आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

SCHOOL OF SCIENCES

DEPARTMENT OF PHYSICS

Bachelor of Science (Honors Physics)

THREE YEAR PROGRAMME

[W. E. F. ACADEMIC SESSION: 2020 - 21]

IFTM UNIVERSITY
N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244001
www.iftmuniversity.ac.in

आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

Website: www.iftmuniversity.ac.in

SCHOOL OF SCIENCES
DEPARTMENT OF PHYSICS

Study & Evaluation Scheme of
Bachelor of Science (Physics)
[Session 2020-21]

Programme	**:**	**Bachelor of Science (Honours) Physics**
Course Level	**:**	**UG Course**
Duration	**:**	**Three Year (Six Semester) Full Time**
Medium of Instruction	**:**	**English**
Minimum Required Attendance	**:**	**75%**
Maximum Credits	**:**	**168**

Programme Outcomes (POs):
Students completing this course will be able to:

- Understand a fundamental/systematic and coherent understanding of the academic field of basic Physics in areas like Mechanics, Electricity and Magnetism, Waves and Optics, Thermal and Statistical Physics, Quantum Mechanics, Mathematical Physics and their applications to other core subjects in Physics;
- Gain a wide ranging and comprehensive experience in physics laboratory methods in experiments related to mechanics, optics, thermal physics, electricity, magnetism, digital electronics, solid state physics and modern physics. Students should acquire the ability for systematic observations, use of scientific research instruments, analysis of observational data, making suitable error estimates and scientific report writing;
- Understand procedural knowledge that creates different types of professionals related to the disciplinary/subject area of Physics, including professionals engaged in research and development, teaching and government/public service;
- Enhance skills in areas related to their specialization area corresponding to elective subjects within the disciplinary/subject area of Physics and current and emerging developments in the field of Physics.

COURSE STRUCTURE
SESSION: 2020-21
B.Sc. - I Year (H) Physics
Semester-I

S. No.	Course Code	Course Titles	Periods			EVALUATION SCHEME				Total	Credits
						Internal Exam			External Exam		
			L	T	P	CT	AS+AT	Total			
1.	BPHY(H)-101	Mechanics	3	1	0	20	10	30	70	100	4
2.	BPHY(H)-102	Thermal Physics	3	1	0	20	10	30	70	100	4
3.	BCHE(H)-101	Inorganic Chemistry	3	1	0	20	10	30	70	100	4
4.	BCHE(H)-102	Organic Chemistry	3	1	0	20	10	30	70	100	4
5.	BMAT(H)-101	Matrices and Trigonometry	3	1	0	20	10	30	70	100	4
6.	BMAT(H)-102	Calculus	3	1	0	20	10	30	70	100	4
7.	BPHY(H)-151	Physics Lab-1	-	-	4	-	-	30	70	100	2
8.	BCHE(H)-151	Chemistry Lab -1	-	-	4	-	-	30	70	100	2
	TOTAL		18	6	8	-	-	-	-	800	28

Semester-1I

S. No.	Course Code	Course Titles	Periods			EVALUATION SCHEME				Total	Credits
						Internal Exam			External Exam		
			L	T	P	CT	AS+AT	Total			
1.	BPHY(H)-201	Waves & Oscillations	3	1	0	20	10	30	70	100	4
2.	BPHY(H)-202	Optics	3	1	0	20	10	30	70	100	4
3.	BCHE(H)-201	Physical Chemistry	3	1	0	20	10	30	70	100	4
4.	BCHE(H)-202	Basic of Analytical Chemistry	3	1	0	20	10	30	70	100	4
5.	BMAT(H)-201	Vector Calculus and Co-ordinate Geometry	3	1	0	20	10	30	70	100	4
6.	BMAT(H)-202	Differential Equations & Integral Transforms	3	1	0	20	10	30	70	100	4
7.	BPHY(H)-251	Physics Lab -2	-	-	4	-	-	30	70	100	2
8.	BCHE(H)-251	Chemistry lab-2	-	-	4	-	-	30	70	100	2
9.	AECC* Audit course	Environmental Science	3	0	0	20	10	30	70	100	3*
	TOTAL		18	6	8	-	-	-	-	800	28

COURSE STRUCTURE
SESSION: 2020-21
B.Sc. - II Year (H) Physics
Semester-III

S. No.	Course Code	Course Titles	Periods			EVALUATION SCHEME				Total	Credits
						Internal Exam			External Exam		
			L	T	P	CT	AS+AT	Total			
1.	BPHY(H)-301	Electricity and Magnetism	3	1	0	20	10	30	70	100	4
2.	BPHY(H)-302	Circuit fundamental and Basic Electronics	3	1	0	20	10	30	70	100	4
3.	BCHE(H)-301	Inorganic Chemistry	3	1	0	20	10	30	70	100	4
4.	BCHE(H)-302	Organic chemistry	3	1	0	20	10	30	70	100	4
5.	BMAT-(H)301	Mechanics	3	1	0	20	10	30	70	100	4
6.	BMAT(H)-302	Numerical Methods	3	1	0	20	10	30	70	100	4
7.	BPHY(H)-351	Physics Lab -3	-	-	4	-	-	30	70	100	2
8.	BCHE(H)-351	Chemistry Lab -3	-	-	4	-	-	30	70	100	2
9.	UDM* Audit course	Disaster Management	3	0	0	20	10	30	70	100	03*
	TOTAL		18	6	8	-	-	-	-	800	28

Semester-IV

No.	Course Code	Course Titles	Periods			EVALUATION SCHEME				Total	Credits
						Internal Exam			External Exam		
			L	T	P	CT	AS+AT	Total			
1.	BPHY(H)-401	Atomic and Laser Physics	3	1	0	20	10	30	70	100	4
2.	BPHY(H)-402	Classical and Statistical Mechanics	3	1	0	20	10	30	70	100	4
3.	BCHE(H)-401	Physical Chemistry	3	1	0	20	10	30	70	100	4
4.	BCHE(H)-402	Environmental Chemistry	3	1	0	20	10	30	70	100	4
5.	BMAT(H)-401	Discrete Structures	3	1	0	20	10	30	70	100	4
6.	BMAT(H)-402	Real Analysis	3	1	0	20	10	30	70	100	4
7.	BPHY(H)-451	Physics Lab- 4	-	-	4	-	-	30	70	100	2
8.	BCHE(H)-451	Chemistry Lab-4	-	-	4	-	-	30	70	100	2
	TOTAL		18	6	8	-	-	-	-	800	28

COURSE STRUCTURE
SESSION: 2020-21
B.Sc. - III Year (H) Physics
Semester-V

S. No.	Course Code	Course Titles	Periods			EVALUATION SCHEME				Total	Credits
						Internal Exam			External Exam		
			L	T	P	CT	AS+AT	Total			
1.	BPHY(H)-501	Quantum Mechanics & Atomic Spectra	3	1	0	20	10	30	70	100	4
2.	BPHY(H)-502	Elements of Nuclear Physics	3	1	0	20	10	30	70	100	4
3.	BPHY(H)-503	Mathematical Physics-I	3	1	0	20	10	30	70	100	4
4.	BPHY(H)-504	Electromagnetic Theory	3	1	0	20	10	30	70	100	4
5.	BPHY(H)-505	Electronic Instruments and Measurement	3	1	0	20	10	30	70	100	4
6.	BCS(H)-506	Computer Fundamentals and Programming in C	3	1	0	20	10	30	70	100	4
7.	BPHY(H)-551	Physics Lab-5	-	-	4	-	-	30	70	100	2
8.	BCS(H)-556	Practicals for Programming in C	-	-	4	-	-	30	70	100	2
	TOTAL		18	6	8	-	-	-	-	800	28

Semester-VI

S. No.	Course Code	Course Titles	Periods			EVALUATION SCHEME				Total	Credits
						Internal Exam			External Exam		
			L	T	P	CT	AS+AT	Total			
1.	BPHY(H)-601	Solid State and Nano Physics	3	1	0	20	10	30	70	100	4
2.	BPHY(H)-602	Electronics and Fiber Optics	3	1	0	20	10	30	70	100	4
3.	BPHY(H)-603	Mathematical Physics-II	3	1	0	20	10	30	70	100	4
4.	BPHY(H)-604	Material Science	3	1	0	20	10	30	70	100	4
5.	BPHY(H)-605	Molecular Spectroscopy	3	1	0	20	10	30	70	100	4
7.	BPHY(H)-651	Physics Lab-6	-	-	4	-	-	30	70	100	4
8.	BPHY(H)-652	Dissertation	-	-	4	-	-	50	150	200	4
	TOTAL		18	6	8	-	-	-	-	800	28

IFTM University, Moradabad
Bachelor of Science (Honours) Physics Programme
B. Sc. (Hons) Physics I Year- I Semester
BPHY (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, Frictional force.

UNIT-II **(10 Sessions)**

Angular momentum and Linear momentum, Equation of motion of rigid body Moment of inertia, Product of moment of inertia, Radius of gyration, 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, Motion of Planets and satellites, geostationary satellites, Classification of Kepler's orbits.

UNIT-IV **(12 Sessions)**

Frame of References, Galilean transformation, 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:

- Understand laws of motion and their application to various dynamical situations
- Study Fundamental forces in nature.
- Study conservation laws: conservation of energy, momentum, angular momentum and apply them to basic problems.
- 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.
- Understand Frame of References, Galilean transformation, Lorentz transformation, postulates of special theory of relativity.

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 (Honours) Physics Programme
B. Sc. (Hons) Physics I Year I Semester

BPHY (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, Reversible and irreversible process, Concepts of temperature, Equation of states, Vander wall's equation.

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, Carnot's theorem, Enthalpy, Helmholtz function, Gibbs function.

UNIT-III **(10 Sessions)**

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

UNIT-IV **(10 Sessions)**

Thermodynamics and Kinetic temperature, Black body radiation and its application, Kirchoff's law and its applications , Stefan's Boltzmanns 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:

- Learn the basic concepts of thermodynamics, Zeroth law, first and the second law of thermodynamics
- Learn Maxwell's thermodynamic relations, concept of entropy, Carnot's theorem.
- Derive Claussius Clapeyron equation, Inversion Specific heat Equation.
- Understand the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.
- Have a knowledge of the real gas equations, Vander Waal equation of state, the Joule-Thomson effect.

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 (Honours) Physics Programme
B. Sc. (Hons) Physics I Year I Semester

BPHY (H) -151: Physics Laboratory – I

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.

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.

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 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.

Course outcomes:
Students completing this course will be able to:

- Determine value of Stefan's constant.
- Calculate moment of inertia
- Determine surface tension
- Evaluate elastic constant

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 (Honours) Physics Programme
B. Sc. (Hons) Physics I Year II Semester

BPHY (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, 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, superposition of rectangular simple harmonic oscillations.

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, LCR circuit, Moving coil galvanometer.

UNIT-IV **(12 Sessions)**

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

Course Outcomes:

Students completing this course will be able to:

- Study Wave motion, Differential equation of motion, stationary waves
- Learn Simple harmonic motion, Differential equation of S.H.M and obtaining solution of the oscillator using differential equations.
- Understand Oscillators, Damped oscillator, Equation of motion and its solution.
- Understand the principle of superposition of waves, so thus describe the formation of standing waves.
- Study forced oscillations, resonance and impedance.
- Explain several phenomena we can observe in everyday life that can be explained as wave phenomena.

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 (Honours) Physics Programme
B. Sc. (Hons) Physics I Year II Semester

BPHY (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)**

Coherence and Interference of light, Fresnel's Biprism, Thin films, Newton's Rings, Fabry Perot interferometers, Lummer Plate, Interference filters.

UNIT-II **(10 Sessions)**

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

UNIT-III **(10 Sessions)**

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, Polarimeters, Laurent's Half shade Polarimeter and Bi-quartz Polarimeter.

Course Outcomes:

Students completing this course will be able to:

Gain knowledge on various theories of light

Understand the properties of light like coherence, polarization, interference, diffraction.

- Explain Fabry Perot interferometers,
- Learn the applications of diffraction and polarization.
- Understand the applications of interference in design and working of interferometers.

.

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 (Honours) Physics Programme
B. Sc. (Hons) Physics I Year II Semester

BPHY (H)-251: Physics Laboratory – 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.
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 determine frequency of tunning fork with help of sonometer.
6. To determine the Resolving Power of a Plane Diffraction Grating.
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.

Course Outcomes:

Students completing this course will be able to:

- Students completing this course will be able to:
- Evaluate the wavelength of sodium light, radius of curvature.
- Evaluate focal length of combination of two lens
- Evaluate refractive index of the prism
- Evaluate resolving power of plane diffraction grating.

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 (Honours) 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 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: Use and over-exploitation of surface and ground water, 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

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, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.

Environment Laws : 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. x Resettlement and rehabilitation of project affected persons; case studies.

Disaster management: floods, earthquakes, cyclones and landslides.

Environmental movements: Chipko, Silent valley, Bishnios 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:

- To learn about the components of environment: atmosphere, hydrosphere, lithosphere and biosphere
- Understand about the Structure and function of ecosystem
- Study Natural Resources and types of resources, Renewable and Non-renewable Resources
- Biodiversity patterns, Energy resources
- Environmental pollution: types, causes, effects and controls
- Demonstrate a general understanding of the breadth and interdisciplinary nature of environmental issues.

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
- https://www.pmfias.com

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

BPHY (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: 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.

UNIT-II (10 Sessions)

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

UNIT-III (10 Sessions)

Electromagnetic Induction: Laws of Induction, 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, Clausius Mossotti Equation.

Course Outcomes:

Students completing this course will be able to:

- Explain and differentiate the vector (electric fields, Coulomb's law) and scalar (electric potential, electric potential energy) formalisms of electrostatics.
- Apply Gauss's law of electrostatics to solve a variety of problems.
- Study Biot – Savart Law, Amperes' Law and Ampere's Circuital Law
- Describe the magnetic field produced by magnetic dipoles and electric currents.
- Explain Faraday's laws and Lenz's Law
- Derive an Electromagnetic wave equation in free space
- Study of Polarization, Clausius Mossotti Equation.

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
7. Electricity and Magnetism by Satya Prakash
8. Electricity and Magnetism by Edward M. Purcell

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 (Honours) Physics Programme
B. Sc. (Hons) Physics II Year III Semester

BPHY (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, Charging and discharging in R.C and R.L.C. circuits, Time constant, A.C. Bridges, Maxwell's and Schering's Bridges, Wien Bridge.

UNIT-II **(10 Sessions)**

Semiconductors, Intrinsic and extrinsic semiconductors, Unbiased diode, Forward bias and Reverse bias diodes, Diode as a rectifier, Diode characteristics, 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, R.C. coupled amplifier.

UNIT-IV **(12 Sessions)**

Transistor as an Oscillator, Hartley oscillator. Elements of transmission and reception, Modulation and demodulation, Multimeter, Cathode ray oscillator and its simple applications.

Course Outcomes:

Students completing this course will be able to:

- Understand the concept of basic electronics and their applications.
- Obtain knowledge on R L C circuits, semiconductors, diodes, rectifiers and transistors.
- Compute and characterization of amplifiers.
- Study of Transistor as an Oscillator, Hartley oscillator.
- Explain Modulation and demodulation
- Study Cathode ray oscillator and its simple applications.

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 (Honours) Physics Programme
B. Sc. (Hons) Physics II Year III Semester

BPHY (H) -351: Physics Laboratory – 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 with potentiometer.
4. To convert Galvanometer into Voltmeter with potentiometer.
5. To find out internal resistance of Lechlanche 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.
10. To determine the unknown frequency to compare the frequency of two unknown signals using CRO.

Course Outcomes:
Students completing this course will be able to:

- Measurement of specific resistance of material
- compare two resistance
- convert Galvanometer into Ammeter and voltmeter
- magnetic moment (M) of a magnet
- evaluate the ballistic constant

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 use

IFTM University, Moradabad
Bachelor of Science (Honours) Physics Programme
B. Sc. (Hons) Physics II Year III Semester

AECC* (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
- 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), States, Centre, and other stakeholders

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

Inter-Relationship between Disasters and Development

- Factors affecting Vulnerabilities, 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
- 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 is 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 pro active 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:

- Disaster, types of Disasters, Causes Global trends in disasters.
- Disaster life cycle, Global trends in disasters.
- Factors affecting Vulnerabilities, impact of Development projects
- Disaster Risk Management in India

Suggested Readings:

- Satish Modh, Introduction to Disaster Management, Macmillan Publisher India Ltd
- Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press
- Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples' Vulnerability and Disasters, Routledge.
- Damon P. Coppola, Introduction to International Disaster Management, Butterworth-Heinemann,
- Singhal J.P. "Disaster Management", Laxmi Publications. ISBN-10: 9380386427 ISBN-13: 978-9380386423
- Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., ISBN-10: 1259007367, ISBN-13: 978-1259007361]

- Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi
- Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi.
- Carter, Nick. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
- Cuny, F. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development.
- Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009.
- Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi Indian Journal of Social Work.
- 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 (Honours) Physics Programme
B. Sc. (Hons) Physics II Year IV Semester

BPHY (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, LS and JJ coupling, Selection rules, Zeeman effect, Paschen back effect, Stark effect.

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, Moseley's law, 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), Optical resonators, quality factor, transverse and longitudinal mode, Coherence, Threshold conditions.

UNIT-IV **(12 Sessions)**

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

Course Outcomes:

Students completing this course will be able to:

- Hydrogen spectrum, Pauli's exclusion principle
- Spectra of alkali elements and alkaline spectra
- Identify atomic effect such as Zeeman Effect, Paschen back effect and Stark effect.
- 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
- Study about different laser systems and its applications

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
- http://www.laserfest.org
- https://www.physics-and-radio-electronics.com
- https://onlinelibrary.wiley.com

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 IV Semester
BPHY (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 co ordinates, D' Alembert's principle, The Lagrangian formulation and Lagrange's equations of motion, 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.

UNIT-III **(10 Sessions)**
Probability and thermodynamic probability, 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, Equipartition theorem, Statistics of identical particles, Fermi – Dirac and Bose Einstein Statistics.

Course Outcomes:
Students completing this course will be able to:
- Mechanics of a system of a particle, D' Alembert's principle
- Lagrange's equations of motion, The Hamiltonian formulation and Hamilton's equation of motion.
- reduction to equivalent one body problem, the equation of motion and first integrals, classification of orbits
- They are able to interpret different types of events.
- Students have understood the concept of phase space and its volume.
- They can easily distinguish between different types of particles and statistics and can easily distribute bosons, fermions and classical particles among energy levels.
- Probability and Principle of equal priori probability
- Understand the basic idea about statistical distributions.
- Impart the knowledge about the phase transitions and potentials.
- Liouville's theorem, Ensembles, Maxwell-Boltzmann Statistics, Fermi – Dirac and Bose Einstein Statistics.
- Understand the applications of statistical laws.

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
- http://lehman.edu

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 IV Semester
BPHY (H)-451: Physics Laboratory – 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.
4. Measurement of the wavelength of the Laser by Double slit.
5. To measure the divergence of a Laser beam.
6. To Plot frequency response curve of a single stage RC coupled amplifier.
7. To verify the truth table of various Logic Gates Circuits.
8. To verify the truth table of Half Adder and Full Adder.
9. To study the rectification by half wave rectifier.
10. To verify the basic laws of Boolean expression using logic gates.

Course Outcomes:
Students completing this course will be able to:
- Evaluate wavelength of laser
- Determine Thickness of wire
- divergence of a Laser beam
- verify the truth table of logic gates, half adder, full adder.

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 (Honours) 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, 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 .

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 , One dimensional motion in step potential, Rectangular barrier.

UNIT-III **(10 Sessions)**

Operators, Hermitian operator, 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, Somerfeld 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.

Course Outcomes:

Students completing this course will be able to:

- Understand the Failure of classical physics to explain black body spectra
- Study of Compton Effect, Wave particle duality, de Broglie's hypothesis
- Derive Schrodinger's equation, Physical significance of wave function Ψ
- Study Ehrenfest's theorem, Eigen value and Eigen functions
- Understand Operators, orthonormality, normalization, Dirac Delta function.
- Study Bohr's atomic model, Somerfeld elliptic orbits
- Understand Pauli's exclusion principle, Larmor precession

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 (Honours) 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, Electric Quadrapole moment, Parity, packing friction, Binding energy, Saturation of nuclear forces, Main Characteristics of Nuclear forces, Meson theory of nuclear Forces.

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, 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, Semiconductor Detector, Scintillation detector.

UNIT - IV **(10 Sessions)**

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

Course Outcomes:

Students completing this course will be able to:

- acquire Basic knowledge about nuclear Properties, Binding energy, Characteristics of Nuclear forces
- Alpha decay, Range of α particle, Geiger Nuttal law, Gamow's theory of α decay, β- decay, γ- decay
- Understand the features of nuclear forces, exchange force and meson theory.
- Describe various counters : Gas filled counter, Ionization chamber, Proportional counter, Linear accelerators
- elementary particles and their classification

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 (Honours) 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; concept of a metric, spherical and cylindrical coordinates and their unit vectors

UNIT -II **(10 Sessions)**

Matrix algebra: Transpose of a matrix, 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 using separation of variables, Laplace's Equation in problems of rectangular, cylindrical and spherical 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: Fourier series, half range expansion, Arbitrary period, Fourier integral and transforms, FT of delta and Gaussian function.

Course Outcomes:

Students completing this course will be able to:

- understand concept of a metric, spherical and cylindrical coordinates
- study the transpose of a matrix, Hermitian, orthogonal and unitary matrices
- understand Eigen values and eigenvectors of a matrix
- Solve first and second order differential equations and apply these to physics problems
- Learn Fourier series and Fourier Transform

Suggested Book:

1. Mathematical Methods for Physicists by G. Arfken and H.J. Weber
2 .Mathematical Physics by P. K. Chattopadhyay.
3. Mathematical Methods in Physical Sciences by Boas.
4. 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 (Honours) 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; Introduction to Gauss's divergence and Stoke's theorem.

UNIT -II **(10 Sessions)**

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

UNIT -III **(10 Sessions)**

EM Wave Propagation in Unbounded Media: Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance, Propagation through conducting media, relaxation time, skin depth.

UNIT -IV **(12 Sessions)**

EM Wave in Bounded Media: Boundary conditions at a plane interface between two Media, Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. Fresnel's Formulae for perpendicular & parallel Polarization cases, Brewster's law, Reflection & Transmission coefficients. Total internal reflection.

Course Outcomes:

Students completing this course will be able to:

- Understand the basic mathematical concepts related to electromagnetic vector fields.
- Maxwell's equations, Displacement Current, Vector
- EM Wave Propagation in Unbounded Media
- Propagation through conducting media, relaxation time, skin depth.
- Fresnel's Formulae for perpendicular & parallel Polarization cases
- Brewster's law, Reflection & Transmission coefficients

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 (Honours) Physics Programme
B. Sc. (Hons) Physics III Year V Semester

BPHY (H)-505: 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 (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, Types of AC milli voltmeters: Amplifier-rectifier and rectifier amplifier Block diagram and explanation of types of ac milli voltmeter, 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.

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, 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.

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 & Wiliam D. Cooper

Course Outcomes:

Students completing this course will be able to:

- Analyze the performance characteristics of various instruments.
- Illustrate basic meters such as voltmeters and ammeters.
- Amplifier-rectifier and rectifier amplifier
- Principles of measurement of dc voltage and dc current, ac voltage and ac current.

- Amplifier-rectifier and rectifier amplifier Block diagram and explanation of types of ac milli voltmeter.
- Construction of CRT, Electron gun, electrostatic focusing and acceleration, Deflection sensitivity.
- Introduction to digital CRO, CRO probes and current probes.
- Principle and working of RLC bridge,

Website Sources

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

IFTM University, Moradabad
Bachelor of Science (Honours) 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 etc, Output Devices – Printer, Plotters etc.

UNIT-2 **(10 Sessions)**

Computer Memory, Memory Hierarchy, Registers, Cache Memory, Primary Memory, Secondary Memory.

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

UNIT-3 **(6 Sessions)**

Networks: Computer Networks, Types of Networks, 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), 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.

Course Outcomes:

Students completing this course will be able to:

- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.
- Study computer memory, types of operating system
- Understand types of networks.
- Write, compile and debug programs in C language and use different data types for writing the programs.
- Learn Array notation and representation

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 Laboratory – 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.
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.
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. 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.
10. To study emitter follower/ Darlington pair amplifier.

Course Outcomes:
Students completing this course will be able to:

- Evaluate hybrid parameters of transistors
- Plot characteristics of L.D.R., FET, Tunnel diode and Zener diode.
- Evaluate ripple factor
- Evaluate UJT parameters.

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 (Honours) Physics Programme
B. Sc. (Hons) Physics III Year V Semester

BCS (H)-552: 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) Write a program in C to find the sum of two numbers.
2) Write a program in C to find the factorial of a number.
3) Write a program in C to print first ten natural numbers.
4) Write a program in C to calculate area of rectangle.
5) Write a program in C to check whether number is prime or not.
6) Write a program in C using arrays to find the largest and second largest number.
7) Write a program in C to calculate area of circle.
8) Write a program in C to read a string and write it in reverse order.
9) Write a program in C to concatenate two strings of different lengths.
10) Write a program in C to check that the input string is a palindrome

Course Outcomes:
Students completing this course will be able to:

- Identifysituations where computational methods and computers would be useful.
- Given a computational problem, identify and abstract the programming task involved.
- Write the program on a computer, edit, compile, debug, correct, recompile and run it.
- 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.

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 (Honours) 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, Bravais lattices in two or three Dimensional, packing fraction.

UNIT II **(10 Sessions)**

Crystal Planes and Miller indices, Interplanner Spacing, Crystal structures-NaCl, Diamond, CsCl and ZnS.

X-ray diffraction, Bragg's law and Bragg's diffraction conditions in direct and reciprocal lattice, K-Space.

UNIT -III **(10 Sessions)**

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, Nano cluster.

Course Outcomes:

Students completing this course will be able to:

- Understand Crystal structure, Bravais lattices in two or three Dimensional
- Study crystal structure of NaCl, Diamond, CsCl and ZnS.
- Relate crystalline structure to X-ray diffraction data and the reciprocal lattice.
- Understand the influence of crystal binding energy on crystalline structure.
- Understand the influence of lattice vibrations on thermal behavior
- Study Nanoscience and Nanotechnology and their applications.

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 (Honours) 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 & □ Network, Symmetric and Asymmetric Network), Characteristic Resistance, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem ,Mill man'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, Biasing of FET.

UNIT – III **(10 Sessions)**

Tunnel Diodes, Zener and Avalanche diodes, Point contact diode, LED Photo diode, Thermistor, Effect of Temperature on junction diode thermistor, Phototransistors, Silicon Controlled rectifiers, Uni-junction transistor and their simple uses.

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, 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:

- Understand concept of network
- Study of diode and transistor characteristics.
- Understand various diodes and their characteristics.
- Verify the rectifier circuits using diodes and implement them using hardware.
- Design the biasing circuits like self biasing.
- Study of Structure optical fiber, types of fibers and their importance.

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 (Honours) 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, 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(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 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, 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 Bessel functions, generating function.

Course Outcomes

Students completing this course will be able to:

- Understand complex variables :Analytic functions, Cauchy-Riemann differential equations
- Learn about Gradient, Divergence and Curl in orthogonal curvilinear and their typical applications in physics.
- Learn about special type of matrices that are relevant in physics and then learn about tensors.
- Get introduced to Special functions like Gamma function, Beta function, Delta function, Dirac delta function,
- Bessel functions and their recurrence relations, solution of Bessel's equation
- Learn different ways of solving second order differential equations
- Learn the fundamentals and applications of Laplace transforms, their inverse transforms etc

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 (Honours) 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, 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, flurite, Hexagonal and cubic zink 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 eqillibrium and metastability, Phase diagrams of elements, applications of thermodynamics, Clapeyron equations for phase transitions, vapor pressures, effect of temperatures

UNIT- III **(10 Sessions)**

Defects in Materials : 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, concept of formation of phase diagrams on basis of entropy and free energy changes for compositions, Phase diagrams of various categories.

Course Outcomes

Students completing this course will be able to:

- Classify the materials to understand basic properties of materials
- Describe crystal structure, Ceramics, polymers, silicates
- derive various thermodynamical expressions,
- study applications of thermodynamics
- learn various defects in materials
- understand Hume-Rothery rules, Phase diagrams of various categories.

Suggested Readings:

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)-605: 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
Born-Oppenheimer approximation and separation of electronic and nuclear motions in molecules, Band structures of molecular spectra.

UNIT- II
Microwave and far infrared spectroscopy: 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
Infrared spectra : Energy levels of diatomic molecules under simple harmonic and an harmonic (no deduction necessary for this one) models, Selection rules and spectral structures, Morse potential energy curves, Dissociation energies, Isotope effect, Rotational – vibrational coupling, Parallel and perpendicular modes, Symmetry properties of molecular wave functions and nuclear spins.

UNIT-IV
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 crude 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 Franck- Condon principle. Hund's coupling.

Course Outcomes :
Students completing this course will be able to:

- Explain Born-Oppenheimer approximate
- Study Energy levels of diatomic molecules
- Study Band structures of molecular spectra.
- Learn Electronic spectra of diatomic molecules
- Understand Microwave and far infrared spectroscopy
- Examine the electronic and vibrational spectra of diatomic molecules.
- Understand Franck- Condon principle

Reference 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 (Honours) Physics Programme
B. Sc. (Hons) Physics III Year VI Semester

BPHY (H)-651: Physics Laboratory – 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. To verify Thevenin theorem and determine the current flowing through the load resistance.
3. 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. To verify the condition of oscillation in Phase shift oscillator.
9. 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

Course Outcomes:

- Students completing this course will be able to:
- Verify various network theorem.
- Plot V-I characteristics of diode.
- Evaluate Characteristics of transistor
- Evaluate differentiator circuit.

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