IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics I Year- I Semester
BPHYCC (H)-101: Mechanics

Objective: The objective of this paper is to impart knowledge of laws of motion and their application to various dynamical situations, motion of inertial frames and concept of Galilean transformations.

UNIT-I **(10 Sessions)**

Newton's law of motion, Absolute time and absolute space, Fundamental forces of nature, gravitational Electromagnetic, strong nuclear and weak nuclear forces, develop skills to understand Frictional force. Inertial reference frame, Dynamics of particle in rectilinear and circular motion, Conservative and Non – conservative forces, Conservation of energy, liner momentum and angular momentum, Collision in one and two dimensions, cross section

UNIT-II **(10 Sessions)**

Angular momentum and Linear momentum, Equation of motion of rigid body Moment of inertia, Product of moment of inertia, understanding Radius of gyration for skill development, Theorem of parallel and perpendicular axes, Moments of inertia of a ring and disc, Conservation law of energy, Conservative and non conservative forces.

UNIT-III **(10 Sessions)**

Central forces, Two body centre force Problem, Reduced mass, law of gravitation, Kepler's law knowledge for better skill development, Motion of Planets and satellites, geostationary satellites, Classification of Kepler's orbits.

UNIT-IV **(12 Sessions)**

Frame of References, understanding of Galilean transformation for skill development, Lorentz transformation, Postulates of special theory of relativity, Relativistic mass, Relativistic energy, Relativistic momentum, Mass energy relation Transformation of momentum and Energy.

Course Outcomes:

Students completing this course will be able to:

CO1: Develop skill to understand laws of motion and their application to various dynamical situations and study Of fundamental forces in nature.

CO2: Study conservation laws: conservation of energy, momentum, angular momentum and apply them to basic problems for skill development.

CO3: Understand two body central force problem, reduced mass, Kepler's law, its Classification of Kepler's orbits and to apply Kepler's law to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.

CO4: Develop skills to understand and explain frame of References, Galilean transformation, Lorentz transformation, postulates of special theory of relativity and their global employability scopes in astrophysics.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	2	2	1	2	1	1	1	2	1	1
CO 2	1	3	3	3	2	1	2	1	2	2	1	1
CO 3	1	2	1	2	2	1	1	1	1	1	2	1
CO 4	2	2	1	2	1	1	1	1	1	2	2	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. An introduction to Mechanics by Kleppner.
2. Mechanics by Basavaraju & Ghosh.
3. Mechanics by B.S. Agarwal.
4. Mechanics by D.S. Mathur

Website Sources:

- https://en.wikipedia.org
- https://courses.lumenlearning.com
- https://physics.info
- https://www.toppr.com
- https://digitalcommons.unl.edu

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics I Year I Semester
BPHYCC (H)-102: Thermal Physics

Objective: The objective of this course is to teach fundamental laws of thermodynamics, Maxwell's thermo dynamical relation and their applications.

UNIT- I **(10 Sessions)**

Thermodynamics Systems, Thermal equilibrium and Zeroth law of thermodynamics; First law of thermodynamics, Second law of thermodynamics, develop skill to understand Reversible and irreversible process, Concepts of temperature, Equation of states, Vander wall's equation.

Thermal equilibrium, Zeroth law of thermodynamics, Temperature concept, Equations of State, Van der Waal's equation, Critical constants, principle of corresponding states. First law of thermodynamics , Absolute scale of temperature Entropy , Degradation of energy , Enthalpy Helmholtz function , Gibbs function , Maxwell's thermodynamics relations and their application.

UNIT-II **(10 Sessions)**

Maxwell's thermo dynamical relation and their applications, Entropy, Change of entropy in a reversible and irreversible Processes, Absolute scale of temperature, understanding Carnot's theorem for better skill development, Enthalpy, Helmholtz function, Gibbs function.

UNIT-III **(10 Sessions)**

Clausius Clapeyron equation, Differential and integral understand Joule Thomson effects for skill development, Temperature Inversion Specific heat Equation.

UNIT-IV **(10 Sessions)**

Thermodynamics and Kinetic theory, develop skills to understand Black body radiation and its application, Kirchoff's law and its applications, Stefan's Boltzmann's law, Rayleigh-Jean's law, Wien's displacement law, Plank's hypothesis and its application to black body radiation.

Course Outcomes:

Students completing this course will be able to:

CO1: Learn the basic concepts of thermodynamics, Zeroth law, first and the second law of thermodynamics for skill and employability development.

CO2: Learn Maxwell's thermodynamic relations, concept of entropy, Carnot's theorem and their employability scopes in local perspectives.

CO3: Develop skill to derive Claussius Clapeyron equation, inversion Specific heat equation.

CO4: Have a knowledge of the black body radiation and its applications.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	1	2	2	1	1	1	1	1	1	1
CO 2	1	3	1	3	2	1	1	1	1	2	1	1
CO 3	1	2	1	1	3	1	2	1	1	1	2	1
CO 4	1	3	2	1	2	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	1	1	1
CO4	2	1	1

Suggested Readings:

1. An Introduction to Thermal Physics by Clement John Adkins.

2. Thermal Physics and Statistical Mechanics by Satya Prakash.
3. Thermal Physics by Brijlal and Subrahmanyam.
4. Concepts in Thermal Physics, Stephen Blundell**.**

Website Sources:

- https://en.wikipedia.org
- https://madeeasy.in
- https://www3.nd.edu
- https://physics.info
- http://www.csc.kth.se

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics I Year I Semester
BPHYCC (H) -151: Physics Lab – 1

Objective: The main goal of this subject is to share the knowledge to the students about the Experiments. The students will get a better understanding of the concepts studied by them in the theory course and correlate with experimental observations.

List of Experiments **(20 Sessions)**

1. To determine the surface tension of a liquid by Jaeger's method.
2. To determine the viscosity of liquid by Poiseuille's method.
3. To determine the value of Stefan's constant.
4. To determine the moment of inertia of flywheel about its axis of rotation for skill development.
5. To determine the value of g with help of compound pendulum.
6. To determine the modulus of rigidity of a given material in form of a wire by statistical method for development of skill.
7. To determine the time period of simple pendulum.
8. To determine the surface tension of the given liquid by capillary rise method.
9. To Develop skill to determine the Elastic Constants of a Wire by Searle's method.
10. Calculate the moment of inertia of an irregular body using a torsion pendulum to develop skill.
11. Potential energy curves of a 1-Dimensional system and oscillations in it for various amplitudes.
12. Study of oscillations of a mass under different combinations of springs.

Course outcomes:
Students completing this course will be able to:
CO1: Determine value of Stefan's constant.
CO2: Calculate moment of inertia to develop skill.
CO3: Determine surface tension
CO4: Evaluate elastic constant to develop skill in local/global perspectives.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	2	1	1	1	1	2	1	2	1
CO 2	1	3	1	1	1	1	2	1	2	1	2	1
CO 3	1	3	1	2	1	2	1	1	1	2	1	1
CO 4	1	3	2	1	1	1	1	1	1	2	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	1	1	1
CO4	2	1	1

Suggested Readings:
1. Practical Physics by S. L. Gupta
2. Practical Physics by Navneet Gupta
3. Practical Physics by S. K. Gupta

Website Sources:

- https://nvlpubs.nist.gov
- https://dkpandey.weebly.com
- http://vlab.amrita.edu
- https://www.niser.ac.in

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics I Year II Semester
BPHYCC (H)-201: Waves and Oscillations

Objective: The objective of this course is to introduce the basic concepts required for a mathematical description of waves and oscillations.

UNIT-I **(10 Sessions)**

Wave motion, Differential equation of motion, Stationary waves, Flow of energy in stationary states, Plane progressive wave's solution, Reflection of waves, Phase change of reflection, develop skill to understand Phase and group velocity.

UNIT-II **(10 Sessions)**

Simple harmonic motion, Differential equation of S.H.M., energy of oscillations, elasticity and simple harmonic vibrations, study of oscillations and its application, understand superposition of rectangular simple harmonic oscillations for better skill development.

UNIT-III **(10 Sessions)**

Oscillators, Damped oscillator, Equation of motion and its solution, Damped harmonic oscillator, Effect of damping on frequency, Damping force, Relaxation time, understand LCR circuit for skill development, Moving coil galvanometer.

Fourier analysis: Analysis of squire Wave, saw tooth Wave and rectified sinusoidal Wave. Electromagnetic waves: Maxwell's Equation, pointing vector, E.M. Waves and its propagation in free space.

UNIT-IV **(12 Sessions)**

Forced oscillations, Resonance, amplitude resonance, Parallel resonance, Sharpness of resonance, Quality factor (Q), Energy dissipation, Impedance, understanding of Mechanical and electrical impedance for skill development.

Course Outcomes:

Students completing this course will be able to:

CO1: Development of skill to study wave motion, differential equation of motion, stationary waves.

CO2: Learn Simple harmonic motion, differential equation of S.H.M and the solution of the oscillator using differential equations for additional skill development.

CO3: Understand oscillators, damped oscillator, equation of motion and its solution. Understand the principle of superposition of waves and the formation of standing waves.

CO4: Study forced oscillations, resonance and impedance. Explain several phenomena we can observe in everyday life that can be explained as local/ global wave phenomena for developing skill.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	2	3	1	1	3	1	2	1	1	1
CO 2	2	3	1	2	1	1	1	2	1	1	2	1
CO 3	1	3	3	3	1	1	1	1	2	1	1	1
CO 4	1	2	1	2	1	2	1	2	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. The Physics of waves and Oscillations by N. K. Bajaj.
2. Waves and Oscillations by Brijlal and N. Subrahmanyam.
3. Oscillation & Waves by D. P. Khandelwal
4. Oscillation & Waves by Satya Prakash
5. Physics of Vibration & Waves by H.J. Pain

Website Sources:

- https://en.wikipedia.org
- https://en.wikipedia.org
- https://www.toppr.com
- http://egyankosh.ac.in
- http://www.uou.ac.in

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics I Year II Semester
BPHYCC (H) -202: Optics

Objective: To understand the optical phenomena based on the wave description of light. The principles of interference, diffraction, polarization will be fully developed and optical devices that use these properties of light will be described.

UNIT-I **(10 Sessions)**

Reflection, Refraction and refractive index, Coherence and Interference of light, Fresnel's Biprism, Thin films, Newton's Rings, develop skill to understand Fabry Perot interferometers, Lummer Plate, Interference filters.

UNIT-II **(10 Sessions)**

Diffraction ,Fresnel's and Fraunhoffer diffraction, understand Fresnel's half period zones for skill development, Zone plate , Fraunhofer diffraction at single, double and n-slits, Absent Spectra.

UNIT-III **(10 Sessions)**

Develop skill to understand resolving power, Rayleigh Criterion of limit of resolution, Expressions for resolving powers of telescope and grating.

UNIT-IV **(12 Sessions)**

Polarization, Double refraction, Nicol prism, Polaroids and Retardation plates, Analysis of Polarized light, Optical activity, Specific rotation and optical rotation, understand Polarimeters for skill development and employability, Laurent's Half shade Polarimeter and Bi-quartz Polarimeter. Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating and reflection grating, and blazed gratings. Concave grating and different mountings. Resolving power of a grating and comparison with resolving powers of prism and of a FabryPerrot etalon.

Course Outcomes:

Students completing this course will be able to:

CO1: Develop skill and gain knowledge on various theories of light. Understand the properties of light like coherence, Interference.

CO2: Learn the applications of diffraction for skill development.

CO3: Derive an expression for resolving power of telescope etc.

CO4: Understand phenomenon of polarization, uses of polaroids, working and applications of polarimeter for skill development and related local/global applications in optics.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	1	2	1	1	3	1	1	1	2	1
CO 2	1	3	2	2	1	1	2	1	2	1	1	1
CO 3	1	3	1	3	2	1	1	1	1	1	2	1
CO 4	1	2	1	1	2	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Optics by A. K. Ghatak

2. Principle of Optics by B. K. Mathur.
3. Fundamental of Optics by F. A. Jenkins and H. E. White.
4. A Text Book of Optics by N. Subramanyam and Brijlal.
5. Optics by S.L Kakani

Website Sources:

- https://www.veerashaivacollege.org
- http://www.hep.manchester.ac.uk
- https://content.kopykitab.com
- http://www.vpscience.org
- https://nanopdf.com

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics I Year II Semester
BPHYCC (H)-251: Physics Lab – 2

Objective: In this course students would be able to understand basic experiments of optics like: determination of wavelength, radius of curvature, Specific rotation and wavelength of sodium light etc. The students will get a better understanding of the concepts studied by them in the theory course and can correlate with experimental observations.

List of Experiments **(20 Sessions)**

1. To determine the wavelength of sodium light by Newton's ring method for skill development.
2. To determine the radius of curvature of Plano convex lens by Newton's ring experiment.
3. To determine the specific rotation of cane sugar solution with the help of polarimeter.
4. To determine the focal length of combination of two lenses separated by distance with the help of Nodal slide and to verify the formula.
5. To develop skill to determine frequency of tuning fork with help of sonometer.
6. To determine the resolving Power of a Plane Diffraction Grating for skill development.
7. To verify Fresnel's formulae for the reflection of light.
8. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g, and (c) Modulus of Rigidity.
9. To determine the refractive index of the prism and its dispersive power with the help of spectrometer.
10. To determine the wavelength of Sodium light with help of Michelson Interferometer for development of skill and employability.
11. Determination of specific rotation of cane sugar by polarimeter.
12. Determination of wavelength of sodium yellow line by Fresnal's Biprism.

Course Outcomes:
Students completing this course will be able to:
CO1: Evaluate the wavelength of sodium light, radius of curvature for skill development.
CO2: To develop skill to evaluate focal length of combination of two lens.
CO3: Evaluate refractive index of the prism
CO4: Evaluate resolving power of plane diffraction grating for skill development in local/global perspectives.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	1	2	1	1	1	2	1	1	1
CO 2	1	2	1	2	1	1	1	1	1	1	1	1
CO 3	2	3	1	1	3	1	1	1	1	1	1	1
CO 4	1	1	1	1	2	1	1	2	1	1	1	1
CO 5	1	1	1	1	1	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Readings:

1. Practical Physics by S. L. Gupta
2. Practical Physics by Navneet Gupta
3. Practical Physics by S. K. Gupta

Website Sources:

- http://www.iiserpune.ac.in
- http://vlab.amrita.edu
- https://www.niser.ac.in

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics I Year II Semester
AECC* (Audit Course): Environmental Studies

Objective: The aim of this course is to imparting basic knowledge about the environment and its allied problems and also to develop an attitude of concern for the environment.

UNIT- I: **(5 Sessions)**

Introduction to environmental studies, develop skill to understand Multidisciplinary nature of environmental studies; components of environment – atmosphere, hydrosphere, lithosphere and biosphere, Scope and importance, Concept of sustainability and sustainable development.

UNIT- II: **(5 Sessions)**

Ecosystems

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT- III: **(5 Sessions)**

Natural Resources: Renewable and Non-renewable Resources

Land conservation of Resources and land use change; Land degradation, soil erosion and desertification.

Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: understand Use and over-exploitation of surface and ground water for skill development, floods, droughts, conflicts over water (international & inter-state).

Heating of earth and circulation of air; air mass formation and precipitation.

Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT- IV: **(5 Sessions)**

Biodiversity and Conservation

Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots

India as a mega-biodiversity nation; Endangered and endemic species of India

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT-V: **(5 Sessions)**

Environmental Pollution

Develop skill to understand Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution

Nuclear hazards and human health risks

Solid waste management: Control measures of urban and industrial waste, Pollution case studies.

UNIT-VI: **(5 Sessions)**

Environmental Policies & Practices

Climate change, understand global warming for skill development, ozone layer depletion, acid rain and impacts on human communities and agriculture.

Environment Laws : Understand Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC)
Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

UNIT - VII: **(5 Sessions)**

Human Communities and the Environment
Human population and growth rate: Impacts on environment, human health and welfares.
Carbon foot-print. Resettlement and rehabilitation of project affected persons; case studies.
Develop skill to understand Disaster management: floods, earthquakes, cyclones and landslides.
Environmental movements: Chipko, Silent valley, Bishnoi of Rajasthan.
Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

UNIT-VIII: **(5 Sessions)**

Field work
Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.
Study of common plants, insects, birds and basic principles of identification.
Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Course Outcomes:

Students completing this course will be able to:
CO1: To learn about the components of environment: atmosphere, hydrosphere, lithosphere and biosphere for local/ global skill development.
CO2: To develop skill and to understand about the structure and function of ecosystem
CO3: Study natural resources and types of resources, renewable and non-renewable resources
CO4: Biodiversity patterns, energy resources
CO5: Develop skill to understand local/ global environmental pollution: types, causes, effects and controls.
CO6: Explain local/ global environmental policies and practices.
CO7: Understand human communities and environment for skill development.
CO8: Demonstrate a general understanding of the breadth and interdisciplinary nature of environmental issues. Develop skill to dentify common plant, birds and insects.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	3	1	1	2	1	1	1	1	1	1	1
CO 2	1	3	1	2	1	1	1	2	1	1	1	1
CO 3	1	3	1	3	1	1	1	1	2	1	2	1
CO 4	1	2	1	1	2	1	1	1	1	1	1	1
CO 5	1	3	2	1	1	1	1	1	1	1	1	1
CO 6	1	2	1	1	1	1	1	1	2	1	1	1
CO 7	1	2	2	1	1	1	1	1	1	1	1	1
CO 8	1	3	2	1	3	2	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	3	1	1
CO4	1	1	1

Suggested Readings:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson,B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P.1996. Rivers no more: the environmental effects of dams(pp. 29-64). Zed Books.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, h.T. & Andrews, J.1971. Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatement. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India. Tripathi 1992.
14. Sengupta, R. 2003.Ecology and economics: An approach to sustainable development.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren, C.E. 1971. Biology and Water Pollution Control. WB Saunders.
19. Wilson, E.O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
20. World Commission on environment and Development. 1987. Our Common Future. Oxford University Press.

Website Sources

- https://aits-tpt.edu.in
- https://www.overpopulationawareness.org
- https://www.joboneforhumanity.org
- https://www.ugc.ac.in

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honours) Physics Programme
B. Sc. (Hons) Physics II Year III Semester
BPHYCC (H)-301: Electricity and Magnetism

Objective: The goal of the course is to gain an understanding of fundamental concepts in electricity and magnetism, magnetic fields and their relationship to electrical fields.

UNIT-I **(10 Sessions)**

Electrostatics: develop skill to understand Coulomb's law, Electric Field Strength, Electric Potentials, Poisson and Laplace Equations, Gauss Law and its application, Electric dipole, Electric field and potential due to an electric dipole, Current density and Equation of Continuity.

Coulomb's law, Electric Field and potentials, Field due to a uniform charged sphere, Derivations of Poisson and Laplace Equations, Gauss Law and its application: The Field of a conductor . Electric dipole, Field and potential due to an electric dipole, Dipole approximation for an arbitrary charged distribution, Electric quadruple, Field due to a quadruple , Electrostatic Energy of a charged uniform sphere , Energy of a condenser .

UNIT-II **(10 Sessions)**

Magneto statics :Magnetic field , Magnetic forces , Magnetic Induction, Biot – Savart Law, Vector and Scalar Magnetic potentials , Magnetic Dipole , understand Ampere's Law for skill development and Ampere's Circuital Law, Magnetic field due to Solenoid.

UNIT-III **(10 Sessions)**

Electromagnetic Induction: Laws of Induction, develop skill for understanding Faraday's laws and Lenz's Law, Mutual and Self Induction, Betatron, Induced magnetic field, Displacement Current, Maxwell's equations, Electromagnetic wave equation in free space.

UNIT-IV **(12 Sessions)**

Dielectric constant, Polarization, Electronic polarization, Atomic or ionic Polarization, Polarization charges, Electrostatic equation with dielectric, Field, Force and Energy in Dielectrics, understand Clausius-Mossotti Equation for skill development.

Course Outcomes:

Students completing this course will be able to:

CO1: Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics and apply Gauss's law of electrostatics to solve a variety of local problems for skill development.

CO2: Study Biot-Savart law, Amperes' law and Ampere's Circuital law. Describe the magnetic field produced by magnetic dipoles and electric currents for skill development.

CO3: Develop skill to explain Faraday's laws and Lenz's Law. Derive an electromagnetic wave equation in free space

CO4: Study of polarization and derive an expression for Clausius Mossotti equation.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	1	3	1	1	1	1	1	1	1
CO 2	2	3	1	2	2	2	1	1	1	1	2	1
CO 3	3	3	1	3	1	1	2	1	1	1	1	1
CO 4	2	2	3	2	1	3	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Electricity and Magnetism by Reitz and Milford.
2. Electricity and Magnetism by A. S. Mahajan and A. A. Rangawala.
3. Electricity and Magnetism by D. C. Tayal.
4. Electromagnetic Waves and Radiating systems by Jordan Balman
5. Electricity and Magnetism by K. K. Tewari.
6. Electricity and Magnetism by A.S. Mahajan

Website Sources:

- https://mrcet.com
- https://en.wikipedia.org
- http://sites.science.oregonstate.edu
- https://uomustansiriyah.edu.iq
- https://www.electrical4u.com

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics II Year III Semester
BPHYCC (H)-302: Circuit Fundamentals and Basic Electronics

Objective: The aim of this course is to provide comprehensive understanding of electronic devices and circuits.

UNIT-I **(10 Sessions)**

Growth and decay in LR Circuit for skill development, understand Charging and discharging in R.C and R.L.C. circuits for development of skill, Time constant, A.C. Bridges, Maxwell's and Schering's Bridges, Wien Bridge. Alternating currents in R.L.C. circuits, complex impedances, phase diagrams, Q factor, series and parallel resonant circuits, theory of coupled circuits, Transformers, Reflected Impedance and impedance matching.

UNIT-II **(10 Sessions)**

Semiconductors, Intrinsic and extrinsic semiconductors, Unbiased diode, Forward bias and Reverse bias diodes, Diode as a rectifier, Diode characteristics, develop skill to understand Rectifier, Bridge rectifier, Bipolar transistors.

UNIT-III **(10 Sessions)**

Transistor biasing, base bias, emitter bias and voltage divider bias, DC load line. AC equivalent circuits, Amplifiers, Common emitter amplifier, Common collector amplifiers and common base amplifiers, Current and Voltage gain, understand R.C. coupled amplifier for skill development.

UNIT-IV **(12 Sessions)**

Transistor as an Oscillator, develop skill to understand Hartley oscillator. Elements of transmission and reception, Modulation and demodulation, Cathode ray oscilloscope and its simple applications.

Course Outcomes:

Students completing this course will be able to:

CO1: Develop skill to understand the concept of basic electronics and their applications. Obtain knowledge on L C R circuits, semiconductors, diodes, rectifiers and transistors.

CO2: Compute and study characterization of diodes, rectifiers and transistors for skill and employability development in national/global perspectives.

CO3: Study of transistor biasing, amplifiers.

CO4: To develop skill and explain modulation and demodulation and study cathode ray oscillator and its local/global applications.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	3	2	1	2	1	3	1	1	1	1	1
CO 2	1	2	3	2	1	1	1	2	1	1	1	1
CO 3	1	3	2	2	1	1	1	1	1	1	2	1
CO 4	1	2	1	3	1	1	2	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Circuit Fundamental & basic Electronics by J. P. Agarwal & Amit Agarwal.
2. Electronic Devices and Circuit Theory by R. Boylested and L. Nashelksky.

3. Electronic Principles by A. P. Malvino.
4. Integrated Electronics by J. Millman and C.C. Halkias.
5. Electronics by V.K. Mehta

Website Sources

- http://www.olabs.edu.in
- https://www.electronics-tutorials.ws
- https://learnabout-electronics.org
- https://resources.pcb.cadence.com
- https://www.electronics-tutorials.ws
- https://dreamtopper.in

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics II Year III Semester
BPHYCC (H) -351: Physics Lab – 3

Objective: The main objective of this course is to impart the knowledge to the students about the experiments so that students will get a better understanding of the concepts studied by them in the theory course and correlate with experimental observations.

List of Experiments **(20 Sessions)**

1. To determine the specific resistance of material of a given wire using Carey Foster Bridge.
2. To compare two resistance by means of potentiometer.
3. To convert Galvanometer into Ammeter of a given range with potentiometer for skill development.
4. To convert Galvanometer into Voltmeter of a given range with potentiometer.
5. Develop skill to find out internal resistance of Leclanche cell by Potentiometer.
6. To convert Galvanometer to Ammeter and voltmeter with inbuilt power supply and meters
7. To determine the magnetic moment (M) of a magnet and horizontal component of Earth's magnetic field.
8. To find the resistance of an accumulator using Post office box.
9. To study the ballistic constant K of a moving coil Ballistic galvanometer and to calibrate ballistic galvanometer for skill development.
10. To determine the unknown frequency to compare the frequency of two unknown signals using CRO for better skilling and employability.
11. High resistance by leakage.
12. A.C. Bridges

Course Outcomes:
Students completing this course will be able to:
CO1: Measurement of specific resistance of material for skill development.
CO2: compare two resistances.
CO3: Develop local skill to convert galvanometer into ammeter and voltmeter
CO4: Determine skill to determine magnetic moment (M) of a magnet

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	3	2	1	3	1	2	1	2	1	1	1
CO 2	2	2	1	2	2	1	1	1	1	1	2	1
CO 3	1	3	3	1	2	1	1	1	1	1	1	1
CO 4	1	2	1	3	2	1	2	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	2	1	1

Suggested Readings:
1. Practical Physics by Navneet Gupta

2. Practical Physics by S. K. Gupta
3. Practical Physics by S. L. Gupta

Website Sources:

- http://www.iiserpune.ac.in
- http://vlab.amrita.edu
- https://www.niser.ac.in

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics II Year III Semester
UDM (Audit Course): Disaster Management

Objective: The goal of this course is to provide students an understanding to the concepts and aspects of disaster and its relationship with development and to give them awareness of Disaster Risk Reduction (DRR) approaches.

UNIT- I: **(10 Sessions)**

Introduction to Disasters

- Definition: Disaster, Hazard, Vulnerability, Resilience, Risks
- To develop skill and understand Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.
- Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.
- Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Do's and Dont's during various types of Disasters.

UNIT- II: **(8 Sessions)**

Approaches to Disaster Risk Reduction

- Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness
- Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures,
- Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs) for skill development, States, Centre, and other stakeholders

UNIT- III: **(8 Sessions)**

Inter-Relationship between Disasters and Development

- Understand Factors affecting Vulnerabilities for skill development, impact of Development projects such as dams, embankments, changes in Land-use etc.
- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.
- Role of international co-operations in Disaster Management

UNIT- IV: **(8 Sessions)**

Disaster Risk Management in India

- Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management
- Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation
- Develop skill to understand Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT- V: **(10 Sessions)**

Disaster Management: Applications, Case Studies and Field Works

The project /fieldwork are meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the institution is located. A few ideas or suggestions are discussed below.

Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations.

Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could

work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs.

Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid.

Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.

The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Course Outcomes:

Students completing this course will be able to:

CO1: To develop skill to understand disaster, types of disasters, causes and global trends in disasters.

CO2: Explain disaster life cycle, local/ global trends in disasters for skill development.

CO3: Factors affecting vulnerabilities, impact of development projects and understand role of international cooperation in disaster management.

CO4: Study of disaster risk management in India.

CO5: Understand disaster management and its applications for developing skill.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	3	2	1	1	1	2	1	1	1	2	1
CO 2	1	2	2	3	1	2	1	1	1	1	2	1
CO 3	1	3	1	3	2	1	1	1	1	1	1	1
CO 4	1	2	3	2	1	2	1	1	2	1	1	1
CO 5	1	1	1	2	1	3	1	1	2	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	2	1	1
CO4	2	1	1

Suggested Readings:

1. Satish Modh, Introduction to Disaster Management, Macmillan Publisher India Ltd
2. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
3. Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
4. Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
5. Singhal J.P. "Disaster Management", Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
6. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., ISBN-10: 1259007367, ISBN-13: 978-1259007361]
7. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
8. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
9. Carter, Nick. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
10. Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.
11. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009.
12. Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi Indian Journal of Social Work.
13. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.

Websites Source:

- http://nidm.gov.in/
- http://nidmssp.in
- http://www.drishtiias.com

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics II Year IV Semester
BPHYCC (H)-401: Atomic & Laser Physics

Objective: This course imparts knowledge of atomic spectra of one and two valance electron atoms and to teach about Laser construction, working, principles and their applications.

UNIT-I **(10 Sessions)**

Atomic Spectroscopy :-Hydrogen spectrum, Pauli's exclusion principle, Spectra of alkali elements, spin orbit interaction and fine structure in alkali and alkaline spectra, develop skill to understand LS and JJ coupling, Selection rules, Zeeman effect, Paschen back effect, Stark effect. Historical developments, Bohr model and the spectra of hydrogen atoms, Critical resonance and the lionization potentials. Frank-Hertz experiment. Characteristic and continuous S-rays, Moseley's law, Bragg's Law. space Quantization, Vector atom model and quantum Numbers, Magnetic moment of electrons Larmor Precession, Electron Spin, Stem-Gerlach experiment, Pauli's exclusion principle and electronic configuration of atoms, Zeeman effect, Raman effect**,** Particle nature of radiation, Photoelectric effect and Compton Effect. Wave nature off particles. De-Broglie Waves, Davission-Germer Experiment, Wave Packets, Phase velocity and group velocity, Heisenberg's Uncertainty Principle and applications, One dimensional Schrödinger's Wave Equation and concept of probabilistic, amplitude.

UNIT-II **(10 Sessions)**

X-Rays:- X-Rays and generation of X-rays, X-ray spectrum, origin of Continuous X-ray spectrum, Characteristics X-rays, Bragg's Law, understand Moseley's law for skill development, Auger effect.

UNIT-III **(10 Sessions)**

Laser Physics :-Spontaneous and stimulated emission, Einstein coefficients, Population inversion, Pumping schemes, type of Lasers (three and four level), understand Optical resonators for skill development, quality factor, transverse and longitudinal mode, Coherence, Threshold conditions.

UNIT-IV **(12 Sessions)**

Laser and its Applications: Ruby Laser for better skilling and employability, He-Ne Laser, CO_2 Laser, Semiconductor Laser, Four level solid state Laser, Dye Laser, Argon Laser, understand Excimer Laser for skill development, Application of Lasers (Radar, Holography, medical and material processing).

Course Outcomes:

Students completing this course will be able to:

CO1: To develop skill to understand spectrum of Hydrogen, Spectra of alkali elements and alkaline spectra, Identify atomic effect such as Zeeman effect, Paschen back effect and Stark effect.
CO2: Explain the observed dependence of atomic spectral lines on externally applied electric and magnetic fields. X-rays their generation and types of X-ray spectra.
CO3: Study laser and their types for local/ global skill development.
CO4: To develop skill to study of different types of laser, their working and applications.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	1	2	3	2	1	2	1	2	2	1
CO 2	2	2	1	1	2	1	2	2	1	1	1	1
CO 3	3	2	2	2	1	3	1	1	1	2	1	1
CO 4	3	3	1	1	2	2	3	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Readings:

1. Molecular Spectroscopy by Jeanne L.Mc Hale.
2. Laser Theory & Applications by G.M Barrow.
3. Laser Physics by Satya Prakash.
4. Introduction to Atomic Physics by H.E.White.
5. Introduction to LASER by M N Avadhanlu
6. Laser system and Application by Rajesh Mishra
7. Laser system and Application by S K Srivastav
8. Laser , Principle types and application by K R Nadian

Website Sources:

- http://epgp.inflibnet.ac.in
- http://www.tcm.phy.cam.ac.uk
- http://www.iiserpune.ac.in
- https://en.wikipedia.org
- http://www.iiserpune.ac.in

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics II Year IV Semester
BPHYCC (H)-402: Classical and Statistical Mechanics

Objective: This course provides knowledge in a solid foundation in classical mechanics and provides information about general methods of studying the dynamics of particle systems, calculating probability for various statistical systems of particles.

UNIT-I **(10 Sessions)**
Mechanics of a system of particles, generalized coordinates, develop skill to understand D' Alembert's principle, The Lagrangian formulation and Lagrange's equations of motion, Calculus of variation and it's applications. The Hamiltonian formulation and Hamilton's equation of motion.

UNIT-II **(10 Sessions)**
The rigid body motion, force free motion of symmetrical rigid body, two body central force problem, reduction to equivalent one body problem, the equation of motion and first integrals, classification of orbits, orbit for integrable power law potentials, inverse square law – Kepler problem for skill development.

UNIT-III **(10 Sessions)**
Understand Probability and thermodynamic probability for developing skill, Principle of equal priori probability, probability distribution and its narrowing with increase in number of particles, accessible and inaccessible states.

UNIT-IV **(12 Sessions)**
Liouville's theorem, Ensembles, the micro canonical, the canonical and grand canonical ensembles, Maxwell-Boltzmann Statistics, Partition function, Maxwell Velocity distribution and mean values, develop skill to understand Equipartition theorem, Statistics of identical particles, Fermi – Dirac and Bose Einstein Statistics.

Course Outcomes:
Students completing this course will be able to:
CO1: Study of mechanics of a system of a particle, D' Alembert's principle for skill development.
CO2: To develop skill and understand motion of rigid body and explain law of planetary motion.
CO3: They can easily distinguish between different types of particles and statistics and can easily distribute bosons, fermions and classical particles among energy levels for local/ global skill development.
CO4: Understand about statistical distributions. Liouville's theorem, ensembles, Maxwell-Boltzmann Statistics, Fermi – Dirac and Bose Einstein statistics for skill development.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	2	1	2	1	1	2	1	2	1
CO 2	3	2	1	3	1	3	1	1	1	2	1	1
CO 3	2	2	2	1	2	2	1	1	1	1	1	1
CO 4	2	3	1	2	1	2	1	2	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Classical Mechanics by Gupta Kumar.
2. Classical Mechanics by J. C. Upadhayay.
3. Classical Electrodynamics by J. D. Jackson.
4. Statistical Mechanics by K. M. Khanna.
5. Classical Mechanics by Herbourt Goldstein
6. Classical Mechanics by N. C. Rana

Website Sources

- http://www.iitg.ac.in
- https://en.wikipedia.org
- http://kestrel.nmt.edu
- http://people.duke.edu
- http://www.physics.usu.edu
- https://sites.astro.caltech.edu

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics II Year IV Semester
BPHYCC (H)-451: Physics Lab – 4

Objective: In this Course students would gain the practical knowledge by performing various experiments like measuring thickness of wire, wavelength, and verification of truth table etc.

List of Experiments **(20 Sessions)**

1. Measurement of wavelength of laser by diffraction grating.
2. To study the diffraction pattern of laser light and determine its wavelength.
3. Measurement of thickness of wire by Laser for skill development.
4. Measurement of the wavelength of the Laser by Double slit.
5. To measure the divergence of a Laser beam.
6. Develop skill to Plot frequency response curve of a single stage RC coupled amplifier.
7. Develop skill to verify the truth table of various Logic Gates Circuits.
8. To verify the truth table of Half Adder and Full Adder for skill development.
9. To study the rectification by half wave rectifier.
10. To verify the basic laws of Boolean expression using logic gates.
11. To determine the refractive index of water using hollow prism
12. To draw the dispersion curve for the constant deviation prism spectrograph using the spectral lines of iron as standard and to determine the wave length of Copper lines

Course Outcomes:
Students completing this course will be able to:
CO1: To develop local skill to evaluate wavelength of laser
CO2: Determine thickness of wire for skill development.
CO3: Divergence of a laser beam
CO4: To develop skill to verify the truth table of logic gates, half adder, full adder.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	2	2	1	2	1	1	1	1	1	1
CO 2	1	2	3	1	2	3	1	2	1	1	1	1
CO 3	3	3	1	1	1	1	1	1	1	1	2	1
CO 4	3	1	2	3	3	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Practical Physics by Navneet Gupta
2. Practical Physics by S. K. Gupta
3. Hand book of Electronics by Gupta Kumar
4. Practical Physics by S. L. Gupta

Website Sources:

- https://nvlpubs.nist.gov

- https://dkpandey.weebly.com
- http:// amrita.vlab. edu
- https://www.niser.ac.in

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors)Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY (H)-501: Quantum Mechanics & Atomic Spectra

Objective: The objective of this course is to explain the basic principles and formulations of quantum mechanics**.**

UNIT-I **(10 Sessions)**

Failure of classical physics to explain black body spectra, Planck's radiation law to provide employability & skills, Compton Effect, Wave particle duality, de Broglie's hypothesis, Concept of wave and group velocity, Experimental demonstration of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle. Inadequacies of classical mechanics , Photoelectric phinomena , Compton effect , Wave-particle duality , de Briglie matter waves and their experimental verification , Heisenberg's Uncertainty principle, Complementary principle, Principle of superposition , Motion of wave packets .

UNIT -II **(10 Sessions)**

Schrodinger's equation (Time dependent and time independent equations), Physical significance of wave function Ψ, Expectation values of a dynamical quantities, Ehrenfest's theorem, Eigen value and Eigen functions, Particle in a box, Harmonic Oscillator understanding for entrepreneurial skill, One dimensional motion in step potential, Rectangular barrier.

UNIT-III **(10 Sessions)**

Operators, Hermitian operator understanding for entrepreneurial skill, Parity operator, orbital angular momentum operator, Effect of operators, Commutation relations, Eigen values and Eigen functions, Orthonormality, normalization, Dirac Delta function.

UNIT-IV **(12 Sessions)**

Bohr's atomic model, Somerfield elliptic orbits , Effect of finite nuclear mass in relation to Rydberg constant, Vector atom model, Spinning of electron, Space quantization, Selection rules, Pauli's exclusion principal, Larmor precession to provide employability & skills

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the failure of classical physics and explain Compton effect, wave particle duality, de Broglie's hypothesis to develop related skills.

CO2: Derive Schrodinger's equation and understand physical significance of wave function Ψ for local/ global skill development.

CO3: Develop skills to explain Operators, orthonormality, normalization.

CO4: Study Bohr's atomic model, Sommerfeld elliptic orbits. Develop skills to understand Pauli's exclusion principle.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	1	2	1	1	2	1	1	2	1
CO 2	2	3	1	3	2	3	1	1	2	1	1	1
CO 3	3	2	2	1	1	1	1	1	1	2	1	1
CO 4	2	2	1	1	1	2	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	3	1	1
CO3	1	1	1
CO4	2	1	1

Suggested Readings:

1. Quantum Mechanics by L.I. Schiff.
2. Concept of modern Physics by A. Beiser.
3. Quantum mechanics` By Ghatak and Loknathan,
4. Fundamentals of Modern Physics by R.M. Eisberg.
5. Introduction to Atomic Spectra by H.E. White.
6. Quantum Mechanics by Eugen Merzbacher
7. Quantum Mechanics by S P Singh
8. Quantum Mechanics by V K Thankappam
9. Quantum Mechanics by L.D. Landau

Website Source

- https://en.wikipedia.org
- https://ocw.mit.edu
- http://physics.mq.edu.au
- https://faculty.washington.edu
- http://www.nat.vu.nl

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors)Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY (H)-502: Elements of Nuclear Physics

Objective: The aim of the course is to impart knowledge in the content areas of nuclear physics and various decay process.

UNIT -1 **(12 Sessions)**

Basic Properties of the nucleus, Mass/ size (radius), Nuclear spin, Magnetic dipole moment understanding for entrepreneurial skill, Electric Quadrapole moment, Parity, packing friction, Binding energy, Saturation of nuclear forces, Main Characteristics of Nuclear forces, Meson theory of nuclear Forces. Introduction to the nucleus, Fermi gas model, Binding energy, Bethe-Weizsaecker mass formula and its application to explain most stable isobars and nuclear fission, Inferences of nuclear size from elastic electronnucleus experiments (no derivation)

UNIT -II **(10 Sessions)**

Alpha decay, Range of α particle, Geiger Nuttal law, Magnetic spectrometer for energy of α particle, Tunneling, Gamow's theory of α decay for better skilling of entrepreneurship, β- decay, Measurement of energy of β particle and end point energy, Neutrino theory of β- decay, γ- decay, Energy of γ photon.

UNIT -III **(10 Sessions)**

Gas filled counter, Ionization chamber, Proportional counter, Linear accelerators, Cyclotron, Synchrotrons, Geiger Muller detector understanding for entrepreneurial skill, Semiconductor Detector, Scintillation detector.

UNIT - IV **(10 Sessions)**

Classification of elementary particles (Quarks, Strange, Mesons), Quantum Numbers, Yukawa's Theory for better skilling of entrepreneurship, Gell Mann-okubo mass formula.

Course Outcomes:

Students completing this course will be able to:

CO1: Acquire basic knowledge about nuclear properties, binding energy, characteristics of nuclear forces understanding for entrepreneurial skill.

CO2: Explain various decays and their explanation for better skilling of entrepreneurship.

CO3: Describe principle, working and applications of various counters and accelerators understanding for local/ global entrepreneurial skill.

CO4: Study of elementary particles and their classification for better skilling of entrepreneurship.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	1	2	1	1	1	1	2	1	1
CO 2	3	2	1	2	2	1	1	1	1	1	1	1
CO 3	2	3	3	3	1	2	1	2	2	1	1	1
CO 4	2	2	2	1	1	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	2	1	1

Suggested Readings:

1. Nuclear Physics, by- S. N. Ghoshal.
2. Fundamentals of nuclear Physics by- B. B. Srivastava
3. Nuclear Physics by- I. Kaplan
4. Concept of Nuclear Physics by B.L. Cohen
5. Nuclear Physics by –S.B. Patel
6. Nuclear Physics theory and experiment by – R.R. Roy and B.P Nigam
7. Nuclear Physics by D. C. Tayal

Website Sources

- https://www.hep.phy.cam.ac.uk
- http://oms.bdu.ac.in
- http://oregonstate.edu
- https://en.wikipedia.org
- http://www.pas.rochester.edu
- https://science.mcmaster.carad

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY (H)-503: Mathematical Physics-I

Objective: The emphasis of course is to equip students with the mathematical and critical skills required in solving problems of interest to physicists.

UNIT -I **(10 Sessions)**

Curvilinear Coordinates:
Orthogonal curvilinear coordinates understanding for entrepreneurial skill, concept of a metric, spherical and cylindrical coordinates and their unit vectors

UNIT -II **(10 Sessions)**

Matrix algebra: Transpose of a matrix to provide employability & skills, Hermitian, orthogonal and unitary matrices. Matrix for rotation in two and three dimensions, Inverse of a matrix, Solution of a system of linear equations by matrix method, Eigen values and eigenvectors of a matrix, Matrix representations of Linear operators, Similarity transformation.

UNIT- III **(10 Sessions)**

Partial Differential Equations: Solutions to partial differential equations by usingseparation of variables, Laplace's Equation for better skilling of entrepreneurship in problems of rectangular, cylindrical andspherical symmetry, Wave equation and its solution for Vibrational modes of a stretched string, rectangular and circular membranes.

UNIT- IV **(12 Sessions)**

Fourier series and Fourier Transform to provide employability & skills: Fourier series, half range expansion, arbitrary period, Fourier integral and transforms, FT of delta and Gaussian function. Tensor Analysis: Introduction to tensors, Cartesian, covariant and contravariant tensors; contractions and direct products, Examples: pseudo, dual, isotropic, symmetric and anti-symmetric tensors.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand concept of a metric, spherical and cylindrical coordinates understanding for entrepreneurial skill.

CO2: Study the matrix transpose, Hermitian, orthogonal and unitary matrices to provide employability & skills.

CO3: Solve first and second order differential equations and apply these to solve physics problems for better skilling of entrepreneurship.

CO4: Learn Fourier series and Fourier transform to provide local/ global employability & skills.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	2	3	3	1	2	1	1	1	1	1
CO 2	2	3	1	2	2	1	3	2	1	1	1	1
CO 3	3	2	1	1	2	2	1	3	2	1	2	1
CO 4	3	2	1	2	1	1	3	1	3	2	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Book:

1. Mathematical Methods for Physicists by G. Arfken and H.J. Weber
1. 2 .Mathematical Physics by P. K. Chattopadhyay.
2. Mathematical Methods in Physical Sciences by Boas.
3. Mathematical Physics by B.S. Rajput.

Website Sources:

- https://www.intechopen.com
- http://www.physics.gla.ac.uk
- http://www.crfm.it
- https://learn.lboro.ac.uk

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY (H)-504: Electromagnetic Theory

Objective: To introduce the basic mathematical concepts related to electromagnetic vector fields.

UNIT -I **(10 Sessions)**

Vector Calculus:

Gradient, Divergence and curl operators understanding for entrepreneurial skill, Introduction to Gauss's divergence and Stoke's theorem. Magnetic Properties of Matter Intensity of magnetization and magnetic susceptibility, Properties of Diaz, Para and Ferromagnetic materials, Curie temperature, Hysteresis and its experimental determination.

UNIT -II **(10 Sessions)**

Maxwell Equations: Review of Maxwell's equations, Displacement Current, Vector and Scalar Potentials. Gauge Transformations: Lorentz and Coulomb Gauge understanding for entrepreneurial skill, Boundary Conditions at Interface between Different Media, Wave Equations, Plane Waves in Dielectric Media, Poynting theorem and Poynting Vector, Electromagnetic Energy Density.

UNIT -III **(10 Sessions)**

EM Wave Propagation in Unbounded Media: Plane EM waves through vacuum andisotropic dielectric medium, transverse nature of plane EM waves, refractive index anddielectric constant, wave impedance, Propagation through conducting media, relaxationtime, skin depth for entrepreneurship & employability.

UNIT -IV **(12 Sessions)**

EM Wave in Bounded Media: Boundary conditions at a plane interface between twoMedia, Reflection & Refraction of plane waves at plane interface between two dielectricmedia-Laws of Reflection & Refraction. Fresnel's Formulae for perpendicular & parallelPolarization cases, Brewster's law, Reflection & Transmission coefficients provide knowledge for better employability in industry, total internal reflection

Course Outcomes:

Students completing this course will be able to:

CO1: Understand the basic mathematical concepts related to electromagnetic vector fields for local/ global employability skill development.

CO2: Derive Maxwell's equations and understand displacement current for skill development.

CO3: Explain propagation of electromagnetic wave in unbounded media for employability skill development.

CO4: Study the electromagnetic wave propagation through conducting media to provide better employability scope in local/ global industry.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	1	1	2	2	1	1	1	1	1	1
CO 2	2	2	1	1	3	2	1	1	1	2	1	1
CO 3	1	3	2	1	3	1	1	1	1	2	2	1
CO 4	1	3	2	2	1	1	1	1	2	2	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	3	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested books

1. Electronic Devices and Circuits by J. Millman and C. Halkias
2. Electronics Fundamental and Application by D. Chattopadhyay and P.C. Rakshit.
3. Electromagnetic Theory by U.A Bakshi and A.V.Bakshi.
4. Introduction to Electrodynamics by David. J. Griffiths.

Website Sources

- https://en.wikipedia.org
- https://math.libretexts.org
- http://epgp.inflibnet.ac.in
- https://www.photonics.ethz.ch
- http://courseware.cutm.ac.in
- https://ocw.mit.edu

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY (H)-505A: Electronic Instruments and Measurement

Objective: This course provides exposure to students with various aspects of instruments and their usage through hands-on mode.

UNIT -1 **(10 Sessions)**

Basic of Measurement: Review of performance, specification of instruments-accuracy, precision, sensitivity, resolution range etc. Errors in measurement and loading effects, Measuring Instrument: Principle and construction of ammeter and voltmeter (moving coil and moving iron type), extension of their range and simple numerical problems, Principle and Working of Wattmeter give knowledge for better employability in industry (dynamo-meter type) Energy Meter (induction type).

UNIT 2 **(10 Sessions)**

Multimeter: Principles of measurement of dc voltage and dc current, ac voltage and ac current and resistance in a multimeter, Specifications and limitations with regard to frequency and input impedance. Electronic Voltmeter: Principle of voltage, current and resistance measurement (block diagram only), Specification of an electronic voltmeter/Multimeter for better skilling of entrepreneurship, Types of AC millivoltmeters: Amplifier-rectifier and rectifier amplifier type, Block diagram and explanation of types of ac millivoltmeter, Typical Specifications and their significations

UNIT 3 **(10 Sessions)**

Cathode Ray Oscilloscope: Construction of CRT, Electron gun, electrostatic focusing and acceleration, Deflection sensitivity, Phosphor for CRT in relation to their visual persistence, time base operation and need for blanking fly back; synchronization, Specification and Use of CRO, Special feature of dual trace, delayed sweep and storage CROs, Introduction to digital CRO, CRO probes and current probes understanding for entrepreneurial skill.

UNIT 4 **(12 Sessions)**

Low frequency and RF signal generator, pulse generator and function generator, Principle and working of RLC bridge, Specification of RLC Bridge for skill development, Principle and working of Q meter, Comparison of analog and digital instrument, Principles and working of ramp, dual slope and integrating type of digital voltmeter, Time interval, Frequency and period measurement using universal counter/frequency counter, time-base stability, accuracy and resolution. Signal Analysis: Wave Analyzer, Spectrum Analyzer. Frequency Counters: Simple Frequency Counter; Measurement errors; extending frequency range of counters Transducers: Types, Strain Gages, Displacement Transducers.

Course Outcomes:

Students completing this course will be able to:

CO1: Analyze the performance characteristics of various instruments Illustrate basic meters such as voltmeters and ammeters for better employability in local/ global industry.

CO2: Understand working and principle of multimeter and millivoltmeter for the local/ global entrepreneurship skill development.

CO3: Construction, specification and uses of CRT and CRO for the entrepreneurship skill development.

CO4: Study principle and working of RLC Bridge, Q meter etc for skill development.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	3	3	1	1	2	1	1	1	1	1	1
CO 2	1	3	2	1	2	3	1	1	1	1	1	1
CO 3	1	2	2	1	1	2	1	2	1	1	2	1
CO 4	1	2	3	1	2	1	1	3	1	1	1	1
CO 5	1	2	3	1	3	3	1	2	1	2	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Books:

1. Measurements and Instrumentation by Bernard M. Oliver & M. John.
2. Electronic Instrument by Clyde F. Coombs
3. Electronic Instrumentation and Measurements by A. David.
4. Modern Electronic Instrumentation and Measurement Techniques by Albert D. Helfrick & William D. Cooper

Website Sources

- http://www.kelm.ftn.uns.ac.rs
- https://en.wikipedia.org
- https://www.circuitstoday.com
- https://www.electrical4u.com

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY (H)-505B: Modern Physics

Objective of the course: The aim of this course is to understand the concept of semiconductor physics and its applications.

UNIT-1 **(10 Sessions)**

Physical basis for band formation in solids and difference between metal, insulator and semiconductor. Intrinsic and extrinsic semiconductors knowledge for better employability in industry, Fermi-Dirac distribution, Fermi level. Thermal generation and recombination of electron hole pairs. Einstein's relation between mobility and diffusion. Drift and diffusion currents.

UNIT-2 **(10 Sessions)**

P-N junction diode for skill development, depletion width and potential barrier, junction capacitance, I-V characteristics. Rectifiers, ripple factor, filter circuits, rectification efficiency and percentage regulation. Clipping and clamping circuits, Zener diode and voltage regulation

UNIT-3 **(10 Sessions)**

Dielectrics , Polar and Non Polar dielectrics, Polarization P and bound charges (surface and volume), Electric displacement D, Gauss law in dielectrics understanding for entrepreneurial skill, Relation between E, P and D, Dielectric susceptibility and permittivity.

UNIT-4 **(10 Sessions)**

Wave-particle duality, Photoelectric effect, Compton Effect, Matter waves and de-Broglie wavelength. X-ray diffraction and Bragg's Law. Electron waves and Davisson Germer experiment for entrepreneurship & employability.

Course Outcomes:

CO.1 To understand the basic properties of semiconductor and its applications.
CO.2 To study the different diodes and its applications in local/global scenario.
CO.3 To understand the polar and non polar molecules and Gauss's law in dielectrics.
CO.4 To study the photoelectric effect, Compton effect and Davission Germer experiments knowledge for better employability in industry.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	3	1	1	2	1	1	1	1	1	1
CO 2	1	1	2	1	2	1	1	1	1	1	1	1
CO 3	1	2	2	1	1	2	1	2	1	1	1	1
CO 4	1	1	1	1	2	1	1	2	1	1	1	1
CO 5	1	2	2	1	1	3	1	2	1	2	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Books:

1. Electronic devices : T.L. Floyd
2. Modern Physics : A.P. Arya
3. Device and Circuits : J. Millman and C. Halkias.
4. Concepts of Modern Physics : A. Beiser
5. Electronic Fundamental and Applications: D. Chatopadhyay and P.C. Rakshit.
6. Electricity and Magnetism : K.K. Tiwari.

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY-505C Introduction to Cosmology

Objective: The objective of this paper is to impart knowledge of general relativity, Newtonian model of Cosmology and their application to various situations, concept of Lambda-Cold Dark Matter model for skill development and knowledge for employability.

UNIT-I **(10 Sessions)**
Introduction to general relativity for skill development, curvature of spacetime, FLRW metric, comoving and physical distance, Hubble's law, scale factor, conformal time.

UNIT-II **(6 Sessions)**
Isotropic and Homogenous nature of our universe, redshift caused by the expanding universe.

UNIT-III **(14 Sessions)**
Newtonian model of Cosmology, Newton's law to an equation that governs the dynamics of scale factor, first Friedmann equation. energy equation, derive the second Friedmann equation for skill development. universe cannot be static. behaviour of the scale factor, skills to analyse how it grows with time in a matter-dominated, radiation-dominated universe. Grow of scale factor when both the matter and radiation components in the Newtonian universe.

UNIT-IV **(10 Sessions)**
Relativistic version of the Friedmann equations. The Newtonian analysis to understand the relativistic model. densities of various components, radiation, baryonic matter, dark matter, dark energy.

Course Outcomes:
Students completing this course will be able to:
CO1: Able to describe the Big Bang, the age and origin of the Solar System for skill development.
CO2: Illustrate differences between Earth and other planets in the Solar System for skill development.
CO3: Analyse the Lambda-Cold Dark Matter model, that includes recent experimental developments for employability.
CO4: Understand cosmic microwave background; formation of galaxies, large-scale structure in global scenario.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	3	1	1	2	1	1	1	1	1	1
CO 2	1	2	2	1	2	1	1	1	1	1	1	1
CO 3	1	2	2	1	1	2	1	2	1	1	1	1
CO 4	1	2	1	1	2	1	1	2	1	1	1	1
CO 5	1	2	3	1	3	2	1	2	1	2	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Readings:

1. Introduction to Cosmic Inflation and Dark Energy, Konstantinos Demopoulos
2. The Cosmic Spacetime, Fulvio Melia
3. General Relativity The Essentials, Carlo Rovelli
4. Particles in the Dark Universe A Student's Guide to Particle Physics and Cosmology, Yann Mambrini

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BCS (H)-506: Computer Fundamentals and Programming in "C"

Objective: To provide complete knowledge of C language and to create programs in C.

UNIT-1 **(10 Sessions)**

Computer Fundamental: Introduction of Computer, Classification of Computers, Applications of Computers, Generations of Computers, Basic organization of a Computer, Software and its types, Hardware, Input Devices – Keyboard , Mouse, Scanner, Barcode Reader and its scope in employability, Output Devices – Printer, Plotters etc. Definition of software and hardware,types of programming languages, assembler,compiler, interpreter, linker, loader (Definitions only),number system – decimal, binary,octal and hexadecimal number,interconversion of decimal to binary and viceversa.ASCII codes. Algorithm-definition, Characteristics, notations. Flowchart-definition, Symbols used in writing the flow-chart Writing an algorithm and flow-chart of simple problems.

UNIT-2 **(10 Sessions)**

Computer Memory, Memory Hierarchy, Registers, Cache Memory, Primary Memory, Secondary Memory and their scopes in employability.

Operating System: Definition of Operating System, Function of Operating System, Types of Operating System.

UNIT-3 **(6 Sessions)**

Networks: Computer Networks, Types of Networks, Skills to understand Network Topology, Data Transmission Mode.

UNIT-4 **(8 Sessions)**

Programming Using C: Variables, Constants, Operators, Data types: Character types, Integer, short, float, long, Type Casting, functions, Conditional Program Execution: Applying if statement, if…else statement ,nested if else, Looping Statements(while, for, do…while), Skills to understand Nested loop, Use of Break, Continue and goto Statement, Applying Switch case Statement.

UNIT-5 **(6 Sessions)**

Arrays: Introduction of Arrays, Array notation and representation, Type of arrays, String, Debugging and testing of Programs and related employability scopes.

Course Outcomes:

Students completing this course will be able to:

CO1: Understanding the concept of input and output devices of Computers and how it works and develop skills to recognize the basic terminology used in computer programming.
CO2: Study computer memory, types of operating system and understand their scopes in local/ global employability.
CO3: Develop skills to understand types of networks and transmission mode.
CO4: Write, compile and debug programs in C language, use different data types for writing the programs and understand their scopes in local/ global employability.
CO5: Develop skills to learn array notation and representation.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	3	2	1	1	2	1	2	1	1	1
CO 2	1	3	1	3	1	2	3	1	1	2	1	1
CO 3	1	2	3	2	1	1	1	2	1	1	1	1
CO 4	1	3	1	2	2	1	1	1	1	1	1	1
CO 5	1	2	2	1	2	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Books:

1. Pradeep K. Sinha, Priti Sinha, Computer Fundamentals BPB Publications
2. V. Raja Raman, Fundamentals of Computers PHI Learning,
3. Yashavant P. Kanetkar- Let us C, Infinity Science Press.

Website Sources:

- http://gpnanakpur.ac.in
- https://www.tutorialspoint.com
- http://www.tmv.edu.in
- https://www.tutorialspoint.com
- https://en.wikipedia.org

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honours)Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BPHY (H)-551: Physics Lab – 5

Objective: The main goal of this subject is to share the knowledge to the students about the experiments. The students will get a better understanding of the concepts studied by them in the theory course and correlate with experimental observations.

List of Experiments **(20 Sessions)**

1. Measurement of Hybrid parameter of a transistor and understand its employability scopes.
2. To study the resonance in series LCR circuit with source of given frequency (A.C. mains).
3. To study and plot the characteristic of L.D.R and understand its employability scopes.
4. To study the FET amplifier in CS configuration.
5. To study the integrator circuit and observe the effect of RC upon fixed time form.
6. To draw the characteristic of Zener diode in reverse and forward bias voltage.
7. Obtain skills to measure certain UJT parameters and study the operation of UJT relaxation oscillator.
8. To Study the ripple factor in a D.C. power supply.
9. To study the characteristics of a Tunnel diode and understand its employability scopes.
10. To study emitter follower/ Darlington pair amplifier.
11. Amplitude modulation and demodulation characteristics

Course Outcomes:
Students completing this course will be able to:
CO1: Evaluate hybrid parameters of transistors and understand its local/ global employability scopes.
CO2: Plot characteristics of L.D.R., FET, Tunnel diode and Zener diode to understand their local/ global employability scopes..
CO3: Evaluate ripple factor and understand its employability scopes.
CO4: Evaluate UJT parameters and understand its employability scopes.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	2	1	2	1	2	1	1	1	1	1
CO 2	3	1	3	2	3	1	1	2	1	1	1	1
CO 3	1	3	1	3	1	2	1	2	1	1	1	1
CO 4	1	2	2	2	1	1	1	1	1	1	1	1
CO 5	1	1	1	1	1	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	1	1	1
CO3	3	1	1
CO4	1	1	1

Suggested Books:

1. Solid State Physics- A. J. Dekkar, McMillan
2. Solid State Physics - S. L. Gupta & V. Kumar, K. Nath & Co. Meerut

3. Fundamentals of Solid State Physics-B. S. Saxena, R. C. Gupta & P. N. Saxena
4. Solid State Physics by R. K. Puri

Website Sources

- https://www.learncbse.in
- https://www.electronicshub.org
- http://amrita.vlab. edu
- https://www.niser.ac.in

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year V Semester
BCS (H)-556: Practical for Programming in C

Objective: This course helps to learn the fundamental programming concepts and methodologies that are essential to build C programs.

List of Experiments **(20 Sessions)**

1) Obtain skills to write a program in C to find the sum of two numbers.
2) Obtain skills to write a program in C to find the factorial of a number.
3) Obtain skills to write a program in C to print first ten natural numbers.
4) Obtain skills to write a program in C to calculate area of rectangle.
5) Obtain skills to write a program in C to check whether number is prime or not.
6) Obtain skills to write a program in C using arrays to find the largest and second largest number.
7) Obtain skills to write a program in C to calculate area of circle.
8) Obtain skills to write a program in C to read a string and write it in reverse order.
9) Obtain skills to write a program in C to concatenate two strings of different lengths.
10) Obtain skills to write a program in C to check that the input string is a palindrome
11) Find the Fibonacci series between M and N.
12) Norm and trace of the matrix.

Course Outcomes:
Students completing this course will be able to:
CO1: Identify situations where computational methods and computers would be useful.
CO2: Given a computational problem, identify and abstract the programming task involved for the development of skill and employability in global perspectives.
CO3: Write the program on a computer, edit, compile, debug, correct, recompile and run it for skill development.
CO4: Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	3	3	2	1	2	1	1	1	1	1
CO 2	2	3	1	1	3	1	1	1	1	1	2	1
CO 3	3	3	2	1	2	2	1	1	2	1	1	1
CO 4	1	1	3	2	1	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Readings:

1. Pradeep K. Sinha, Priti Sinha, Computer Fundamentals BPB Publications
2. V. Raja Raman, Fundamentals of Computers PHI Learning,
3. Yashavant P. Kanetkar, Let us C, Infinity Science Press.

Website Sources:

- https://www.lkouniv.ac.in
- https://legacy.essie.ufl.edu

- https://ncss-wpengine.netdna-ssl.com
- https://uomustansiriyah.edu.iq
- https://beginnersbook.com

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-601: Solid State and Nano Physics

Objective: The aim of the course is to impart knowledge of basic theory of solid state structure and nano physics.

UNIT -I **(10 Sessions)**

Crystalline and glassy forms, liquid crystal, Crystal structure, periodicity, lattice and basis, Crystal translational vector, Unit cell and primitive cell, Wigner Seitz cell, Develop Skills to understand Bravais lattices in two or three Dimensional, packing fraction. Crystal structures of s.c.,b,c,c,f,c,c, diamond and h.c.p. Reciprocal lattices: s.c.,b.c.c, and f.c.c. lattices, Brillouin Diffraction conditions in reprocal lattice, Bragg's law.

UNIT II **(10 Sessions)**

Crystal Planes and Miller indices, Interplaner Spacing, Crystal structures-NaCl, Diamond, CsCl and ZnS. Develop Skills to understand X-ray diffraction, Bragg's law and Bragg's diffraction conditions in direct and reciprocal lattice, K-Space.

UNIT -III **(10 Sessions)**

Develop Skills to understand Reciprocal lattice, Reciprocal Lattice Vectors, Reciprocal Lattice to the simple cubic lattice, b.c.c and f.c.c., Specific heat of solids, Einstein's theory of specific heat, Debye model of specific heat of solids.

UNIT -IV **(12 Sessions)**

Introduction to NanoScience and Nanotechnology, Difference between nanomaterials and bulk materials, Reduction of dimensions 3D, 2D, 1D, 0D materials, various morphologies of Nanomaterials, Bottom up and top down approaches, size dependent physical properties, Develop Skills to understand Nano-cluster and its employability.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand crystal structure, Bravais lattices in two and three dimensions for local/global employability opportunities

CO2: Study crystal structure of NaCl, Diamond, CsCl and ZnS for skill development.

CO3: Relate crystalline structure to X-ray diffraction data and the reciprocal lattice and understand the influence of crystal binding energy on crystalline structure for skill development.

CO4: Understand NanoScience and Nanotechnology, properties and applications of nanomaterials for employability.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	3	1	1	2	2	1	1	1	1	1
CO 2	3	3	2	2	1	1	1	1	1	2	1	1
CO 3	1	3	2	2	1	1	2	1	1	2	1	1
CO 4	3	2	3	1	3	2	1	2	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	2	1	1

Suggested Readings:

1. Introduction to solid state Physics by Kittel .John Wiley & Sons Inc. Publication
2. Solid State Physics- A. J. Dekkar, McMillan students Ed.
3. Solid State Physics - S.L. Gupta & V. Kumar
4. Fundamentals of Solid State Physics-B. S. Saxena, R.C.Gupta & P. N. Saxena
5. Introduction to Nanotechnology, by Charles P. Poole, Jr. Frank J. Owens, John Wiley &Sons Inc. Publication.
6. Solid State Physics by R K Puri

Website Sources

- http://www.uou.ac.in
- http://solid.fizica.unibuc.ro
- https://www.chem.uci.edu
- http://shodhganga.inflibnet.ac.in
- https://www.nanowerk.com

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-602: Electronics and Fiber Optics

Objective: The aim of this course is to provide knowledge of various network theorems, transistors, diodes, optical fiber and their importance

UNIT - I **(10 Sessions)**

Concept of Network (Active and Passive Network, T & π Network, Symmetric and Asymmetric Network), Characteristic Resistance, Thevenin's theorem, Develop Skills to understand Norton's theorem and its employability, Superposition theorem, Maximum power transfer theorem,Millman's theorem.

UNIT - II **(10 Sessions)**

Transistors parameters, base width modulation transit time and life-time of minority carriers , Emitter resistance, Collector conductance, Base spreading resistance, Diffusion capacitance, Reverse Feedback ratio, Equivalent circuit for transistors, hybrid model, Input and output impedances, Field effect transistors and their characteristics, Develop Skills to understand Biasing of FET.

UNIT – III **(10 Sessions)**

Tunnel Diodes, Zener and Avalanche diodes, Point contact diode, Develop Skills to understand LED Photo diode, Thermistor, Effect of Temperature on junction diode thermistor, Phototransistors, Silicon Controlled rectifiers, Uni-junction transistor and their simple uses, SCR**.** Diffusion of minority carrier in semiconductor, work function in metals and semiconductors Junctions between metal and semiconductors, Semiconductor and semiconductor, Depletion layer, Junction Potential Width of depletion layer, Field and Capacitance of depletion layer, Forward A.c. And D.C. resistance of junction Reverse Breakdown.

UNIT-IV **(12 Sessions)**

Structure optical fiber, Importance of optical fiber, Propagation of light waves in optical fiber, Types of fiber, Acceptance angle and acceptance cone, Develop Skills to understand Numerical aperture, Fiber losses and their units (basic concept), Band width, Bandwidth length product, Dispersion in optical fiber.

Course Outcomes:

Students completing this course will be able to:

CO1: Understand concept of network and study various network theorems for skill development.
CO2: Understand various diodes and their characteristics for skill development.
CO3: To study the working and characteristics of tunnel diode, Zener diode and avalanche diode etc for skill development and local/global employability.
CO4: Study of structure of optical fiber, types of fibers and their importance for skill development.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	2	1	2	2	1	1	2	1	1
CO 2	3	2	3	3	1	1	1	1	1	3	1	2
CO 3	1	3	3	3	1	1	1	1	1	1	1	1
CO 4	3	1	2	3	2	1	1	1	1	2	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	2	1	1
CO4	1	1	1

Suggested Readings:

1. Networks, Lines and Fields- John D Ryder (Prentice-Hall)
2. Electronic Principles – Malvino.
3. Principles of Electronics - V.K. Mehta
4. Optical Fiber and Optical Fiber Communication Systems - S. K. Sarkar
5. Optical Fiber Communication- G. Keiser (Mc Graw Hill)
6. Electronic Devices & Circuit Theory - Bodystead / Nashels

Website Sources:

- https://circuitglobe.com
- https://ecee.colorado.edu
- https://ecee.colorado.edu
- https://en.wikipedia.org
- http://www.sasurieengg.com

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-603: Mathematical Physics-II

Objective: The goal of this course is to understand general structure of basic equations of mathematical physics and introduction into approaches to solve such equations.

UNIT-I **(10 Sessions)**

Complex Variables

Analytic functions, Develop Skills to understand Cauchy-Riemann differential equations, line integrals of complex function, Cauchy's integral theorem, Cauchy's integral formula, Problems based on Cauchy's integral theorem and integral formula, Taylor and Laurent series. Cauchy's residue theorem, contour integrations.

UNIT-II **(10 Sessions)**

Vector Calculus and Curvilinear Coordinates

Differential vector operators (Develop Skills to understand Gradient, divergence and curl),Gauss's theorem, Green's theorem, Stoke's theorem, orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates, divergence, gradient, curl and Develop Skills to understand Laplacian in these coordinates.

UNIT-III **(10 Sessions)**

Differential Equations and Legendre Functions

Second order homogeneous differential equations and their series solution, Method of obtaining series solution of second order differential equation, and power series methods for second solution

Legendre function: Polynomial solution of the Legendre equation, the Legendre function of the second kind, the generating function, Develop Skills to understand Rodrigues' formula, orthogonality relation, Associated Legendre functions and its orthogonality property.

UNIT-IV **(12 Sessions)**

Bessel functions: Series solution and Bessel function of the first kind, recurrence relations, second solution of Bessel's equation, spherical Develop Skills to understand Bessel functions, generating function.

Course Outcomes

Students completing this course will be able to:

CO1: Understand complex variables - Analytic functions, Cauchy-Riemann differential equations for skill development

CO2: Learn about Gradient, Divergence and Curl in orthogonal curvilinear and their typical local/ global applications in physics for skill development.

CO3: Learn different ways of solving second order differential equations for skill development.

CO4: Understand Bessel functions and their recurrence relations and solution of Bessel's equation for skill development.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	3	2	2	3	1	2	1	1	1	1	1
CO 2	3	3	1	1	2	1	1	1	1	2	1	2
CO 3	1	2	3	2	1	3	1	1	1	1	1	1
CO 4	2	1	1	1	1	1	2	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	2	1	1

Suggested Readings:

1. Mathematical Physics by P. K. Chattopadhyay
2. Mathematical Methods for Physicists by Arfken and Weber
3. Mathematical Methods in Physical Sciences by Boas.
4. Advanced Engineering Mathematics by Erwin Kreyszig

Website Sources:

- https://www.intechopen.com
- http://www.physics.gla.ac.uk
- http://www.crfm.it
- https://learn.lboro.ac.uk

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-604: Material Science

Objective: The objective of this course is to familiarize the students with the fundamental concepts of Materials Science.

UNIT- I **(10 Sessions)**

Short review of basic structures, Develop Skills to understand Tetrahedral and octahedral sites and their properties and importance, substitutional and interstitial solid solutions (only definitions), coordination number and Pauling rules, Crystal Structures of metallic alloys, Ceramics, polymers, silicates, composite materials include structures such as NaCl, Rutile, fluorite, Hexagonal and cubic Zinc Blende, glass.

UNIT- II **(12 Sessions)**

Concept of entropy, derivation of expression for configurationally entropy using concept of multiplicity,micro and macrostates etc., free energies, chemical potential, derivation of various thermodynamical expressions, concepts of equilibrium and metastability, Phase diagrams of elements, applications of thermodynamics, Develop Skills to understand Clapeyron equations for phase transitions, vapor pressures, effect of temperatures

UNIT- III **(10 Sessions)**

Defects in Materials: Develop Skills to understand point defects, line defects (dislocations), surface defects (grain boundaries), volume defects (voids), defects formation energies, their impact on physical properties of materials, formation energies, defect creation and annihilation, thermodynamic aspects such as concentration and Interactions, stress fields.

UNIT- IV **(10 Sessions)**

Phase Diagrams: Concepts of solid solubility, Hume-Rothery rules, and concept of formation of phase diagrams on basis of entropy and free energy changes for compositions, Develop Skills to understand Phase diagrams of various categories.

Course Outcomes

Students completing this course will be able to:

CO1: Classify the materials to understand basic properties of materials and describe crystal structure, Ceramics, polymers, silicates for skill development and local/global employability

CO2: Derive various thermodynamical expressions and learn applications of thermodynamics for skill development

CO3: Learn various defects in materials for skill development and employability

CO4: Understand the concept of Phase diagrams, Hume-Rothery rules for skill development.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	2	2	2	1	1	3	1	1	1	1	1
CO 2	3	1	2	2	1	2	1	1	1	1	1	2
CO 3	2	3	2	1	1	1	1	1	2	1	1	1
CO 4	1	2	3	1	1	3	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	2	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. 1 Introduction to Solid State Physics by C. Kittel
2. Materials Science and Engineering by V. Raghvan
3. Solid State Physics by A.J. Dekker
4. Elements of Materials Science and Engineering by L.H. Van Vlack

Website Sources:

- https://en.wikipedia.org
- https://www.tulane.edu
- http://www.physics.usu.edu
- https://sites.krieger.jhu.edu
- http://people.virginia.edu
- https://nptel.ac.in

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honours) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-605A: Molecular Spectroscopy

Objective: This course will familiarize the student with basic knowledge of the interaction of radiation with matter and will be able to understand molecular spectra.

UNIT- I **(10 Sessions)**

Develop Skills to understand Born-Oppenheimer approximation and separation of electronic and nuclear motions in molecules, Band structures of molecular spectra.

UNIT- II **(12 Sessions)**

Microwave and far infrared spectroscopy: Develop Skills to understand Energy levels of diatomic molecules under rigid rotator and non-rigid rotator models. Selection rules, Spectral structure. Structure determination. Isotope effect, Stark-effect.

UNIT- III **(10 Sessions)**

Infrared spectra: Energy levels of diatomic molecules under simple harmonic and anharmonic (no deduction necessary for this one) models, Selection rules and spectral structures, Morse potential energy curves, Dissociation energies, Isotope effect, Develop Skills to understand Rotational – vibrational coupling, Parallel and perpendicular modes, Symmetry properties of molecular wave functions and nuclear spins.

UNIT-IV **(10 Sessions)**

Electronic spectra of diatomic molecules:

Vibrational band structure, Progressions and sequences, Isotope shifts. Deslandres tables, Molecular constants in the ground and excited electronic states and idea of molecular bonding, Rotational structure of electronic spectra, P-, Q- and R- branches, Band head formation and shading of bands, Intensity distribution in the vibrational structure of electronic spectra and Develop Skills to understand Franck-Condon principle, Hund's coupling and its employability.

Course Outcomes:

Students completing this course will be able to:

CO1: Explain Born-Oppenheimer approximation for skill development.

CO2: Study energy levels of diatomic molecules under rigid and non rigid rotator models to gain knowledge for employability.

CO3: Study energy levels of diatomic molecules under simple harmonic and anharmonic models models to gain knowledge for local/global employability.

CO4: Learn Electronic spectra of diatomic molecules and examine the electronic and vibrational spectra of diatomic molecules for skill development and employability.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	1	3	2	1	3	1	2	1	1	1	1	1
CO 2	3	3	1	3	1	2	1	1	1	2	1	1
CO 3	2	2	1	3	1	1	1	1	1	1	1	1
CO 4	1	3	1	2	2	1	1	1	1	1	2	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Fundamentals of Molecular Spectroscopy by C.A. Banwell.
2. Basic Atomic and Molecular Spectroscopy byJ.M Hollas.
3. Molecular Spectroscopy by Jeanne L.Mc Hale.
4. Molecular Spectra and Molecular Structure: Diatomic molecules by Gerhard Herzberg.

Website Sources:

- https://en.wikipedia.org
- https://chem.libretexts.org
- http://epgp.inflibnet.ac.in
- https://nptel.ac.in
- http://www.egyankosh.ac.in
- http://mutuslab.cs.uwindsor.ca

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-605B: Astronomy and Astrophysics

Objective of the course: This course in astronomy is designed to develop in the students the following competency set: Familiarize and appreciate the field of astronomy and its relation with various allied fields of Science viz., Physics, Biology, Chemistry, Mathematic, Geology, meteorology etc. as it is multidisciplinary in nature.

Unit 1 - Lectures History of Astronomy and Apparent Luminosity of Stars: Ptolemy's astronomical work, Copernican heliocentrism and Tychonian system, Luminosity (Apparent and Absolute) of stars, Magnitude scale, Luminosity measurement: Visual Method knowledge for better employability in industry, Photographic method and Photoelectric method.

Unit 2 - Stellar Evolution (HR diagram): Life cycle for skill development; Stellar Processes (Nuclear) and spectral classification of Stars O, B, A, F, G, K, M.

Unit 3 - The Sun and Planets Origin of the solar system for better skilling of entrepreneurship, Internal structure and surface features of sun, Sun spots and Magnetic field on the sun and Solar activity. Surface features of planets, Atmospheres for entrepreneurship & employability and Magnetic fields of Planets and their moons.

Unit 4 - Asteroids, Meteors, Comets and Galaxies: Asteroids: Discovery and designation, Origin, Nature and Orbits of Asteroids. Meteors: Meteor showers understanding for entrepreneurial skill and sporadic meteors. Comets: Periodic comets, Brightness variation in Comets. Gas production rates, dust and ion tails.

Course Outcomes:

CO.1 Acquire knowledge of the Physical universe and its evolution.
CO.2 Communicate about celestial objects such as parent star, planets, dwarf planets, satellites etc.
CO.3 Understand Stellar Processes (Nuclear) and spectral classification of Stars.
CO.4 Acquire knowledge of the Asteroids, Meteors, Comets and Galaxies in global scenario.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	1	2	1	1	1	1	1	1	1	1
CO 2	3	2	1	2	2	1	1	1	1	1	1	1
CO 3	1	2	1	1	1	1	1	1	1	1	1	1
CO 4	1	2	2	1	1	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	1	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Astronomy structure of the Universe. A.E. Roy and D. Clarke, Adam Hilger Pub.
2. Source Book of Space Sciences, Samuel Galsstone; D. Van Nostrand Co. Inc
3. Textbook of Astronomy and Astrophysics with elements of cosmology, V.B. Bhatia, NarosaPub.
4. Structure of the Universe, J.V. Narlikar
5. Introduction to Astrophysics - Baidyanath Basu

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-605C: Satellite Communication and Remote Sensing.

Objective of the course: This course will familiarize the student with basic knowledge of Satellite Communication and Remote Sensing.

UNIT-1

Remote Sensing: Definition -Historical Components of Remote Sensing Principles methods of remote sensing - Active and Passive remote sensing - Remote Sensing platforms for entrepreneurship & employability.

UNIT-2

Electromagnetic radiation- Spectrum- Block body radiation – planks law – Stefan – Boltzmann law – satellites classification – based on orbit- sun synchronous and Geosynchronous based on purpose Earth Resources satellites, communication satellite knowledge for better employability in industry

UNIT-3

EMR Interactions: Interaction with atmosphere Scattering of EMR Raleigh understanding for entrepreneurial skill, Mie, Non Selective and Raman Scattering Bach scattering Speckle EMR Interaction with water and Ozone Atmospheric windows and its significance EMR interaction with the earth surface materials Radiance, irradiance, Absorbed and Transmitting energy .

UNIT-4

Characteristics of Digital satellite image enhancement for skill development, Filtering Applications of Aerial photographs and satellite imageries , merits, Limitations, Water resources, watershed management , Urban Studies – Flood Management Fishing Forestry etc.

Course outcomes:

CO 1: To Understand the knowledge of remote sensing and its applications.
CO 2: Study the electromagnetic radiation and communication satellite in local/ global perspectives.
CO 3: Study the EMR interaction with atmosphere scattering and interaction with water.
CO 4: Characteristics of Digital Satellite image enhancement filtering applications.

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	2	1	1	1	1	1	1	1	1
CO 2	3	2	1	2	2	1	1	1	1	1	1	1
CO 3	1	2	1	1	1	1	1	1	1	1	1	1
CO 4	1	3	3	1	1	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Reference Books:

1. A. Reddy, “Remote Sensing and Geographical Information Systems”, BS Publications.
2. P. H. Anand, “Principles of remote Sensing and Geographical Information Systems”, Sri Venkateswara Publishers.
3. T. M. Lillesand and R.W. Kiefer, “Remote sensing and Image, Interpretation”, John Wiley.
4. P. A. Burrough, “Principle of GIS for land resource assessment”, Oxford University.

Note: Latest editions of all the suggested readings must be used

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-651: Physics Lab – 6

Objective: The main goal of this subject is to share the knowledge to the students about the various network theorems. The students will get a better understanding of the concepts studied by them in the theory course and correlate them with experimental observations.

List of Experiments **(20 Sessions)**

1. To verify superposition theorem and determine the current flowing through the load resistance.
2. Develop Skills to verify Thevenin theorem and determine the current flowing through the load resistance.
3. Develop Skills to verify Norton theorem and determine the current flowing through the load resistance.
4. To Plot the V-I characteristics of P-N junction diode.
5. To plot the input and output characteristics of transistor in Common Emitter Configuration.
6. To plot the input and output characteristics of transistor in Common Base Configuration.
7. To study a push Pull amplifier using transistor.
8. Develop Skills to understand and verify the condition of oscillation in Phase shift oscillator.
9. Develop Skills to measure the self-inductance of a given coil by Anderson's bridge method.
10. To study the differentiator circuit and obtain differentiated pulse from it at different frequencies
11. Determination of thermal conductivity of a card-board by Lee's disc method.
12. Determination of internal resistance of micro ammeter and conversion of micro ammeter into voltmeter, milliammeter and Ohmmeter.

Course Outcomes:
Students completing this course will be able to:
CO1: Verify various network theorems for skill development.
CO2: Plot V-I characteristics of diode for skill development and employability.
CO3: Evaluate characteristics of transistor for skill development and local/global employability

CO/PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	2	1	1	1	1	1	1	1	1
CO 2	3	2	1	2	2	1	1	1	1	1	1	1
CO 3	1	2	1	1	1	1	1	1	1	1	1	1
CO 4	1	3	3	1	1	1	1	1	1	1	1	1

CO- Curriculum Enrichment Mapping

	Skill Development	Employability	Entrepreneurship Development
CO1	1	1	1
CO2	2	1	1
CO3	1	1	1
CO4	1	1	1

Suggested Readings:

1. Practical Physics by Navneet Gupta
2. Practical Physics by S. K. Gupta
3. Hand book of Electronics by Gupta Kumar
4. Practical Physics by S. L. Gupta

5. Networks, Lines and Fields- John D Ryder (Prentice-Hall)
6. Electronic Principles – Malvino.

Website Courses:

- https://www.electronics-tutorials.ws
- http://itmgoi.in
- https://www.electronics-tutorials.ws
- https://www.electronicshub.org

Note: Latest editions of all the suggested readings must be used.

IFTM University, Moradabad
Bachelor of Science (Honors) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester
BPHY (H)-652: Dissertation

The students should strictly adhere to the following points while preparing their final project report.

- Students are expected to undergo project work individually and submit individual project report for the development of their individual skills.
- Project reports should be typed / printed in double space using A4 size sheets.
- Table of contents should be in the specified format as provided by the supervisor.
- The students are asked to report to the concerned supervisors regularly during their project period to present their progress of work.
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.

Project Report and Viva-Voce Examination:

Project Report
It may be comprised of the following sections:

- Introduction
- Conceptual Framework/ National/International Scenario
- Presentation, Analysis & Findings
- Conclusion & Recommendations

Viva-Voce
In Viva-Voce Examination, the question may be asked in the following areas:

- Importance / Relevance of the Study
- Objective of the Study
- Methodology of the Study
- Analysis, findings, concluding observations, recommendation, limitations of the Study
- Overall Impression