UNIVERSITY OF MUMBAI

Syllabus for Sem I & II
Program: B.Sc.
Course: Physics

(Credit Based Semester and Grading System for Academic year 2016-17)

TherevisedsyllabusinPhysicsasper creditbasedsystemfortheFirstYearB.Sc.Course willbeimplementedfromtheacademicyear**2016–2017.**

Preamble:

The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics.

Objectives:
- To develop analytical abilities towards real world problems
- To familiarize with current and recent scientific and technological developments
- To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course code	Title	Credits
	Semester I	
USPH101	Classical Physics	2
USPH102	Modern Physics	2
USPHP1	Practical I	2
		Total= 06
	Semester II	
USPH201	Mathematical Physics	2
USPH202	Electricity and Electronics	2
USPHP2	Practical II	2
		Total=06

Nameofthe Programme	Duration	Semester	Subject
B.Sc.inPhysics	Sixsemesters	I	Physics
CourseCode	Title	Credits	
USPH102	**Modern Physics**	2for USPH102	

Learning Outcomes:

After successful completion of this course students will be able to
1. Understand nuclear properties and nuclear behavior.
2. Understand the type isotopes and their applications.
3. Demonstrate and understand the quantum mechanical concepts.
4. Demonstrate quantitative problem solving skills in all the topics covered.

Unit I   15lectures

1. Structure of Nuclei:Basic properties of nuclei, Composition, Charge, Size, Rutherford's expt. for estimation of nuclear size, density of nucleus, Mass defect and Binding energy, Packing fraction, BE/A vs A plot, stability of nuclei (N Vs Z plot) and problems.
2. Radioactivity: Radioactive disintegration concept of natural and artificial radioactivity, Properties of α, β, γ-rays, laws of radioactive decay, half-life, mean life (derivation not required), units of radioactivity, successive disintegration and equilibriums, radioisotopes. Numerical Problems.
3. Carbon dating and other applications of radioactive isotopes (Agricultural, Medical, Industrial, Archaeological -information from net).

Unit II   15 lectures

Interaction between particles and matter, Ionization chamber, Proportional counter and GM counter, problems
Nuclear Reactions: Types of Reactions and Conservation Laws. Concept of Compound and Direct Reaction, Q value equation and solution of the Q equation, problems.
Fusion and fission definitions and qualitative discussion with examples.

Unit III   **15 lectures**

1. Origin of Quantum theory, Black body (definition), Black Body spectrum, Wien's displacement law, Matter waves, wave particle duality, Heisenberg's uncertainty Principle. Davisson-Germer experiment, G. P. Thompson experiment.
2. X-Rays production and properties. Continuous and characteristic X-Ray spectra, X-Ray Diffraction, Bragg's Law, Applications of X-Rays.
3. Compton Effect, Pair production, Photons and Gravity, Gravitational Red Shift.

Note: Agoodnumberofnumericalexamplesareexpectedtobecoveredduringthe prescribed lectures

References:

1. Kaplan: Nuclear Physics, Irving Kaplan, 2nd Ed. Narosa Publishing House
2. SBP: Dr. S. B. Patel, Nuclear Physics Reprint 2009, New Age International
3.BSS: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
4. Arthur Beiser, Perspectives ofModernPhysics : Tata McGraw Hill

Additional References:

1   S N Ghosal, Atomic Physics   S Chand
2   S N Ghosal, Nuclear Physics 2nd ed. S Chand

Nameofthe Programme	Duration	Semester	Subject
B.Sc.inPhysics	Sixsemesters	II	Physics
CourseCode	Title	Credits	
USPH202	**Electricity and Electronics**	2for USPH202	

Unit I :   **15 lectures**
  1. Alternating current theory:(Concept of L, R, and C: Review)
AC circuit containing pure R, pure L and pure C, representation of sinusoids by complex numbers, Series L-R, C-R and LCR circuits. Resonance in LCR circuit (both series and parallel), Power in ac circuit. Q-factor.
  2. AC bridges: AC-bridges: General AC bridge, Maxwell,de-Sauty, Wien Bridge , Hay Bridge.

Unit II: Electronics   **15 lectures**
1.Circuit theorems: (Review: ohm's law, Kirchhoff's laws)
Superposition Theorem, Thevenin's Theorem, Ideal Current Sources, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem.
Numericals related to circuit analysis using the above theorems.
2.DC power supply:Half wave rectifier , Full wave rectifier, Bridge rectifier, PIV and Ripple factor of full wave rectifier, Clipper and Clampers(Basic circuits only), Capacitor Filter.
Zener diode as voltage stabilizer.
3.Digital electronics : Logic gates(Review), NAND and NOR as universal building blocks. EXOR gate: logic expression, logic symbol, truth table, Implementation using basic gates and its applications, Boolean algebra, Boolean theorems. De-Morgan theorems, Half adder and Full adder

Unit III : Electrostatics and Magnetostatics   **15 lectures**
1.The Electric Field : Introduction, Coulomb's Law, The Electric Field, Continuous charge Distribution, Electric Potential, Introduction to Potential, Comments on Potential, The Potential of a Localized Charge Distribution
2.Work and Energy in Electrostatics**:** The Work Done to Move a charge, The Energy of a Point Charge Distribution
3.Magnetostatics**:** Magnetic Fields
4.TheBiotSavart Law**:** Steady Currents,The Magnetic Field of a Steady Current

Helmholtz coil and solenoid.

Note: Agoodnumberofnumericalexamplesareexpectedtobecoveredduringthe   prescribed lectures

References :

CR: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book agency.

TT :B.L. Theraja and A.K. Theraja , A Textbook of Electrical Technology Vol. I , S. Chand Publication

BN :Boylestad and Nashelsky, Electronic devices and Circuit Theory: 7th edition, Prentice Hall of India.

VKM: V K Mehta and R Mehta Electronics Principals, MulticolouredRevised 11th Ed. reprint in 2012 ,S Chand.

David J. Griffiths : Introduction to Electrodynamics, Prentice Hall India (EEE) 3rd Ed.

A B Bhattacharya, Electronics Principlesand Applications, Central publisher.

A P Malvino, Digital Principles and Applications: Tata McGraw Hill

Tokhiem, Digital electronics, 4thed, McGraw Hill International Edition.