CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Electrodynamics-I

Class: M.Sc. (Physics)

Semester: 2nd

Name of the Teacher: Dr. Amanpreet Kaur Sandhu

Availability Timings: 9:00 A.M. to 3:30 P.M.

E-mail: amansandhugndu@gmail.com

Objectives of the Course:

1. The major objective of the course is to make the students familiar with the vast implications of Electricity and Magnetism
2. To cultivate skills at formulating and solving physics problems.
3. To develop familiarity with the physical concepts and mathematical methods of electrodynamics.

Course Content:

Coulomb's law, Guass's law, Poisson's equation, Laplace equation. Solution of boundary value problem: Green's function, method of images and calculation of Green's function for the image charge problem in the case of a sphere. Biot and Savart's law. The differential equation of Magnetostatics and Ampere's law, vector potential and magnetic fields of a localised current distribution. Time varying fields, Maxwell's equations, conservation laws: Faraday's law of induction, Energy in a magnetic field. Maxwell's displacement current, vector and scalar potential, Gauge transformations. Plane wave like solutions of the Maxwell equations. Polarisation, linear and circular polarisation. Superposition of waves in one dimension. Group velocity. Illustration of propagation of a pulse in dispersive medium. Reflection and refraction of electromagnetic waves at a plane surface between dielectrics. Polarisation by reflection and total internal reflection. Waves in conductive medium, Simple model for conductivity

(Detailed Course Content: Available at www.gndu.ac.in)

What will be the teaching Methods:

- Lectures : Six per week
- Student Seminars
- Assignments: Assignments will given on numerical problems regarding articles.

- Powerpoint Presentations
- Participatory and Experiential Learning

Learning Outcomes:

A. Knowledge and Understanding:

Students will:

- Know how to define Electrostatics and Electrodynamics.
- Understand Maxwell equations and their importance.
- Properties of electromagnetic waves.

B. Intellectual (Cognitive/ Analytical) Skills:

Students will be able to:

- Think critically about the theories of physics.
- Think critically about the contribution of various scientists in the field of electrodynamics.
- Understand that how a charge on single electron does plays a crucial role in understanding the world of current and magnetism.
- Think critically about the wave particle duality nature.
- Think critically about the use of physics in our daily life.
- Think critically about how electricity and magnetism plays a crucial role in day to day life.
- Think critically about how electromagnetic wave theory plays an important role in telecommunication.

C. Tranferable skills:

Students will be able to:

- Use concepts of physics more effectively.
- Learn to think more creative as well as comparatively.
- Project planning.
- Problem solving

Modes of Assesment	Minimum score required(to qualify for the next exam/class)	Schedule
Continuous Internal Evaluation (CIE)		
1. Class Test(Unit wise)	50%	After Each Unit
2. Student Seminar	50%	

Teaching outline:

Unit	Teaching dates
I	**11 January to 13 February**
II	**14 February to 2 March**
III	**3 March to 22 March**
IV	**23 March to 13 April**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students must maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in the university exams.

Text book(s):

- Classical Electrodynamics - J.D. Jackson.
- Introduction to Electrodynamics - D.J. Griffiths.

Refrences:

- Classical Electromagnetic Radiation - J.B. Marion.

- Fields and waves: Electromagnetics by David K. Cheng.
- Feynmann Lectures in Physics- Vol. I
- Halliday, Resnick & Walker, Fundamentals of Physics
- Scott, W.T., The Physics of Electricity and Magnetism.

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Condensed Matter Physics

Class: M.Sc. (Physics)

Semester: IIIrd

Name of the teacher: Dr. Ranju Mahajan

Availability timings: 9:00 AM to 3.30 PM

E-mail: mahajan_ranju@yahoo.co.in

Objective of the Course:

This course aims to establish fundamental concepts in condensed matter physics, and applies the physics you have learned previously (in particular quantum mechanics, classical mechanics, electromagnetism and statistical mechanics) to these real-world materials. The structure and properties of solids including thermal and electrical properties are described in detail. It also aims to explore the students with principle, theory and mathematical calculations involved in various instruments.

Course content:

Lattice Specific Heat and Elastic Constants, Different theories of lattice specific heat of solids, Einstein model of the Lattice Specific heat, Density of modes of vibration, Debye model of Lattice specific heat, Born cut-off procedure, Specific heat of metals, Defects and Diffusion in Solids, Conductivity of metals and ionic crystals, Dielectrics and Ferro Electrics, Macroscopic field, The local field, Lorentz field, The Claussius-Mossotti relations, Different contribution to polarization etc.

(***Detailed Course content:*** Available at www. gndu.ac.in)

What will be the teaching methods:

- Lectures: Six per week
- Interactive classroom discussions
- Assignments & Seminars.
- Power point presentations.
- Participation in online courses.

Program Learning Outcomes:

(Knowledge and understanding, intellectual skills, practical skills, transferable skills)

A. Knowledge and understanding:

Students will

- have a basic knowledge of lattice specific heat and elastic constants.
- understand the concept of point defects and be able to use it as a tool .
- know the significance of grain boundaries .
- know the fundamental principles of mean free path in metals and qualitative discussion of the features of resistivity.
- know basic models of dipole theory and thermodynamics of ferroelectric transitions..

B. Intellectual (Cognitive/Analytical) skills:

Students will

- be able to outline the importance of solid state physics in the modern society.
- be able to perform structure determination of simple structures.
- Industrial applications.

C. Practical skills:

Students will learn to:

- Apply appropriate mathematical techniques to solve different theories of lattice specific heat.
- Think in graphical terms and approximate terms when appropriate.
- Perform statistical analysis, and a willingness to question fundamentals.
- Apply appropriate laboratory techniques to measure conductor properties.
- Understand the operation and characteristics of various conducting devices.

D. Transferrable skills:

- Communication skills.
- Thinking skills.
- Project planning.
- Problem solving.

Modes of Assessment	**Minimum Score Required (to Qualify for the next Exam)**	**Schedule**

Continuous Internal Evaluation (CIE) 1. Class Test (Unit wise)	**50%**	**After Each Unit**
2. Student Seminars	**50%**	**After Each Unit**

Teaching outline:

Unit	Teaching Dates
I	**11 January to 2 February**
II	**3 February to 23 February**
III	**24 February to 23 March**
IV	**24 March to 13 April**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of total lecture delivered, failing which they will be detained from appearing in university exams.

Text Books :

1. Solid State Physics: A.J. Dekker-Prentice Hall, 1965.
2. An Introduction to Solid State Physics: C. Kittle-Wiley, 1958.
3. Elementary Solid State Physics-Omar, Addison Welly, 1975.
4. Principles of Solid State Physics: R.A. Levey-Academic Press, 1968.
5. Introduction of Solid State Physics: Ashroft-Cengage Learning, 1999.

Refrences:

- Solid State Physics-Aschroft and Mermin-New York Holt, 1976
- Material Science and Engineering William D. Callister JR, Wiley.
- Elementary Solid State Physics-Omar, Addison Wesly, 1975.
- Madelung, O., "Introduction to Solid State Theory"
- Jones & March, "Theoretical Solid State Physics, vol. 1"

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name : Atomic and Molecular Spectroscopy

Class: M.Sc. Physics

Semester: II

Name of Teacher: Dr. Narveer Singh

Availability Timing: 9.00 AM to 3.30 PM

E-mail: narveerapd @gmail.con

Objectives of the Course:

Atoms and molecules are the fundamental units for all matters in the Universe. Whatever state of matter it is made of atoms. All the properties of matter are governed by the electronic structure of atoms and molecules. The individual properties of atoms like electronic, magnetic and optical are quite different from the collective properties of matter made of atoms and molecules. This course enlightens the knowledge of structure of atoms and molecules with various spectroscopic techniques.

Course Contents:

1. Experiential and theoretical predictions of constituents of atoms.
2. Quantum numbers and vector model
3. Fine spectra of alkali and alkaline metals
4. Effect of external electric and magnetic field on atomic spectra
5. Structure of molecules
6. Molecular rotational, vibration and electronic spectroscopy
7. FTIR, Raman spectroscopy and UV-VIS spectroscopy.

Detailed course contents: available atwww.gndu.ac.in

Teaching methods:

- Lectures : six per week
- Student Seminar: two per week
- Experiments in lab: two per week
- Power point presentation
- Assignments and discussions

Program Learning Outcomes:

A. Knowledge and Understanding:

Students will learn

- About the structure of atom and molecules with various theoretical and experimental observations.
- Understand and explain basic concepts of different spectroscopic techniques to explore the physical and chemical properties of matter.
- Students will understand interdisciplinary approach of spectroscopy in other branches of science.

B. Intellectual (Cognitive/Analytical) Skills:

Students will be available to

- Analyze atomic and molecular spectra to explore the structure of materials and their constituents.
- Analyze Fourier Transform Infra-red spectra for molecular bonding.
- Analyze UV-VIS spectra for electronic spectra.
- Analyze Raman Spectra for different types of molecules

C. Practical Skills

Students will learn

- The use of various spectroscopy techniques for materials characterizations.
- Basics of different components of spectroscopy in experimental setup.
- Experimental verification of theoretical models.

D. Transferable Skills:

Students will be able to transfer the theoretical and experimental skills to other branches of science like medical science and material engineering nanotechnology.

Modes of Assesment	Minimum Score Required (to qualify for the next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Test (Unit wise)	**40%**	**After each Unit**
2. Student Seminars		**Every week**
3.In house Exams	**40%**	**Last week of March onwards**
End of Semester Exam	**40%**	**Last week of May**

Unit	Teaching Dates
I	**11 January to 26 January**
II	**27 January to 12 Feb**
III	**13 Feb to 28 Feb**
IV	**1 March to 20 March**
Revision	**Till 20 April**

Teaching Outline:

Attendance Policy

Lecture attendance of 75% of total lectures delivered is mandatory, failing which student will be debarred from appearing in final University examinations.

References

1. Physics of Atoms and Molecules by B.H.Bransden and C.J. Joachain.
2. Fundamental of Molecular Spectroscopy by C.N. Banwell and E.M. McCash
3. Introduction to Atomic spectroscopy by H.E.White.

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Quantum Mechanics-I

Class: M.Sc. (Physics)

Semester: 2nd

Name of the Teacher: Dr. Navneet Arora

Availability Timings: 9:00 A.M. to 3:30 P.M.

E-mail: mail4navneet@gmail.com

Objectives of the Course:

1. The major objective of the course is to develop a better understanding of Quantum Physics of sub atomic particles.
2. To cultivate skills at formulating and solving physics problems.
3. To develop familiarity with the physical concepts and mathematical methods of quantum mechanics.
4. Provide the student with different practical, intellectual and transferable skills.

Course Content:

Stern Gerlach experiment as a tool to introduce quantum ideas, analogy of two level quantum system with polarisation states of light. Complex linear vector spaces, Ket space, Bra space and inner product, operators and properties of operators. Time evolution operator and Schorodinger equation, special role of the Hamiltonian operator, energy eigen kets, time dependence of expectation values, spin precession. Schrodinger vs. Heisenberg picture, unitary operators. Potential Step, potential barrier, potential well. Scattering vs. Bounds states. Schrodinger equation for a spherically symmetric potential. Orbital angular momentum commutation relations. Eigen value problem for L^2, spherical harmonics. Three dimensional harmonic oscillator, three dimensional potential well and the hydrogen atom.

(Detailed Course Content: Available at www.gndu.ac.in)

What will be the teaching Methods:

- Lectures : Six per week
- Student Seminars
- Assignments: Assignments will given on numerical problems regarding articles.
- Powerpoint Presentations.
- Participatory and Experiential Learning

- Discussion method

Learning Outcomes:

D. Knowledge and Understanding:

Students will come to know about:

- Dirac notation and its advantage above other notations.
- the difference between classical and quantum physics.
- How to handle algebra of orbital angular momentum.

E. Intellectual (Cognitive/ Analytical) Skills:

Students will be able to:

- Think critically about the theories of physics.
- Think critically about the contribution of various scientists in the quantum world.
- Identify the process of how spin of individual electron plays a crucial role in understanding the world of microscopic bodies.
- Think critically about the wave particle duality nature.
- Learn about degenerate states of same energy level.
- Think critically about the use of physics in our daily life.

F. Tranferable skills:

Students will be able to:

- Use concepts of physics more effectively.
- Learn to think more creative as well as comparatively.
- Project planning.
- Problem solving

Modes of Assesment	Minimum score required(to qualify for the next exam/class)	Schedule
Continuous Internal Evaluation (CIE)		
1.Class Test(Unit wise)	50%	After Each Unit
2.Student Seminar	50%	

Teaching outline:

Unit	Teaching dates
I	**11 January to 10 February**
II	**11 February to 27 February**
III	**1 March to 20 March**
IV	**21 March to 14 April**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students must maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in the university exams.

Text book(s):

- Modern Quantum Mechanics by J.J. Sakurai.
- Quantum Mechanics by Schiff.

References:

- A Text book of Quantum Mechanics, P.M. Mathews and K. Venkatesan, (Tata McGraw Hill Pub., Co., Delhi) 2002.
- Quantum Mechanics J.L. Powell and B. Craseman (Narosa Pub. House, New Delhi) 1997.
- Concepts of Modern Physics, Arthur Beiser (McGraw Hill Pub. Co., New Delhi, 9th Ed.) 1995.
- Feynmann lectures in Physics Vol. III-Addison Wesly, 1975
- Quantum Mechanics : Merzbacher-John Wiley & Sons, New York, 1970.Quantum Mechanics, E. Merzbacher (John Wiley, 2nd Edition)

  Introduction to Quantum Mechanics, L. Pauling and E.B. Wilson (Tata McGraw Hill Pub. Co. Delhi), 2002.

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: RADIATION PHYSICS

Class: M.Sc. Physics

Semester: 4th

Name of the Teacher: Dr. Mandeep Kaur

Availability Timings: 9:00 AM to 3:00 PM

E-mail: mandeep062000@gmail.com

Objectives of the Courses:

1. Provide the student with a broad spectrum of physics courses.
2. Emphasize the role of physics in life and other discipline (chemistry, mathematics and biology).
3. Develop the ability of the students to conduct, observe, analyzes and report an experiment.
4. Develop the ability of the students to deal with physical models and formulas mathematically.
5. Provide the student with different practical, intellectual and transferable skills.

Course Content:

Types and sources of ionizing radiation, fluence, energy fluence, kerma, exposure rate and its measurement - The free air chamber and air wall chamber, Absorbed dose and its measurement ; Bragg Gray Principle, Radiation dose units, dose equivalent and quality factor. Pocket dosimeter, films, solid state dosimeters such as TLD, SSNTD, chemical detectors and neutron detectors, numerical problems. Biological effects of radiation at molecular level, acute and delayed effects, stochastic and nonstochastic effects, Relative Biological Effectiveness (RBE), linear energy transformation (LET), Dose response characteristics. Permissible dose to occupational and non-occupational workers, safe handling of radioactive materials, The ALARA, ALI and MIRD concepts, single target, multitarget and multihit theories, Rad waste and its disposal.Thermal and biological shields, accelerator facilities, shielding materials, radiation attenuation calculations-The point kernal technique. The exponential point-Kernal. Practical applications of some simple numerical problems.

(Detailed Course Content: Available at www.gndu.ac.in)

What will be the teaching Methods:

- Lectures : Six per week
- Student Seminar: Two per week
- Assignments
- PowerPoint Presentation
- Participatory and Experimental Learning
- Discussion method

Learning Outcomes:

G. Knowledge and Understanding:

Students will:

- Know how to define a various branches of Nuclear physics (eg. Radiation physics, Reactor physics, Particle Physics).
- Understand and explain the basic concepts associated with the Radiation Physics(eg. Units, quality factor, radiation hazards and protection etc.)
- Students will understand the concept of radiation shielding in medical, industrial and accelerator facilities.

H. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to:

- Think critically about the theories of physics.
- Think critically about the contribution of various scientists in the particle world.
- Work with others in task-oriented groups, productively participating and interacting in the group.
- Learn the application of ionizing radiation in diagnosis and treatment of disease.
- Think critically about the use of physics in our daily life.

I. Practical Skills:

Students will learn about :

- Different types and sources of ionizing radiations with units.
- Measurement of radiations.
- Radiation effects and hazards to living organisms.
- Protection and radiation shielding.

J. Tranferable skills:

Students will be able to:

- Use concepts of physics more effectively.
- Learn to think more creative as well as comparatively.
- project planning.
- Problem solving.

Modes of Assesment	Minimum score required(to qualify for the next exam/class)	Schedule
Continuous Internal Evaluation (CIE)		
1.Class Test(Unit wise)	50%	After Each Unit
2.Student Seminar	50%	After completion of syllabus

Teaching outline:

Unit	Teaching dates
I	**11 January to 11 February**
II	**12 February to 28 February**
III	**1 March to 16 March**
IV	**17 March to 5 April**
Revision	**Till 20 April**

Attendance policy:

Lecture attendance is mandatory. Students are to maintain 75% attendance of the total lectures delivered , falling which they will be detained from the appearing in the university.

Text book(s):

- The elements of nuclear reactor physics: Glasstone & Edlund – Vam Nostrand, 1952.
- Introduction to Radiological Physics and Radiation Dosimetry-Wiley-VCH , F.H. Attix:, 1986

Refrences:

- Alison. P. Casart: Radiation Theory
- Edward Profio: Radiation Biology-Radiation Bio/Prentice Hall, 1968

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Reactor Physics

Class: M.Sc. Physics

Semester: 4th

Name of the Teacher: Dr. Amritpal Singh

Availability Timings: 9:00 AM to 3:00 PM

E-mail: amritpal.amy@gmail.com

Objectives of the Courses:

1. Provide the student with a broad spectrum of physics courses.
2. Emphasize the role of physics in life and other discipline (chemistry ,mathematics and biology).
3. Develop the ability of the students to conduct, observe, analyzes and report an experiment.
4. Develop the ability of the students to deal with physical models and formulas mathematically.
5. Provide the student with different practical, intellectual and transferable skills.

Course Content:

Thermal neutron diffusion, transport mean free path, slowing down power and moderating ration of a medium. Slowing down density, slowing down time, Neutron cycle and multiplication factor, four factor formula, neutron leakage,Advantages and disadvantages of heterogeneous assemblies, various types of reactors with special reference to Indian reactors, Breeding ratio, breading gain, doubling time, Fast breeder reactors, fission product poisoning, use of coolants and control rods. *(Detailed Course Content: Available at www.gndu.ac.in)*

What will be the teaching Methods:

- Lectures : Six per week
- Student Seminar: Two per week
- Assignments
- PowerPoint Presentation
- Participatory and Experimental Learning
- Discussion method

Learning Outcomes:

K. Knowledge and Understanding:

Students will:

- Know how to define a various branches of Nuclear physics(eg. Radiation physics, Reactor physics, Particle Physics).
- Understand and explain the basic concepts associated with the Reactor Physics(eg. Moderation of neutrons, Thermal Neutrons, working of nuclear reactor)
- Students will understand and able to describe the difference between the various Reactor processes.

L. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to:

- Think critically about the theories of physics.
- Think critically about the contribution of various scientists in the particle world.
- work with others in task-oriented groups, productively participating and interacting in the group.
- Learn the conversion of fertile material to fissionable material.
- Think critically about the use of physics in our daily life.

M. Practical Skills:

Students will learn to:

- Detect the Beta Particals with the help of GM Counter.
- Study the properties of different elements.
- Measuring a activation of material in reactor.
- Study of Mass defect(mass reduced after reaction and that reduced mass changes into energy).
- Study types of nuclear reactors in our country.

N. Tranferable skills:

Students will be able to:

- Use concepts of physics more effectively.
- Learn to think more creative as well as comparatively.
- project planning.
- Problem solving.

Modes of Assesment	Minimum score required(to qualify for the next exam/class)	Schedule
Continuous Internal Evaluation (CIE)		
1.Class Test(Unit wise)	50%	After Each Unit
2.Student Seminar	50%	After completion of syllabus

Teaching outline:

Unit	Teaching dates
I	**11 January to 1 February**
II	**42February to 23 February**
III	**24 February to 14 March**
IV	**15 March to 5 April**
Revision	**Till 20 April**

Attendance policy:

Lecture attendance is mandatory. Students are to maintain 75% attendance of the total lectures delivered , falling which they will be detained from the appearing in the university.

Text book(s):

- The elements of nuclear reactor physics: Glasstone & Edlund – Vam Nostrand, 1952.
- Reactor physics : S.E liverhunt

Refrences:

- J. J. Duderstadt and L. J. Hamilton, “Nuclear Reactor Analysis,” John Wiley and Sons, Inc., New York (1976).
- H. Sekimoto, Genshiryoku-kogyo, 27[4], 81(1981) (in Japanese).
- G. I. Bell and S. Glasstone, “Nuclear Reactor Theory,” Van Nostrand Reinhold Co., New York (1970).
- D. L. Hetrick, “Dynamics of Nuclear Reactors,” American Nuclear Society, La Grange Park, Illinois (1993).
- R. L. Murray, “Nuclear Energy, 5th ed.,” Butterworh Heinemann, Boston (2001).
  J. R. Lamarsh, “Intro. to Nuclear Reactor Theory,” Addison-Wesley Pub. Co., Reading, Massachusetts (1966).

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Condensed Matter Physics

Class: M.Sc. (Physics)

Semester: IV

Name of the teacher: Dr. Ranju Mahajan

Availability timings: 9:00 AM to 3.30 PM

E-mail: mahajan_ranju@yahoo.co.in

Objective of the Course:

This course aims at acquainting students with various concepts and basic techniques essential for conduct of practical and research work in the field of condensed matter physics and have an understanding of scientific knowledge. It also aims to explore the students with principle, theory and mathematical calculations involved in various instruments.

Course content:

Classification of magnetic materials, Origin of permanent magnetic dipoles, Diamagnetic susceptibility, Langevin diamagnetic equation, Classical theory of paramagnetism, Quantum theory of paramagnetism, Quenching of orbital angular momentum, Cooling by adiabatic demagnetization, , Josephson effect: dc Josephson effect, ac Josephson effect, Superconducting magnet and SQUID, Atomic and electronic interactions, Optical properties of metals and non-metals: Reflection, Refraction, Absorption, Transmission, Fundamentals of direct and indirect band gap, Exciton absorption etc.

(Detailed Course content: Available at www. gndu.ac.in)

What will be the teaching methods:

- Lectures: Six per week
- Interactive classroom discussions
- Assignments: The students will be asked to write articles on given topics
- Power point presentation
- Participation in online courses.

Program Learning Outcomes:

(Knowledge and understanding, intellectual skills, practical skills, transferable skills)

B. Knowledge and understanding:

Students will

- have a basic knowledge of crystal systems and spatial symmetries.
- understand the concept of reciprocal space and be able to use it as a tool .
- know the significance of Brillouin zones .
- know the fundamental principles of semiconductors, including p-n junctions, and be able to estimate the charge carrier mobility and density.
- know basic models of magnetism .
- know what phonons are, and be able to perform estimates of their dispersive and thermal properties.

B. Intellectual (Cognitive/Analytical) skills:

Students will

- be able to outline the importance of solid state physics in the modern society.
- be able to perform structure determination of simple structures.
- Industrial applications

C. Practical skills:

Students will learn to:

- Apply appropriate mathematical techniques to solve semiconductor problems.
- Apply appropriate laboratory techniques to measure semiconductor properties.
- Understand the operation of semiconductor devices.
- Apply appropriate laboratory techniques to measure semiconductor device characteristics.

D. Transferrable skills:

- Communication skills
- Thinking skills
- Project planning.
- Problem solving.

Modes of Assessment	Minimum Score	Schedule

	Required (to Qualify for the next Exam)	
Continuous Internal Evaluation (CIE)		
3. Class Test (Unit wise)	**50%**	**After Each Unit**
4. Student Seminars	**50%**	**First week of April**

Teaching outline:

Unit	Teaching Dates
I	**11 January to 10 February**
II	**11 February to 24 February**
III	**1 March to 15 March**
IV	**16 March to 31 March**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of total lecture delivered, failing which they will be detained from appearing in university exams.

Text Books :

1. An Introduction to Solid State Physics: C. Kittel-Wiely Estem Ltd., New Delhi, 1979.
2. Solid State Physics-A.J. Dekkar-Maemillan India Ltd., New Delhi, 2004.
3. Principles of Solid State Physics-R.A. Levy-New York Academy, 1968

Refrences:

- Solid State Physics-Aschroft and Mermin-New York Holt, 1976
- Material Science and Engineering William D. Callister JR, Wiley.
- Elementary Solid State Physics-Omar, Addison Wesly, 1975.
- Madelung, O., "Introduction to Solid State Theory"
- Jones & March, "Theoretical Solid State Physics, vol. 1"
- Callaway, J., "Quantum Theory of the Solid State"

- Harrison, W., "Solid State Theory"

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Particle Physics PHY: 551

Class: M.Sc. (Physics)

Semester: IV

Name of the teacher: Dr. Ravneet Kaur

Availability timings: 9:00 AM to 3.30 PM

E-mail: ravneet.physics.lkc@gmail.com

Objective of the Course:

The objectives of particle physics are to identify the simplest objects out of which all matter is composed and to understand the forces which cause them to interact and combine to make more complex things. The subject aims to acquaint students with basic laws of nuclear and particle physics. It helps to develop the capability of elementary problem solving and relating theoretical predictions and measurement results amongst students.

Course content:

Historical survey of elementary particles and their classification, determination of mass, life time, decay mode, spin and parity of muons, pions, kaons and hyperons. Experimental evidence for two types of neutrinos, production and detection of some important resonances and antiparticles, Conserved quantities and symmetries, the electric charge, baryon number, leptons and muon number, particles and antiparticles, hypercharge (strangeness), the nucleon isospin, isospin invariance, isospin of particles, parity operation, charge conservation, time reversal invariance, CP violation and CPT theorem, the quark model. Classification of weak interactions, Fermi theory of beta decay, matrix element, classical experimental tests of Fermi theory, Parity non conservation in beta decay, lepton polarization in beta decay, the V-A interaction, parity violation in P-decay, Gauge symmetry, local gauge invariance, Feynmann rules, introduction of neutral currents. Spontaneously broken symmetries in the field theory, standard model.

(*Detailed Course content:* Available at www. gndu.ac.in)

What will be the teaching methods:

- Lectures: Six per week
- Interactive classroom discussions

- Assignments: The students will be asked to write articles on given topics
- Power point presentation
- Participation in online courses.

Program Learning Outcomes:

(Knowledge and understanding, intellectual skills, practical skills, transferable skills)

C. Knowledge and understanding:

Students will

- understand the elementary particles and their classification.
- will be able to determine of mass, life time, decay mode, spin and parity of various sub atomic particles.
- know about the symmetries and conservation laws involving high energy particles.
- know about weak interactions, their classification and theories involving these decays such as Fermi theory and Cabibbo's theory
- learn about field equations for scalar, spinor , vector fields
- gain information about Standard Model

B. Intellectual (Cognitive/Analytical) skills:

Students will

- Explore the substructures of matter.
- be able to co-relate the theoretical and practical aspects of the subject.
- Become aware of the applicability of the theories in research and development.

C. Practical skills:

Students will learn to:

- Apply appropriate mathematical techniques to solve elementary problems.
- Apply appropriate laboratory techniques to measure various properties of sub atomic particles.
- Understand the mode and decay behaviour of various particles

D. Transferrable skills:

- Communication skills

- Thinking skills
- Project planning.
- Problem solving.

Modes of Assessment	Minimum Score Required (to Qualify for the next Exam)	Schedule
Continuous Internal Evaluation (CIE)		
	50%	**After Each Unit**
1.Class Test (Unit wise)		
2.Student Seminars	**50%**	**First week of April**

Teaching outline:

Unit	Teaching Dates
I	**11 January to 14 February**
II	**15 February to 28 February**
III	**1 March to 15 March**
IV	**16 March to 31 March**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of total lecture delivered, failing which they will be detained from appearing in university exams.

Text Books :

1. Subatomic Physics: H. Fraunfelder and E.M. Henley- N.J. Prentice Hall
2. Introduction to Elementary Particles: D. Griffiths-Wiley-VCH-2008
3. Introduction to High Energy Physics: D.H Perkins-Cambridge University Press, 2000

References:

1. Elementary Particles, S.I. Hughes, Cambridge University Press, (1991).
2. Introduction to Quarks and Partons, F.E. Close , Academic Press, (1979).

3. Nuclei and Particles, E.Segre, Benjamin-Cummings, (1977).
4. Introduction to Particle Physics, M.P. Khanna, Prentice-Hall of India, (2004).

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Relativity And Electromagnetism

Class: B.Sc. (Non Med and C.Sc.)

Semester: 2nd

Name of the Teacher: Dr. Ravneet Kaur

Availability Timings: 9:00 AM to 3:00 PM

E-mail: ravneet.physics.lkc@gmail.com

Objectives of the Courses:

1. Provide the student with a broad spectrum of physics courses.
2. Emphasize the role of physics in life and other discipline (chemistry ,mathematics and biology).
3. To cultivate skills at formulating and solving physics problems.
4. To develop familiarity with physical concepts and mathematical relations of electromagnetism.
5. Provide the student with different practical, intellectual and transferable skills.

Course Content:

Postulates of special theory of relatively. Lorentz transformations, observer and viewer inrelativity. Relativity of simultaneity, Length, Time. Relativistic Dopper effect.Variation of mass with velocity, mass–energy equivalence, rest mass in an inelastic collision,relativistic momentum & energy, their transformation, Biot Savart's Law and its application to long straight wire,circular current loop and solenoid. Ampere's Circuital law and its application. Faraday's Law of EM induction, Displacement current, Mutual inductance and reciprocity theorem. Self inductance, Maxwell's equations their derivation and characterizations, E.M. waves and wave equation in a medium having finite permeability and permitivity

(Detailed Course Content: Available at www.gndu.ac.in)

What will be the teaching Methods:

- Lectures : Three per week
- Student Seminars
- Assignments: Assignments will given on numerical problems regarding articles.
- Powerpoint Presentations
- Participatory and Experiential Learning
- Discussion method

Learning Outcomes:

A. Knowledge and Understanding:

Students will:

- Know how to define a various branches of Relativity And Electromagnetism.
- Understand and explain the basic concepts associated with the electric and magnetic field (eg. Boit Savart Law and Ampere's Law and their applications)
- Students will understand and able to describe the difference between the particles travelling with speed f light and with velocity very smaller than the speed of light.

B. Intellectual (Cognitive/ Analytical) Skills:

Students will be able to:

- Think critically about the theories of physics.
- Think critically about the contribution of various scientists in the particle world.
- Identify the different relations of momentum, energy ,velocities etc.
- Think critically about the Maxwell relations.
- Think critically about the use of physics in our daily life.

C. Practical Skills:

Students will learn to:

- Study the characterizations of various applications of Ampere's Law
- Determine the value of planck's constant.
- To study the LCR circuits.
- To study the variation of self and mutual inductance.

D. Tranferable skills:

Students will be able to:

- Use concepts of physics more effectively.
- Learn to think more creative as well as comparatively.
- project planning.
- Problem solving

Modes of Assesment	Minimum score required(to qualify for the next exam/class)	Schedule
Continuous Internal Evaluation (CIE)		
1. Class Test(Unit wise)	50%	After Each Unit
2. Student Seminar	50%	After completion of syllabus

Teaching outline:

Unit	Teaching dates
I	**11 January to 2 February**
II	**3 February to 23 February**
III	**24 February to 23 March**
IV	**24 March to 13 April**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students must maintain 75% attendance of the total lectures delivered , failing which they will be detained from appearing in the university exams.

Text book(s):

- A text book of Relativity And Electromagnetism by Modern Publishers.
- A text book of Relativity And Electromagnetism by Dinesh Publications.

Refrences:

1. Introduction to Electrodynamics - D.J. Griffiths-Pearson Education Ltd., New Delhi, 1991
2. Physics of Vibrations and Waves by H.J. Pain.
3. EM Waves and Radiating Systems by Edward C. Jordan and K.G. Balmain.
4. Fields and Waves Electromagnetic by David K. Cheng.
5. Basics of Electromagnetism by Kulwant Singh Thind.

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Vibrations and Waves

Class: B.Sc.(Non Med And C.Sc.)

Semester: 2nd

Name of the Teacher: Dr. Ravneet Kaur

Availability Timings: 9:00 AM to 3:00 PM

E-mail: ravneet.physics.lkc@gmail.com

Objectives of the Courses:

1. Provide the student with a broad spectrum of physics courses.
2. Emphasize the role of physics in life and other discipline (chemistry ,mathematics and biology).
3. To cultivate skills at formulating and solving physics problems.
4. To develop familiarity with physical concepts and mathematical relations of vibration and waves.
5. Provide the student with different practical, intellectual and transferable skills.

Course Content:

Simply harmonic motion, energy of a SHO. Compound pendulum. Torsional pendulum Electrical Oscillations and energy of electrical oscillations, superposition of two perpendicular SHM having periods in the ration 1:1 and 1:2, Differential equation of damped harmonic motion, Determination of damping co–efficient– Logarithmic decrement, relaxation time and Q–Factor. Electromagnetic damping (Electrical oscillator). Differential equation for forced mechanical and electrical oscillators, Types of waves, wave equation (transverse) and its solution characteristic impedance of a string. Impedance matching, Reflection and Transmission of waves at boundary. Reflection and transmission of energy. Reflected and transmitted energy coefficients, Standing waves on a string of fixed length. Energy of vibrating string. Wave and group velocity.

(Detailed Course Content: Available at www.gndu.ac.in)

What will be the teaching Methods:

- Lectures : Three per week
- Student Seminars
- Assignments: Assignments will given on numerical problems regarding articles.
- Powerpoint Presentations
- Participatory and Experiential Learning

- Discussion method

Learning Outcomes:

E. Knowledge and Understanding:

Students will:

- Know how to define various branches of Vibration and Waves.
- Understand and explain the basic concepts associated with Oscillation, simple harmonic oscillation, damped oscillations energy of oscillor(Mechanical and electrical), Waves.
- Students will understand and able to describe Oscillations and simple harmonic motion , and waves and standing waves.

F. Intellectual (Cognitive/ Analytical) Skills:

Students will be able to:

- Think critically about the theories of physics.
- Think critically about the contribution of various scientists in the particle world.
- Identify the different relations of displacement, velocities, acceleration and energy etc.
- Think critically about the basic motion of every particle in the Universe i.e vibration .
- Think critically about the use of physics in our daily life.

G. Practical Skills:

Students will learn to:

- To find the damping coefficient of a simple pendulum.
- To study Melde's experiment.
- To study Electrical oscillator.

H. Tranferable skills:

Students will be able to:

- Use concepts of physics more effectively.
- Learn to think more creative as well as comparatively.
- Project planning.
- Develop Problem solving attitude.

Modes of Assesment	Minimum score required(to qualify for the next exam/class)	Schedule
Continuous Internal Evaluation (CIE)		
1.Class Test(Unit wise)	50%	After Each Unit
2.Student Seminar	50%	After completion of syllabus

Teaching outline:

Unit	Teaching dates
I	**11 January to 2 February**
II	**3 February to 23 February**
III	**24 February to 23 March**
IV	**24 March to 13 April**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students must maintain 75% attendance of the total lectures delivered , failing which they will be detained from appearing in the university exams.

Text book(s):

- A text book of Vibrations and waves by Modern Publishers.
- A text book of Vibrations and Waves by Vishal Publications.

Refrences:

1. Fundamentals of Vibrations and Waves by S.P. Puri.
2. Physics of Vibrations and Waves by H.J. Pain.

CURRICULUM PLANNING AND IMPLEMENTATION

Paper Name: Quantum Mechanics

Class: B.Sc.(Non Med And C.Sc.)

Semester: 4th

Name of the Teacher: Dr. Navneet Arora

Availability Timings: 9:00 AM to 3:00 PM

E-mail: mail4navneet@gmail.com

Objectives of the Courses:

1. Provide the student with a broad spectrum of physics courses.
2. Emphasize the role of physics in life and other discipline (chemistry ,mathematics and biology).
3. To cultivate skills at formulating and solving physics problems.
4. To develop familiarity with the physical concepts and mathematical methods of quantum mechanics.
5. Provide the student with different practical, intellectual and transferable skills.

Course Content:

Photoelectric effect, Compton effect, wave particle duality, uncertainity principle, normalization, superposition principle, Ehrenfest theorem, Eigen functions, operators, hermitian operator, equation of motion, problems in one and three dimensions, Schrodinger equation for a free particle, potential barrier, potential well, degeneracy, X-Ray spectra, Mosley law, absorption spectra, Auger effect, molecular binding, molecular spectra, selection rules, rotational and vibrational spectra, Raman spectra.

(Detailed Course Content: Available at www.gndu.ac.in)

What will be the teaching Methods:

- Lectures : Three per week
- Student Seminars
- Assignments: Assignments will given on numerical problems regarding articles.
- Powerpoint Presentations
- Participatory and Experiential Learning
- Discussion method

Learning Outcomes:

I. Knowledge and Understanding:

Students will:

- Know how to define a various branches of Quantum Physics (eg. high energy physics, high particle physics, Molecular Physics).
- Understand and explain the basic concepts associated with the quantum physics (eg. Uncertanity principle, Normalization, Operators)
- Students will understand and able to describe the difference between classical (old) and quantum (new) physics.

J. Intellectual (Cognitive/ Analytical) Skills:

Students will be able to:

- Think critically about the theories of physics.
- Think critically about the contribution of various scientists in the particle world.
- Identify the different process of how individual atoms interact with one another.
- Think critically about the wave particle duality nature.
- Learn about degenerate states of same energy level.
- Think critically about the use of physics in our daily life.

K. Practical Skills:

Students will learn to:

- Study the characterizations of Photovoltaic cell.
- Determine the value of planck's constant.
- To study the absorption and rotational spectra.
- To study the variation of light intensity with distance.

L. Tranferable skills:

Students will be able to:

- Use concepts of physics more effectively.
- Learn to think more creative as well as comparatively.
- project planning.
- Problem solving

Modes of Assesment	Minimum score required(to qualify for the next exam/class)	Schedule
Continuous Internal Evaluation (CIE)		
1.Class Test(Unit wise)	50%	After Each Unit
2.Student Seminar	50%	After completion of syllabus

Teaching outline:

Unit	Teaching dates
I	**11 January to 9 February**
II	**10 February to 2 March**
III	**3 March to 23 March**
IV	**24 March to 13 April**
Revision	**Till 25 April**

Attendance policy:

Lecture attendance is mandatory. Students must maintain 75% attendance of the total lectures delivered , failing which they will be detained from appearing in the university exams.

Text book(s):

- A text book of Quantum Mechanics by Modern Publishers.
- A text book of Quantum Mechanics by Dinesh Publications.

Refrences:

- A Text book of Quantum Mechanics, P.M. Mathews and K. Venkatesan, (Tata McGraw Hill Pub., Co., Delhi) 2002.
- Quantum Mechanics J.L. Powell and B. Craseman (Narosa Pub. House, New Delhi) 1997.
- Concepts of Modern Physics, Arthur Beiser (McGraw Hill Pub. Co., New Delhi, 9th Ed.) 1995.
- Elements of Modern Physics, S.H. Patil (McGraw Hill), 1998.
- Quantum Mechanics, E. Merzbacher (John Wiley, 2nd Edition)
- Fundamentals of Molecular Spectroscopy, C.N. Banwell (Tata McGraw Hill Pub. Co., Delhi), 2001.
- Atomic Spectra, H.G. Kuhn (Longmans), 2nd Ed., 1969.
  Introduction to Quantum Mechanics, L. Pauling and E.B. Wilson (Tata McGraw Hill Pub. Co., Delhi), 2002.