CENTRAL UNIVERSITY OF JAMMU

Minutes of meetings
Board of Studies Meeting

Date: 31-01-2020 Time: 2:30 PM

Department of Physics and Astronomical Sciences

जम्मू केंद्रीय विश्वविद्यालय

Central University of Jammu

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

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

Agenda for the Conduct of 4th Board of Studies meeting on Jan 31, 2020

The agenda of the meeting are the following:

1. Adoption of SCHEME OF CHOICE BASED CREDIT SYSTEM(CBCS) FOR Six Semester (B.Sc Honours) under B.Sc(H)-M.Sc. Degree programme in Physics as per UGC.

2. With reference to 11th AC minutes agenda 15: As a result of introduction of an exit option in the integrated program, it was decided that the name of the existing degree [i.e Five Year Integrated MSc (Physics)] to be considered as the name of the first degree- name of the final degree [i.e. BSc (H) - MSc (Physics)], keeping in view the polices of the Honour Degree Program. **Consequently, restructure course matrix and syllabi for the first two semesters.**

3. To recommend Generic Elective for other Department to be offered by Department of Physics and Astronomical Sciences.

4. Inclusion of two courses [Special Paper -I and -II in IXth and Xth semesters respectively] for Five years Integrated M.Sc. (Physics) Program.

5. Adoption of new Course Code Scheme.

6. To discuss and include relevant allied subjects at the M.Sc. level in the eligibility criterion for faculty recruitment purpose in the Department.

7. Update list of Examiner(s) for various purposes like paper setter, evaluator, thesis examiners for different programmes of the department.

8. Any other matter with the permission of the chair.

31-01-20

Minutes of the 4th Board of Studies, Department of Physics & Astronomical Sciences, Central University of Jammu, held on Jan 31, 2020

The 4th Board of Studies meeting was held in the Department of Physics & Astronomical Sciences, Central University of Jammu, Samba on Jan 31, 2020. The following members were present in the meeting:

1. Dr. Vinay Kumar, Associate Professor & Head of the Department
2. Prof. Naresh Padha, (External Expert) Department of Physics, University of Jammu
3. Prof. Arun Bharti, (External Expert) Department of Physics, University of Jammu
4. Dr. Suram Singh, Associate Professor
5. Dr. Avinash Chand Yadav, Assistant Professor
6. Dr. Tanuj Deswal, Assistant Professor, Department of Nano Sciences & Materials
7. Dr. Jehova Jire L. Hmar, (invitee member), Assistant Professor

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

Agenda 1. : Adoption of SCHEME OF CHOICE BASED CREDIT SYSTEM(CBCS) FOR Six Semester (B.Sc Honours) under B.Sc(H)-M.Sc. Degree programme in Physics as per UGC.
Decision: The BOS recommends the Adoption of SCHEME OF CHOICE BASED CREDIT SYSTEM(CBCS) FOR Six Semester (B.Sc Honours) under B.Sc(H)-M.Sc. Degree programme in Physics as per UGC.
Agenda 2. With reference to 11th AC minutes agenda 15: As a result of introduction of an exit option in the integrated program, it was decided that the name of the existing degree [i.e Five Year Integrated MSc (Physics)] to be considered as the name of the first degree- name of the final degree [i.e. BSc (H) - MSc (Physics)], keeping in view the polices of the Honour Degree Program. Consequently, to restructure course matrix and syllabi for the first two semesters.

Decision: Incorporating the suggestions, the course matrixfor the first two semester [as per UGC Choice Based Credit System (CBCS) for UG Honour Degree] and syllabi of papers [Physics specific discipline] are approved. It is suggested to apply the new structure from the upcoming academic session (2020-21).

Agenda 3. : To recommend Generic Elective for other Department to be offered by Department of Physics and Astronomical Sciences.
Decision: The BOS recommends the General Physics course (3-1-0) 4 credits and General Physics Lab (0-0-4) 2 credits for other department of University.

Agenda 4: Inclusion of two courses [Special Paper -I and -II in IXth and Xth semesters respectively] for Five years Integrated M.Sc. (Physics) Program.

Decision: The BOS recommends the two courses relevant to Nuclear Physics for inclusion in the Five years Integrated M.Sc. (Physics) Program.

by on circulation

31/01/2020

31/01

Agenda 5. : Adoption of new Course Code Scheme.

Decision: The BOS recommends new course code scheme as given in table below:

IC	Integrated Dual Degree
PHY	Physics
COR	Core
AEC	Ability Enhancement Compulsory
AEE	Ability Enhancement Elective
DSE	Discipline Specific Elective
GE	Generic Elective

For example: ICPHY1COR01T or ICPHY1COR01L: IC- Integrated Programme, PHY- Department, 1 Semester, COR- Type of Course, 01 No. of Course, T- Theory, L- Lab

Agenda 6. To discuss and include relevant allied subject at the MSc level level in the eligibility criterion for faculty recruitment purpose in the Department.

Decision: The BOS recommends the following subjects [Physics/ Astrophysics/ Applied Physics] to be considered as allied subject at the MSc level for faculty recruitment purpose in the Department.

Agenda 7. Update list of Examiner(s) for various purposes like paper setter, evaluator, thesis examiners for different programmes for the department.

Decision: The BOS recommends the list of Examiner(s) [for various purposes like paper setter, evaluator, thesis examiners] is updated. It is also suggested to authorize the HOD to include a suitable examiner in an emergent situation.

The meeting ends with votes of thanks.

on circulation

Prof. Naresh Padha, (External Expert) Department of Physics, University of Jammu

on circulation

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

31-01-20

Dr. Tanuj Deswal, Assistant Professor, Department of Nano Sciences & Materials

31/01/2020

Dr. Suram Singh, Associate Professor

31/01/2

Dr. Avinash Chand Yadav, Assistant Professor

31/1/2020

Dr. Jehova Jire L. Hmar, (invitee member), Assistant Professor

31/01/2020

Dr. Vinay Kumar, Associate Professor & Head of the Department

Abbreviations

Related to contact hours

L: Lecture

T: Tutorial

P: Practical

Types of courses

1	Core Course	COR
2	Ability Enhancement Compulsory Course	AEC
3	Ability Enhancement Elective Course	AEE
4	Discipline Specific Elective	DSE
5	Generic Elective	GE

Weightage of different assessment components

1	Continuous Internal Assessment	CIA	25
2	Mid Semester Assessment	MSA	25
3	End Semester Assessment	ESA	50
	Total		100

General Note for Paper Setting

1. The Question Papers for the Mid-Semester Examination shall be as follows:

   - In four credit course, the paper shall be of 2 (two) hours duration and shall comprise the following sections:

Section	Type	No. of Questions	To Attempt	Marks per question	Marks
A	Objective	10	10	1	10
B	Short Answer type	5	3	6	18
C	Essay/Long Answer Type	2 (with internal choice)	2	11	22
				Total	50

Detailed description of the above table is:

a. Section A shall have 10 (Ten) objective type questions (Multiple choice) of one mark each. All questions in this section shall be compulsory (Total 10 Marks);

b. Section B shall have 5 (Five) Short Answer Questions (SAQ) of 6 (six) Marks each, out of which the examinees shall be required to attempt any three questions (Total 18 Marks);

c. Section C shall have 2 (Two) Essay/Long Answer Questions (one from each unit with internal choice), of 11 (Eleven) Marks each (Total 22 Marks); alternatively, if the course so requires, this section may comprise a case study of 11 marks and one question with internal choice of 11 Marks;

2. **The Question Papers for the End-Semester Examination shall be as follows:**

   - In four credit course, the paper shall be of 3 (three) hours duration and shall comprise the following sections:

Section	Type	No. of Questions	Examinees To Attempt	Marks per question	Marks
A	Objective	10	10	1.5	15
B	Short Answer type	10 (two from each units)	5	8	40
C	Essay/Long Answer Type	5 (one from each Unit)	3	15	45
				Total	100

Detailed description of the above table is:

a. Section A shall have 10 (Ten) objective type questions (Multiple choice) of 1.5 mark each. All questions in this section shall be compulsory (Total 15 Marks);

b. Section B shall have 10 (Ten) Short Answer Questions (SAQ) (two from each unit) of 8 (eight) Marks each, out of which the examinees shall be required to attempt any five questions (Total 40 Marks);

c. Section C shall have 5 (Five) Essay/Long Answer Questions (one from each unit), of 15 (Fifteen) Marks each, out of which the examinees shall be required to

31.01.20 31/1/20 31/01/2020

As a general rule, a course of one credit shall require a work load of thirty hours comprising:

(i) 10 hours of Lectures/organized Classroom Activities/ Contact Hours.

(ii) 05 hours of laboratory Work/ Practicals / field Work/ Tutorials/ Teachers-led activities.

(iii) 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/ dissertation/ thesis; seminars etc.

31/01/2020

31/1/20

31.01.20

31/01/2020

31/01/2020

CENTRAL UNIVERSITY OF JAMMU

Central University of Jammu

Department of Physics and Astronomical Sciences

SCHEME OF CHOICE BASED CREDIT SYSTEM(CBCS) FOR Six Semester (B.Sc Honours) under B.Sc(H)-M.Sc. Degree programme in Physics

Semester	CORE COURSE (14)	Ability Enhancement Compulsory Course (AECC) (2)	Ability Enhancement Elective Course (AEEC) (2) (Skill Based)	Elective: Discipline Specific DSE (4)	Elective: Generic (GE) (4)
I	Mathematical Physics-I (4+2)	(English/MIL Communication) /Environmental Science			GE-1
	Mechanics (4 +2)				
II	Electricity & Magnetism (4+2)	Environmental Science/ (English/MIL Communication)			GE-2
	Waves and Optics (4 + 2)				
III	Mathematical Physics–II (4 + 2)		AECC -1		GE-3
	Digital Systems and Applications (4+2)				
	Thermal Physics (4+2)				
IV	Mathematical Physics–III (4+2)		AECC -2		GE-4
	Elements of Modern Physics (4+2)				
	Analog Systems & Applications (4+2)				
V	Quantum Mechanics And Applications (4+ 2)			DSE-1	
	Solid State Physics (4 + 2)			DSE-2	
VI	Electromagnetic Theory (4+2)			DSE-3	
	Statistical Mechanics (4 + 2)			DSE-4	

31/01/2020 31-01-20 31/1/20 31/01/20

Recommendation of Scheme/Courses Opted for first two semesters

SEMESTER	COURSE OPTED	COURSE NAME	Credits
I	Ability Enhancement Compulsory Course-I	English	2
	Core course-I	Mathematical Physics-I	4
	Core Course-I Practical/Tutorial	Mathematical Physics-I Lab	2
	Core course-II	Mechanics	4
	Core Course-II Practical/Tutorial	Mechanics Lab	2
	Generic Elective -1	Chemistry-I	4
	Generic Elective -1 Practical/Tutorial	Chemistry Lab-I	2
		Total credits	20
II	Ability Enhancement Compulsory Course-II	Environmental Science	2
	Core course-III	Electricity and Magnetism	4
	Core Course-III Practical/Tutorial	Electricity and Magnetism Lab	2
	Core course-IV	Waves and Optics	4
	Core Course-IV Practical/Tutorial	Waves and Optics Lab	2
	Generic Elective -2	Introduction to Computers	4
	Generic Elective -2 Practical/Tutorial	Computer Lab	2
		Total Credits	20

Generic Electives for other department

Generic Elective -3	General Physics	4
Generic Elective -3 Practical/Tutorial	General Physics Lab	2

31/01/2020
31/1/20
31/01/2020

B.Sc(H)-M.Sc. Physics			
Semester :	I	**Type:**	Core
Course Name:	Mathematical Physics-I	**Course Code:**	ICPHY1COR01T
Credits:	4	**L T P:**	3-1-0

(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

Recapitulation: 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. FirstOrder Differential Equations and Integrating Factor.

UNIT-II

Second Order Differential equations:Homogeneous Equations with constant coefficients Wronskian and general solution. 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. Integrating factor, with simple illustration. Constrained Maximizationusing Lagrange Multipliers.

UNIT-III

Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl andLaplacian 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-IV

Recapitulation of vectors: Properties of vectors. Scalar product and its invariance under rotations. Vector product, Scalar triple product and their interpretationin terms of area and volume respectively. Scalar and Vector fields.Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities, Gradient, divergence, curl and Laplacian inspherical and cylindrical coordinates.

UNIT-V

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-I Lab	Course Code:	ICPHY1COR02L
Credits:	2	L T P:	0-0-4

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***
- ***The course will consist of lectures (both theory and practical) in the Lab***
- ***Evaluation done not on the programming but on the basis of formulating the problem***
- ***Aim at teaching students to construct the computational problem to be solved***
- ***Students can use any one operating system Linux or Microsoft Windows***

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.
SCI lab	Solution of linear and quadratic equation, Matrix operation, Random number generation etc.
	Evaluation of trigonometric functions e.g. sin θ, cos θ, tan θ, etc.
	Given Position with equidistant time data to calculate velocity and acceleration and vice versa. Find the area of B-H Hysteresis loop
	To Solve the different types of Differential equations.

Text and Reference Books:

1. Introduction to Numerical Analysis, S.S. Sastry, 5th Edn. , 2012, PHI Learning Pvt. Ltd.
2. Schaum's Outline of Programming with C++. J. Hubbard, 2 0 00 , 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.

31-01-20

31/01/2020

B.Sc(H)-M.Sc. Physics			
Semester :	I	**Type:**	Core
Course Name:	Mechanics	**Course Code:**	ICPHY1COR03T
Credits:	4	**L T P:**	3-1-0

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. Centre of mass and laboratory frames.

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-III

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

Frame of Reference: 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 - Centrifugal and Coriolis forces.Laws of Physics in a laboratory on the surface of the earth.

Unit-V

Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire. Bending of a beam. Elastic potential energy. Fluid Motion: compressible and incompressible fluids, Equation of continuity; streamline and turbulent flow, Reynold's number. Euler's Equation, Pascal's law and Archimedes principle.Poiseuille's equation. Viscosity.

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			
		Type:	Core
Semester :	I	Course Code:	ICPHY1COR04L
Course Name:	Mechanics Lab	L T P:	0-0-4
Credits:	2		

List of Experiments:

1. Measurements of length (or diameter) using vernier caliper, 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.

31/1/20

31/01/2020

31/01/2020

B.Sc(H)-M.Sc. Physics			
Semester :	II	**Type:**	Core
Course Name:	Electricity and Magnetism	**Course Code:**	ICPHY2COR01T
Credits:	4	**L T P:**	3-1-0

Unit-I

Vector algebra: 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, electric potential and field at any point due to a dipole, Gauss's theorem in electrostatics, conductors, capacitor, electrostatics energy.

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), capacitance, Effect of dielectric on capacitance.

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 Alternating current circuits. Ballistic galvanometer: current and charge sensitivity, electromagnetic damping, logarithmic damping.

Unit-V

Current electricity: electric current, 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).

31-01-20

31/1/20

31/01/20

B.Sc(H)-M.Sc. Physics			
Semester :	II	**Type:**	Core
Course Name:	Electricity and Magnetism Lab	**Course Code:**	ICPHY2COR02L
Credits:	2	**L T P:**	0-0-4

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-resonantfrequency 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, (VaniPublication House, New Delhi).

B.Sc(H)-M.Sc. Physics			
Semester :	II	**Type:**	Core
Course Name:	Waves and Optics	**Course Code:**	ICPHY2COR03T
Credits:	4	**L T P:**	3-1-0

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).

Unit-II

Plane and Spherical Waves. Longitudinal and Transverse Waves. Travelling Waves. Wave Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Velocity of Transverse Vibrations of Stretched Strings. Velocity ofLongitudinal Waves in a Fluid in a Pipe.Standing (Stationary) Waves in a String, Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Melde's Experiment. Longitudinal Standing Waves and Normal Modes.

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-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 PlaneWave. 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, aslit 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.

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.

31/01/2020

B.Sc(H)-M.Sc. Physics			
Semester :	II	Type:	Core
Course Name:	Waves and Optics Lab	Course Code:	ICPHY2COR04L
Credits:	2	L T P:	0-0-4

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'srings.

(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 diffractiongrating

(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. 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).

31/1/20 31/1/20 31/1/20 31/01/2020

B.Sc(H)-M.Sc. Physics			
Semester :	II	**Type:**	Generic Elective
Course Name:	General Physics	**Course Code:**	ICPHY2GE3T
Credits:	4	**L T P:**	3-1-0

Unit-I

Laws of Thermodynamics-I: 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, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Reversible and irreversible processes.

Unit-II

Laws of Thermodynamics-II: 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-II

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-II

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 :	II	**Type:**	Generic Elective
Course Name:	General Physics Lab	**Course Code:**	ICPHY2GE3L
Credits:	2	**L T P:**	0-0-4

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).

31-01-20 31/1/20 31/1/20 31/01/2020

Five years Integrated M.Sc. Physics			
Semester :	IX	**Type:**	Core
Course Name:	Special Paper-I (Nuclear Theory-I)	**Course Code:**	
Credits:	4	**L T P:**	3-1-0

Unit-I

Abstract group theory: Group postulates, Finite and infinite groups, Order of a group, subgroup, permutation group, group table, Isomorphism and Homomorphism, Cayley's theorem and its application for finding the group structures of groups of order 3,4,5 and 6.Cosets, Lagrange's theorem and its applications for determining the group structures of groups of order 4,5 and 6. Conjugate elements and classes, Invariant subgroup, Factor or Quotient groups, self-conjugate sub-groups.

Unit-II

Matrix representation, Equivalent representation, Unitary representation, Reducible and irreducible representation, characters of irreducible representation, Schur's Lemmas, Orthogonality theorem for irreducible representation of a group- statement and proof, interpretation of Orthogonality theorem, Orthogonality of characters, Continuous groups, Lie Groups- general properties and examples of Lie groups.

Unit-III

General concept of symmetries, Space and time displacements, Symmetry of Hamiltonian, Time-reversal symmetry, Time-reversal operator for spinless particles, Time reversal operator for particles with spin, Effect of time-reversal on wave function of particle, Space-inversion symmetry, The axial rotation group SO(2), Generators of SO(2), 3-dimensional rotation group SO(3), its generators and irreducible representation.

Unit-IV

O(4) and SO(4) groups, SO(4) as a direct product of two SO(3) groups, Special unitary group SU(2) and its irreducible representation, Homomorphism of SU(2) on SO(3), Generators of U(n) and SU(n), Generators of SU(2), physical applications of SU(2).

Unit-V

Special unitary group SU(3), physical applications of SU(3), formation of SU(3) from elementary particles, Gell-Mann's representation of SU(3) and quarks, Detailed study of Lorentz group, application of group theory to isotropic Harmonic Oscillator and Hydrogen atom.

Text and Reference Books:

1. Quantum mechanics/Symmetries(2nd edition) by W.Greiner and B.Muller.
2. Group Theory by Hammer Mesh.
3. Group Theory and Quantum Mechanics by M.Tinkham.
4. Introduction to Group theory by A.W. Joshi.
5. Applied group theory by G.G.Hall.
6. Introduction to Group theory, European Mathematical Society, O.Bogopalski.
7. Problems and solutions in group theory for physicists, World Scientific, Zhang-Qi Ma and Xiao-Yan Gu.

31-01-20 31/01/20 31/1/20 31/01/2020

Five years Integrated M.Sc. Physics			
Semester :	X	**Type:**	Core
Course Name:	Special Paper-II (Nuclear Theory-II)	**Course Code:**	
Credits:	4	**L T P:**	3-1-0

Unit-I

Transition from discrete to continuous vibrating system, Lagrangian and Hamiltonian Formulations for continuous systems, Euler lagrange equations and Hamilton's equations of motion, Applications of Lagrangian and Hamiltonian Formulations to Schrodinger and Electromagnetic fields, Derivation of Schrodinger and Maxwell's equations.

Unit-II

Second Quantization, second quantization of electromagnetic field and Schrodinger field, quantized field energy and momentum, commutation relation between E and H, Number representation of operators for fermions.

Unit-III

Brillowin-Wigner Perturbation series, Schrodinger, Heisenberg and Interaction representation, Theory of Scattering Matrix(S-Matrix) and its properties, Optical theorem, Symmetries of S-Matrix (Lorentz Invariance and Time reversal).Wick's theorem and its applications (Feyman diagrams).

Unit-IV

Density Operator and its equation of motion, Fermi Gas and Thomas Fermi model, Importance of Hartree-Fork(HF) method, Derivation of (HF) equation, Symmetries of HF Hamiltonian, choice of expansion for the orbits, Single major shell HF- calculations.

Unit-V

General aspects, pair creation and annihilation operators, one body and two body potentials in second quantized formalism, pairing interaction in second quantized form. Pairing theory for degenerate configuration, commutation relations of pair creation operators with pairing Hamiltonian and Number operators.Calculation of pairing matrix for two and four particles in J=5/2 Shell, Generalization to non-degenerate configurations. The BCS formalism, Normalization of BCS wavefunction, Application of the BCS wavefunction to the pure j-shell.Derivation of expression for occupation probability and pairing gaps, Unified model.

Text and Reference Books:

1. Classical Mechanics by Goldstein.
2. Classical Mechanics byW.Greiner.
3. Classical Mechanics byT.W.B Kibble and F.H.Berkshire.
4. Elements of Advanced Quantum Mechanics by J.M.Zimen.
5. Field Quantization by W.GreinerandJ.Reinhardt.
6. Shapes and Shells in nuclear structure by S.G.Nilsson and I.Ragnarsson.
7. An introduction to Relativistic Quantum Field Theory by Silvan S.Schweber.
8. Relativistic Quantum Mechanics and introduction to Quantum field theory by Anton z.
9. Relativistic Quantum Fields by Bjorken and Drell.

List of examiners for setting of Question papers/Evaluation of answer scripts/minor project for the B.Sc(H)-M. Sc. Physics Programme

Department of Physics and Astronomical Sciences

S. No.	Name of the Faculty	Affiliation	Contacts
1.	Prof. Naresh Padha	Department of Physics, University of Jammu,Jammu	nareshpadha@jammuuniversity.in M:9419182875
2.	Prof .Vivek Gupta	Department of Physics, University of Jammu, Jammu	vivek_gupta2k2@hotmail.com M:9419102467
3.	Prof. Ravi Kumar	Centre of Material Science and Engineering NIT Hamirpur H.P..-177 005 India	Mobile: 9814941401 Email: ranade65@gmail.com
4.	Prof. Arun Bharti	Department of Physics, University of Jammu, Jammu	arunbharti_2003@yahoo.co.in M:9419134355
5.	Prof. K. K. Bamazai	Department of Physics, University of Jammu, Jammu	kkbamazi@jammuuniversity.in M:9419134629
6.	Dr. Rajesh Kharab	Department of Physics Kurukshetra University	kharabrajesh@rediffmail.com 9416262306
7.	Dr. Fakir Chand	Department of Physics Kurukshetra University	fchand72kuk@gmail.com 9466481420
8.	Dr. Ramni Gupta	Department of Physics, University of Jammu, Jammu	M:9419191509
9.	Dr. Rani	Department of Physics, University of Jammu, Jammu	rani_rakwal@yahoo.co.in
10.	Dr. Yugal Khajuria	Department of Physics, Shri Mata Vaishno Devi University, Katra, Jammu	yugal@smvdu.ac.in M:9419932508
11.	Dr Jitendra Sharma	Department of Physics, Shri Mata Vaishno Devi University, Karta, J&K	Mobile:9622220321 jitendra.sharma@smvdu.ac.in
12.	Dr. Kamni	Department of Physics, Shri Mata Vaishno Devi University , Karta, J&K	9419633717 kamni.pathania@smvdu.ac.in
13.	Dr. Sundeep Chopra	Scientist 'H', IUAC New Delhi	choprasundeep@gmail.com 9810448516
14.	Dr Harleen Dahiya	NIT Jalandhar	dahiyah@nitj.ac.in
15.	Dr. Kiran Singh	NIT Jalandhar	singhkp@nitj.ac.in
16.	Dr. H. M. Mittal	NIT Jalandhar	mittalhm@nitj.ac.in
17.	Dr. Suneel Dutt	NIT Jalandhar	dutts@nitj.ac.in
18.	Dr. Abhinav Pratap Singh	NIT Jalandhar	jaiswarsinghap@nitj.ac.in
19.	Dr. Surender Verma	Department of Physics Central University of Himachal Pradesh	s_7verma@yahoo.co.in 9817241400
20.	Dr. Kamlesh Yadav	Central University of Punjab, Bathinda	kamlesh.yadav@cup.edu.in, kamlesh.yadav001@gmail.com, kamlesh_yadav@cup.ac.in 8968742800
21.	Dr. Samarjit Sihotra	Department of Physics Panjab University, Chandigarh	ssihotra@pu.ac.in 9463576594
22.	Dr. Ajeet Sharma	IIT Jammu	ajeet.sharma@iitjammu.ac.in 8955338841

31/1/20 31-01-20 31/01/20 31/1/20 31/01/2020

23.	Dr. Vivek K Singh	Department of Physics, Shri Mata Vaishno Devi University, Karta, J&K	9419115187 vivek.singh@smvdu.ac.in
24.	Prof. Vishal Sharma	Institute of Forensic Sc and Criminology, Panjab University, Chandigarh	vsharma@pu.ac.in 9317782111; 7889094265
25.	Dr. Ram Prakash	Department of Physics, Shri Mata Vaishno Devi University, Karta, Jammu	ramprakash@smvdu.ac.in 9419904015
26.	Prof. Navdeep Goyal	Department of Physics Panjab University Chandigarh 160014	Email: ngoyal@pu.ac.in Phone: +91 172 2534451
27.	Prof. Rajeev Kumar Puri	Department of Physics, Panjab University, Chandigarh,	drrkpuri@gmail.com Ph:91 172 2534468
28.	Dr. Amit Kumar	GCW, Gandhi Nagar, Jammu	akbcw2@gmail.com 8803747761
29.	Dr. Sandeep Arya	Department of Physics, University of Jammu	snp09arya@gmail.com 7889455309
30.	Dr. Naresh Sharma	GDCW, Kathua(J&K)	nareshbasotra@gmail.com 9419254522
31.	Dr. Rawan Kumar	GDC, Samba (J&K)	rawanphysics@gmail.com 9858689264
32.	Dr. Chetan Sharma,	GDC, R.S. Pura (J&K)	chetan24101985@gmail.com 9622397742
33.	Mr. Jasvinder Singh	GDC, Kathua (J&K)	jasvinderkah076@gmail.com 9796451155
34.	Dr. Arun Sharma	GDC, Billawar (J&K)	aruncool.gaur88@gmail.com 9419148949

The Head of the Department is authorized to add or delete any other reputed Examiner(s) if such a need arises in future.