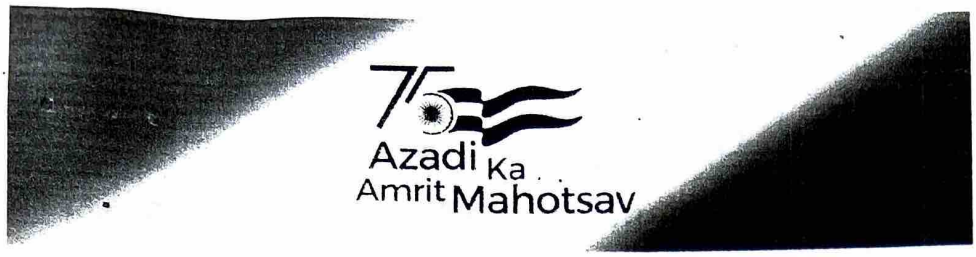
Prof. Manoj Kumar Sharma, Professor , SPMS, TIET, Patiala.

(online)
Dr. Shiv Kumar, Director ERIPR, DRDO HQ, New Delhi

Dr. Vinay Kumar, Associate Professor

(online)
Dr. Tapta K Roy, Assistant Professor Department of Chemistry and Chemical Sciences, Central University of Jammu

03/06/2022
Dr. Suram Singh, Associate Professor & Head of the Department



Tapta Kanchan Roy <tapta.che@cujammu.ac.in> Wed, Jun 15, 2022 at 8:37 AM
To: "HOD Physics, CU Jammu" <hod.phy@cujammu.ac.in>

Dear Sir,

Thanks for sharing the MoM and other details. I would like to validate the same.

Best Regards

Dr Tapta Kanchan Roy

Assistant Professor
Department of Chemistry and Chemical Sciences
Central University of Jammu
Rahya-Suchani, Bagla, Jammu
J&K, India 181143

Minutes of meeting of 8th BOS of Department of Physics and Astronomical Sciences

3 messages

HOD Physics, CU Jammu <hod.phy@cujammu.ac.in> Mon, Jun 13, 2022 at 4:51 PM
To: SHIV KUMAR <shiv.kumar.hqr@gov.in>, Tapta kanchan <tapta.che@cujammu.ac.in>

Dear Sir,

Kindly find attached Minutes of meeting of 8th BOS of Department of Physics and Astronomical Sciences held on 3rd June 2022.
You are requested to validate it.

Regards

Dr. Suram Singh
Associate Professor and Head
Department of Physics and Astronomical Sciences
Central University of Jammu
Rahya-Suchani (Bagla), Samba (J&K)-181143, INDIA
Mb. +91-9419270371
Alternate Email: suram.phy@cujammu.ac.in

MOM of 8th BOS.pdf
827K

SHIV KUMAR <shiv.kumar.hqr@gov.in> Tue, Jun 14, 2022 at 3:55 PM
To: hod phy <hod.phy@cujammu.ac.in>

Dear Dr. Suram Singh

The minutes are OK. Please do the needful.
Regards

Dr. Shiv Kumar
Director, ER&IPR
510, NTB Building
DRDO HQ. Annexe, Metcalfe House
Civil Lines, Delhi-110054
Phone: 011-23818132

From: "hod phy" <hod.phy@cujammu.ac.in>
To: "SHIV KUMAR" <shiv.kumar.hqr@gov.in>, "tapta che" <tapta.che@cujammu.ac.in>
Sent: Monday, June 13, 2022 4:51:35 PM
Subject: Minutes of meeting of 8th BOS of Department of Physics and Astronomical Sciences

Central University of Jammu

Department of Physics & Astronomical Sciences

8th Board of Studies

Agenda

Date: June 03, 2022

जम्मू केंद्रीय विश्वविद्यालय

Central University of Jammu

राया-सूचानी (बागला),साम्बा-181143, जम्मू (जम्मू और कश्मीर)

Rahya-Suchani (Bagla), Samba-181143, Jammu (J & K)

Course Matrix and Syllabus
(Semesters I and II)

Five Year Integrated B.Sc.-M.Sc. Program in Physics

(*w.e.f.* Academic Session 2022-2023)

Learning Outcomes based Curriculum Framework (LOCF)

As per *National Education Policy (NEP-2020)*

Offered By

Department of Physics and Astronomical Sciences

Agenda

The proposed agenda of the meeting will as follow:

1. Recommendation on the course matrix for UG/PG programmes of the department as per NEP-2020.
2. Recommendation of course content for 1st year of UG.

Course Matrix for Five Year Integrated B.Sc.-M.Sc. Physics
(Semesters I to X)
w.e.f. Academic Session 2022-2023

The first three years of the Integrated programme (Levels 5, 6, and 7) will be having a total number of 120 credits as shown in **Tables 1 and 2**. After completion of the third year of the Integrated programme (Level 7), the students will continue the programme in the following two streams.

1. **Stream 1** for those who have completed the first three years (Level 7) with CGPA greater than 7.5 **(Table 1)**

After completing the first three years of the Integrated programme (Level 7), the students who have scored CGPA greater than 7.5 will be allowed to continue in the fourth year of the undergraduate programme (Level 8) to pursue and complete the Bachelor's degree with Research (which will be named as B.Sc. (Hons. / Research)) and these students will continue to one year Master's degree programme (Level 9) and receive Integrated B.Sc. (Hons. /Research)-M.Sc. degree (4+1 years) in Physics.

2. **Stream 2** for those students who have completed first three years (Level 7) with CGPA less than 7.5 **(Table 2)**

After completing the first three years of the Integrated programme (Level 7), the students who have scored CGPA less than 7.5 will be allowed to continue in two years Master's degree programme (Level 8 and Level 9) and receive Integrated B.Sc.-M.Sc. (Physics) degree (3+2 years).

Note: However, students of stream 1 with CGPA greater than 7.5 may opt stream 2 directly also.

Table 1. Course Matrix for Five Year Integrated B.Sc.(Hons./Research)-M.Sc. Physics (4+1 years)

Stream 1: For those who have completed first three years of the Integrated programme (Level 7) with CGPA greater than 7.5

Semester	Core Course (CC) (Theory+Lab)	Open Elective Course (OEC)	Ability Enhancement Course (AEC)	Skill Enhancement Course (SEC)	Value Addition Course (VAC)	Total Credits
I	CC-1 (3+1) CC-2 (3+1)	OEC-1 (4) OEC-2 (4)	AEC-1 (2)	SEC-1 (2)	-	20
II	CC-3 (3+1) CC-4 (3+1)	OEC-3 (4) OEC-4 (4)		SEC-2 (2)	VAC-1 (2)	20
III	CC-5 (3+1) CC-6 (3+1)	OEC-5 (4) OEC-6 (4)	AEC-2 (2)	SEC-3 (2)		20
IV	CC-7 (3+1) CC-8 (3+1)	OEC-7 (4) OEC-8 (4)		SEC-4 (2)	VAC-2 (2)	20
V	CC-9 (3+1) CC-10 (3+1)	OEC-9 (4) OEC-10 (4) OEC-11 (4)	-	-	-	20
VI	CC-11 (3+1) CC-12 (3+1)	OEC-12 (4) OEC-13 (4) OEC-14 (4)	-	-	-	20
VII	CC-13 (3+1) CC-14 (3+1) CC-15 (3+1)	OEC-15 (4) OEC-16 (4)	-	SEC-5 (2)	-	22
VIII	Project/ Dissertation/ Internship (12)	OEC-17 (4) OEC-18 (4)	-	SEC-6 (2)	-	22
Total	**72**	**72**	**4**	**12**	**4**	**164**
IX	CC-16 (3+1) CC-17 (3+1) CC-18 (3+1)	OEC-19 (4) OEC-20 (4)	-	SEC-7 (2)	-	22
X	Project/ Dissertation/ Internship (12)	OEC-21 (4) OEC-22 (4)	-	SEC-8 (2)	-	22
Total	**24**	**16**	**-**	**4**	**-**	**44**
Grand Total	**96**	**88**	**4**	**16**	**4**	**208**

Table 2. Course Matrix for Five Year Integrated B.Sc.-M.Sc. Physics (3+2 years)
Stream 2: For those who have completed first three years of the Integrated programme (Level 7) with CGPA less than 7.5

Semester	Core Course (CC)	Open Elective Course (OEC)	Ability Enhancement Course (AEC)	Skill Enhancement Course (SEC)	Value Addition Course (VAC)	Total Credits
I	CC-1 (3+1) CC-2 (3+1)	OEC-1 (4) OEC-2 (4)	AEC-1 (2)	SEC-1 (2)	-	20
II	CC-3 (3+1) CC-4 (3+1)	OEC-3 (4) OEC-4 (4)		SEC-2 (2)	VAC-1 (2)	20
III	CC-5 (3+1) CC-6 (3+1)	OEC-5 (4) OEC-6 (4)	AEC-2 (2)	SEC-3 (2)		20
IV	CC-7 (3+1) CC-8 (3+1)	OEC-7 (4) OEC-8 (4)		SEC-4 (2)	VAC-2 (2)	20
V	CC-9 (3+1) CC-10 (3+1)	OEC-9 (4) OEC-10 (4) OEC-11 (4)	-	-	-	20
VI	CC-11 (3+1) CC-12 (3+1)	OEC-12 (4) OEC-13 (4) OEC-14 (4)	-	-	-	20
Total	**48**	**56**	**4**	**8**	**4**	**120**
VII	CC-13 (3+1) CC-14 (3+1) CC-15 (3+1)	OEC-15 (4) OEC-16 (4)	-	SEC-5 (2)	-	22
VIII	CC-16 (3+1) CC-17 (3+1) CC-18 (3+1)	OEC-17 (4) OEC-18 (4)	-	SEC-6 (2)	-	22
IX	CC-19 (3+1) CC-20 (3+1) CC-21 (3+1)	OEC-19 (4) OEC-20 (4)	-	SEC-7 (2)	-	22
X	Project/ Dissertation/ Internship (12)	OEC-21 (4) OEC-22 (4)	-	SEC-8 (2)	-	22
Total	**48**	**32**	**-**	**8**	**-**	**88**
Grand Total	**96**	**88**	**4**	**16**	**4**	**208**

Abbreviation(s):

Core Course	CC
Open Elective Course	OEC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Value Addition Course	VAC

Semester – I

Course Code	Course	Type	Credits	Contact hours per week (L-T-P)
IPHY1C001T	Mechanics	CC	3	3-0-0
IPHY1C001L	Mechanics Lab	CC	1	0-0-2
IPHY1C002T	Mathematical Physics-I	CC	3	3-0-0
IPHY1C002L	Mathematical Physics Lab	CC	1	0-0-2
As provided by concerned deptt.	Open Elective Course-1	OEC	4	As provided by concerned deptt.
As provided by concerned deptt.	Open Elective Course-2	OEC	4	As provided by concerned deptt.
As provided by concerned deptt./ SWAYAM platform	Any course from the approved basket or by MOOC on SWAYAM platform	AEC	2	2-0-0
As provided by concerned deptt./ SWAYAM platform	Any course from the approved basket or by MOOC on SWAYAM platform	SEC	2	2-0-0
	Total		20	

Semester – II

Course Code	Course	Type	Credits	Contact hours per week (L-T-P)
IPHY1C003T	Electricity and Magnetism	CC	3	3-0-0
IPHY1C003L	Electricity and Magnetism Lab	CC	1	0-0-2
IPHY1C004T	Waves and Optics	CC	3	3-0-0
IPHY1C003L	Waves and Optics Lab	CC	1	3-0-2
As provided by concerned deptt.	Open Elective Course-3	OEC	4	As provided by concerned deptt.
As provided by concerned deptt.	Open Elective Course-4	OEC	4	As provided by concerned deptt.
As provided by concerned deptt./ SWAYAM platform	Any course from the approved basket or by MOOC on SWAYAM platform	SEC	2	2-0-0

Course Code	Course	Type	Credits	Contact hours per week (L-T-P)
As provided by concerned deptt./ SWAYAM platform	Any course from the approved basket or by MOOC on SWAYAM platform	VAC	2	2-0-0
	Total		20	

Examination Pattern:

Course	Credit	CIA	MSE	ESE	Max. Marks
Core Course (Theory+Practical)	Theory (3)	15	20	40	75
	Practical (1)	10	-	15	25
Theory	4	25	25	50	100
Theory	2	12.5	12.5	25	50

List of Open electives courses offered by Department of Physics and Astronomical Sciences

Sr. No.	Level (UG/PG)	Course Code	Course Name	Nature of Open Elective
1.	UG	IPHY1O001T	General Physics-I	OEC
2.	UG	IPHY1O002T	Renewable Energy and Energy Harvesting	OEC
3.	UG	IPHY1O003T	Astronomy and Astrophysics	OEC
4.	UG	IPHY1O004T	Basics of Atmospheric Physics	OEC
5.	UG	IPHY1O005T	A Course on Matlab	SEC
6.	UG	IPHY1O006T	Introduction to SciLab	SEC
7.	UG	IPHY1O007T	Physics ~~Lab Skill Equipment~~ workshop-I	VAC

Syllabus

B.Sc(H)-M.Sc. Physics			
Semester :	I	**Type:**	Core
Course Name:	Mechanics	**Course Code:**	IPHY1C001T
Credits:	4	**L T P:**	3-0-2

After going through the course, the student should be able to

- *Understand Coordinate systems, laws of motion and their application to various dynamical situations, notion of inertial frames and concept of Galilean invariance.*
- *Understand the phenomena of collisions and idea about center of mass and laboratory frames and their correlation.*
- *Understand the principles of elasticity through the study of Young Modulus and modulus of rigidity.*
- *Apply Kepler's law to describe the motion of planets and satellite in circular orbit,through the study of law of Gravitation.*
- *In the laboratory course, the student shall perform experiments related to mechanics.*

Unit-I

Coordinate systems: Cartesian, polar, spherical, and cylindrical. Newton's law of motion, conservation of momentum; impulse; momentum of variable mass system-motion of rocket; work and energy theorem, conservative and non-conservative forces, potential energy, energy diagram; stable and unstable equilibrium; elastic and inelastic collisions between particles.

Unit-II

Dynamics of a system of particles, centre of mass, moment of inertia: calculation of moment of inertia for rectangular, cylindrical and spherical bodies; Angular momentum of a particle and system of particles, conservation of angular momentum; torque, rotation about a fixed axis, kinetic energy of rotation; motion involving both translation and rotation.

Unit-II

Kepler's laws, two body problem and its reduction to one body problem and its solution; the energy equation and energy diagram; Law of gravitation: Gravitational force and potential energy, inertial and gravitational mass, potential and field due to spherical shell and solid sphere; motion of a particle under central force field, orbits of artificial satellites.

Unit IV

Inertial and Non-Inertial, Fictitious forces. Equation of motion with respect to a uniformly accelerating frame. Equation of motion with respect to a uniformly rotating frame - Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire. Bending of a beam. Fluid Motion: compressible and incompressible fluids, Equation of continuity; streamline and turbulent flow, Pascal's law and Archimedes principle. Poiseuille's equation.

Text and Reference Books:

1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
2. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
3. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
4. Analytical Mechanics, G.R. Fowles and G.L. Cassiday. 2005, Cengage Learning.

5. Feynman Lectures, Vol. I, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
6. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
7. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000 University Physics.

B.Sc(H)-M.Sc. Physics			
Semester :	II	**Type:**	Core
Course Name:	Mechanics Lab	**Course Code:**	IPHY1C001L
Credits:	1	**L T P:**	0-0-2

List of Experiments:

1. Measurements of length (or diameter) using vernier calliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the height of a building using a Sextant.
4. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
5. To determine the Moment of Inertia of a Flywheel.
6. To determine g and velocity for a freely falling body using Digital Timing Technique
7. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
8. To determine the Young's Modulus of a Wire by Optical Lever Method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
10. To determine the elastic Constants of a wire by Searle's method.
11. To determine the value of g using Bar Pendulum.
12. To determine the value of g using Kater's Pendulum.

Text and Reference Books:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal.

B.Sc(H)-M.Sc. Physics			
Semester :	I	**Type:**	Core
Course Name:	Mathematical Physics-I	**Course Code:**	IPHY1C002T
Credits:	3	**L T P:**	3-0-0

(i) Course learning outcome:

- *Revise the knowledge of calculus, vectors, vector calculus, probability and probability distributions. These basic mathematical structures are essential in solving problems in various branches of Physics as well as in engineering.*
- *Learn the curvilinear coordinates which have applications in problems with spherical and cylindrical symmetries.*
- *Learn the Dirac delta function its properties, which have applications in various branches of Physics, especially quantum mechanics.*
- *The aim of this Lab is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics. Highlights the use of computational methods to solve physical problems, Students can use any one operating system Linux or Microsoft Windows*

UNIT-I

Limits, continuity, average and instantaneous quantities, differentiation. Plotting functions. Intuitive ideas of continuous, differentiable, etc. functions and plotting of curves. Approximation: Taylor and binomial series. First Order Differential Equations and Integrating Factor. SecondOrder Differential equations: Homogeneous Equations with constant coefficients, Wronskian and general solution

UNIT-II

. Statement of existence and Uniqueness Theorem for Initial Value Problems. Particular Integral. Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems. Definition of Dirac delta function Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function.

UNIT-III

Recapitulation of vectors: Properties of vectors. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. Vector Differentiation: Directional derivatives and normal derivative.

UNIT-IV

Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes, Theorems and their applications (no rigorous proofs).

Text and Reference Books:

1. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris,2013, 7th Edn., Elsevier.
2. Differential Equations, George F. Simmons, 2007, McGraw Hill.
3. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.
4. Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Book.
5. Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jones and Bartlett Learning.
6. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.

B.Sc(H)-M.Sc. Physics			
Semester :	I	**Type:**	Core
Course Name:	Mathematical Physics Lab-I	**Course Code:**	IPHY1C002T
Credits:	1	**L T P:**	0-0-2

List of Experiments:

Topics	Description with Applications
Introduction and Overview	Computer architecture and organization, memory and Input/output devices
Basics of scientific computing	Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow &overflow-emphasize the importance of making equations in terms of dimensionless variables, Iterative methods
Errors and error Analysis	Truncation and round off errors, Absolute and relative errors, Floating point computations.

Text and Reference Books:

1. Introduction to Numerical Analysis, S.S. Sastry, 5thEdn., 2012, PHI Learning Pvt. Ltd.
2. Schaum's Outline of Programming with C++. J. Hubbard, 2000, McGraw---Hill Pub.
3. Numerical Recipes in C: The Art of Scientific Computing, W.H. Pressetal, 3rd Edn., 2007, Cambridge University Press.
4. A first course in Numerical Methods, U.M. Ascher& C. Greif, 2012, PHI Learning.
5. Elementary Numerical Analysis, K.E. Atkinson, 3rd Edn., 2007, Wiley India Edition.

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

(i) Course learning outcome:

After going through the course, the student should be able to

- *Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems ofpoint charges as well as line, surface, and volume distributions of charges.*
- *Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electricpotential, electric potential energy) formalisms of electrostatics.*
- *Apply Gauss's law of electrostatics to solve a variety of problems.*
- *Describe the magnetic field produced by magnetic dipoles and electric currents.*
- *Explain Faraday-Lenz and Maxwell laws to articulate the relationship between electricand magnetic fields.*
- *Understand the dielectric properties, magnetic properties of materials and phenomena of electromagnetic induction.*
- *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 theconstruction, working of various measuring instruments.*
- *Should be able to verify of various circuit laws, network theorems elaborated above, using simple electric circuits.*

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,

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).

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).

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

(i) Course learning outcome:

This course will enable the student to

- *Recognize and use a mathematical oscillator equation and wave equation, and derivethese equations for certain systems.*
- *Apply basic knowledge of principles and theories about the behaviour of light and thephysical environment to conduct experiments.*
- *Understand the principle of superposition of waves, so thus describe the formation ofstanding waves.*
- *Explain several phenomena we can observe in everyday life that can be explained aswave phenomena.*
- *Use the principles of wave motion and superposition to explain the Physics ofpolarisation, interference and diffraction.*
- *Understand the working of selected optical instruments like biprism, interferometer,diffraction grating, and holograms.*
- *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 Ringsexperiment, Fresnel Biprism etc. Resolving power of optical equipment can be learnt firsthand.*

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).~~
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

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, 7th Edn., 1999, Pergamon Press.
4. Optics, Ajoy Ghatak, 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 photosensor 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. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, (Kitab Mahal, New Delhi).
3. D. P. Khandewal, A Laboratory Manual of Physics for Undergraduate Classes, (Vani Publication House, New Delhi).

Syllabus of Open Electives Courses
offered by
Department of Physics and Astronomical Sciences

Sr. No.	Level (UG/PG)	Course Code	Course Name	Nature of Open Elective
1.	UG	IPHY1O001T.	General Physics-I	OEC
2.	UG	IPHY1O002T	Renewable Energy and Energy Harvesting	OEC
3.	UG	IPHY1O003T	Astronomy and Astrophysics	OEC
4.	UG	IPHY1O004T	Basics of Atmospheric Physics	OEC
5.	UG	IPHY1O005T	A Course on MatLab	SEC
6.	UG	IPHY1O006T	Introduction to SciLab	SEC
7.	UG	IPHY1O007T	Physics ~~Lab Skill~~ Workshop I	VAC

B.Sc.(H)-M.Sc. Physics			
Semester:	I or II	**Type:**	Open Elective
Course Name:	General Physics	**Course Code:**	IPHY1O001T
Credits:	3	**L T P:**	3-0-0

Unit-I

Laws of Thermodynamics: Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_P and C_V,. Second law and Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Third law of thermodynamics. Concept of absolute zero temperature.

Unit-II

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.

Unit-III

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Unit-IV

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor.

Magnetism: Magnetostatics: Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para-and ferro-magnetic materials.

Reference Books:

1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
3. Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
4. Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears and G.L. Salinger. 1988, Narosa.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
7. Electricity & Magnetism, J.H. Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press.

B.Sc.(H)-M.Sc. Physics			
Semester:	I or II	**Type:**	Generic Elective
Course Name:	General Physics Lab	**Course Code:**	IPHY1O001L
Credits:	1	**L T P:**	0-0-2

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.
3. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.
5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
6. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions.
7. (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 determine a low resistance by Carey Foster's Bridge.
8. To determine the (a) charge sensitivity and (b) current sensitivity of B.G.
9. To determine the ratio of two capacitances by de Sauty's bridge.
10. To determine self-inductance of a coil by Anderson's bridge using AC.
11. To determine the mutual inductance of two coils by absolute method using a B.G.
12. 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.
13. 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. Geeta Sanon, B.Sc. Practical Physics, (R. Chand & Co).
2. B. L. Workshop and H.T. Flint, Advanced Practical Physics, (Asia Publishing House, New Delhi).
3. Indu Prakash and Ramakrishna, A Text Book of Practical Physics, (Kitab Mahal, New Delhi).
4. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
5. D.P. Khandewal, A Laboratory Manual of Physics for Undergraduate Classes, (Vani Publication House, New Delhi).

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

Course Learning Outcomes:
(The emphasis of course is on applications in solving problems of interest to physicists. The students are to be examined entirely on the basis of problems, seen and unseen.)

UNIT-I

Fossil fuels and Alternate Sources of energy: Fossil fuels and nuclear energy and their limitation, need of renewable energy, non-conventional energy sources. developments in offshore Wind Energy, Tidal Energy, Wave energy systems, biomass, biochemical conversion, biogas generation, tidal energy, Hydroelectricity.

UNIT-II

Solar energy: Solar energy and its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond, solar water heater, solar distillation, solar cooker, solar green houses, Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.

UNIT-III

Wind Energy Harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies.

UNIT-IV

Ocean Energy, Geothermal Energy and Hydro Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power, Ocean Bio-mass. Geothermal Resources, Geothermal Technologies. Hydropower resources and technologies, environmental impact of hydro power sources.

UNIT-V

Piezoelectric Energy harvesting: Introduction, Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modelling piezoelectric generators, Piezoelectric energy, harvesting applications, Human power.

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent applications.

Reference Books:

1. Non-conventional energy sources - G. D. Rai - Khanna Publishers, New Delhi. Solar energy - M P Agarwal - S Chand and Co. Ltd.
2. Solar energy - Suhas P Sukhative Tata McGraw - Hill Publishing Company Ltd.
3. Godfrey Boyle, Renewable Energy, Power for a sustainable future, 2004, Oxford University Press, in association with The Open University.
4. Dr. P Jayakumar, Solar Energy: Resource Assesment Handbook, 2009. J. Balfour, M. Shaw and S. Jarosek, Photovoltaics, Lawrence J Goodrich (USA)

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

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.

Unit-II

Telescopes & instrumentation: Different optical configurations for astronomical telescopes, mountings, plate scale and diffraction limits. Telescopes for gamma ray, X-ray, UV, IR; radio astronomy, stellar photometry- solid state, photo-multiplier tube and CCD based photometers, spectroscopy and polarimetry using CCD detectors.

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.

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.

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).

B. Sc(H)-M. Sc. Physics			
Semester :	1 or 2	**Type:**	Open Elective
Course Name:	Basics of Atmospheric Physics	**Course Code:**	IPHY1O004T
Credits:	4	**L T P:**	4-0-0

Unit-I

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.

Unit-II

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.

Unit-III

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

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, Classificationand properties of aerosols, Production and removal mechanisms, Concentrationsand 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 rd edn. 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

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:

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

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

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).

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

Course Outcomes:

The aim of this course is to enable the students to familiar and experience with tools of SciLab

UNIT-I

Installation of the software, Scilab. Basic syntax, Mathematical Operators, Predefined constants, Built in functions.

UNIT-II

Complex numbers, Polynomials, Vectors, Matrix. Handling these data structures using built in functions. Programming - Functions - Loops - Conditional statements - Handling .sci files

UNIT-III

Installation of additional packages e.g. 'optimization' , Graphics handling - 2D, 3D - Generating .jpg files , Function plotting - Data plotting

UNIT-IV

Applications - Numerical Linear Algebra (Solving linear equations, eigen values atc.) - Numerical Analysis – iterative methods - ODE – Blotting solution curves Comparison with C / C++/ Matlab

Text Books and Reference:

1. Ramachandran Hema (Author), Nair Achuthsankar SSkylab (A Free Software To Matlab) S.Chand Publisher
2. Anil Kumar Verma, SCILAB: A Begineer's Approach , Cengage Publishers

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

Course Outcomes:

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

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 solidblock, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metalsheet, 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-IV

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