

# SAURASHTRA UNIVERSITY



Accredited by NAAC With 'A' Grade  
[3<sup>rd</sup> Cycle]

Faculty of Science  
Syllabus  
for  
B.Sc. / M.Sc. (Applied Physics) Integrated  
Semester – IV  
**Revised syllabus**  
**Effective From**

June 2020 onwards

Under  
Department of Nano science  
&  
Advanced Materials

Saurashtra University,  
University Road, University Campus  
Rajkot- 360005  
Gujarat, India

**SEMESTER IV: PAPER XIII - MODERN COMPUTATIONAL TECHNIQUES AND  
PROGRAMMING ( Revised)**

**Unit I : Introduction to numerical computing and Computing Concepts :** Numeric data, Analog computing, digital computing, process of numerical computing, characteristics of numerical computing, computational environment, new trends in numerical computing, mathematical background, Introduction to computers and computing concepts: Evolution of numerical computing and computers, types of computers, computing concepts, Computer organization, Software and programming languages, interactive computing, algorithms, flow charts, structuring the logic.

Page Nos 1- 39

**Unit II :Computer Codes and Arithmetic :** Introduction, Decimal system, Binary system, Hexadecimal system , Octal system, Conversion of Numbers, Representation of Numbers, Computer Arithmetic, Errors in Arithmetic, Laws of Arithmetic.

Page Nos 40-60

**Unit III :Roots of non-linear Equations I -** Introduction, methods of solution, iterative methods , starting and stopping an Iterative process, evaluation of polynomials, bisection method, false position method, Newton-Raphson method.

Page Nos 121-151

**Unit IV :Roots of non-linear Equations II -** Secant method, fixed point method, determining all possible roots, systems of nonlinear equations, roots of polynomials, multiple roots by Newton's method, complex roots by Bairstow method, Muller's method

Page Nos 151-205

**Text Book : Numerical methods By E. Balagurusamy ( TMH pub)**

## **SEMESTER IV: PAPER XIV APPLIED NUCLEAR PHYSICS (Revised)**

### **Unit I: Particle Detectors and Particle accelerators**

Ionization chamber, Geiger Counter, Scintillation counter, Semiconductor junction detector, Cloud Chamber, Bubble chamber, other detectors, Van-de-graph generator, Cyclotron, Synchrocyclotron, Synchrotron, linear Accelerator

Books: Page Nos: 382-393

Modern Physics By G. Aruldas, P. Rajagopal, PHI, New Delhi

Books: Page Nos: 415-445

Modern Physics By Murugesan, S. Chand Publications

### **Unit II: Elementary Particles**

Leptons, Hadrons, Quarks, Color, Flavor, Field Bosons, The Standard Model, Conservation laws

Books: Page Nos : 531, 535, 541, 545, 546, 548, 550

Concepts of Modern Physics By A. Beiser, S. Mahajan, S. R. Chaudhary

McGraw Hill Publications

Books: Page Nos : 1415-1422

Modern Physics By S.L. Kakani and SubhraKakani, Viva Books Pvt. Ltd.

### **Unit III: Applications of Nuclear Energy**

Mossbauer Spectroscopy, Positron Emission Tomography, Magnetic Resonance Imaging(MRI), Gamma Knife, Environmental Impact

Books: Page Nos : 416-422, 425-427

Basics of Nuclear Physics By Hari Agrawal, PHI Pvt. Ltd.

Page Nos : 788-808 Introduction to Nuclear Physics By Kenneth S.Krane Wiley Pub.

### **Unit IV: Cosmology**

The Big Bang, Dark Matter and Dark energy, Elementary Particles and their applications, Van Allen belt, Evolution of Stars, Cosmic rays

Books: Page Nos: 563-573

Concepts of Modern Physics By A. Beiser, S. Mahajan, S. R. Chaudhary

McGraw Hill Publications

Books: Page Nos: 420-424

Modern Physics By G. Aruldas, P. Rajagopal, PHI, New Delhi

## SEMESTER IV: PAPER XV FUNDAMENTALS OF MATERIALS SCIENCE

(Revised)

**Unit I:** Introduction to Materials World, Classification of Materials, Advanced Materials, Levels of Structure, Atomic Structure and Chemical Bonding, Equilibrium & Kinetics: Stability and Metastability, Basic Thermodynamic Functions

Books: Page Nos 01-14 & 53-76 : Materials Science & Engineering: A First Course (V<sup>th</sup> Edition)

By V. Raghavan (Eastern Economy Edition, PHI Publication)

Page Nos 01-33 : Callister's Materials Science & Engineering

By Balasubramanian (Wiley India Publication)

**Unit II:** Phase Diagrams: Solubility Limit, Phases, Phase Equilibria, Phase Rule, Single Component Systems, Binary Phase Diagrams, Interpretation of Phase Diagrams, Microstructural Changes in Isomorphous Alloys, Lever Rule, Binary Eutectic System

Books: Page Nos 148-163 : Materials Science & Engineering : A First Course (V<sup>th</sup> Edition)

By V. Raghavan (Eastern Economy Edition, PHI Publication)

Page Nos 170-193 : Callister's Materials Science & Engineering

By R. Balasubramanian (Wiley India Publication)

**Unit III:** Phase Transformations in Solids - Basic Concepts, Time Scale for Phase Changes, Nucleation and Growth, Homogeneous & Heterogeneous Nucleation, Transformation in Steel, Precipitation Process, Solidification & Crystallization, The Glass transition, Recovery, Recrystallization & Grain Growth.

Books: Page Nos 201-232 : Materials Science & Engineering : A First Course (V<sup>th</sup> Edition)

By V. Raghavan (Eastern Economy Edition, PHI Publication)

Page Nos 229-240 : Callister's Materials Science & Engineering

366-378 By R. Balasubramanian (Wiley India Publication)

**Unit IV:** Ceramic Materials: Types, Properties and Applications of Ceramics, Clay Products, Refractories, Abrasives, Cements, Advanced Ceramics, Glass Ceramics: Types, Properties & Applications, Heat Treatment of Glasses & Glass Ceramics

Books: Page Nos 431-460 : Callister's Materials Science & Engineering

By R. Balasubramanian (Wiley India Publication)

## **SEMESTER IV: PAPER XVI ELECTRODYNAMICS & PLASMA PHYSICS (Revised)**

**Unit I:** Coulomb's law and field intensity, Field due to continuous charge distributions, electric flux density, Gauss's Law- Maxwell's Equation, Electrical Potential, Relationship between E and V – Maxwell's Equation, Concepts of An electric dipole and energy density in electrostatic fields Convention and Conduction currents, conductors, polarization in dielectrics, dielectric constant and strength, continuity equation, Boundary Conditions Poisson's and Laplace's equations

Book Page nos. 104-146 : Elements of Electromagnetics by Matthew N. O. Sadiku  
Page nos. 162-182: Oxford University Press

**Unit II:** Biot Savart's law, Ampere's circuit law, Magnetic Flux density, Maxwell's equations for static EM fields ,Concept of Magnetization in materials, magnetic boundary conditions, Magnetic Energy, Maxwell's Equations: Faraday's law, Transformer and Motional EMF's, Displacement current, Maxwell's Equation in Final Forms , Power and the pointing vector, Concept of Reflection of a plane wave at Normal and oblique incidence

Book Page nos. 263-283 : Elements of Electromagnetics by Matthew N. O. Sadiku  
Page nos. 323,330,339 Oxford University Press  
Page nos. 369-384,435-451

Unit I & II REFERENCE BOOKS :

1. Introduction to Electrodynamics by David J. Griffiths, PHI publication
2. Engineering Electromagnetics by William H. Hyat, TMH Publication
3. Electromagnetics with applications by Kraus/Flesich, McGraw Hill publication

**Unit III:** Definition of PLASMA, Occurrence of PLASMA, concept of Temperature, Production of PLASMA, Debye Shielding, PLASMA parameters, Criteria for PLASMA, Properties of PLASMA, Applications of PLASMA

Books: Page Nos 1-17 : Introduction to Plasma Physics & Controlled Thermonuclear Fusion  
By F.F.Chen Plenum Press (N.Y.)  
Page Nos 26-40 : Textbook of Plasma Physic By Suresh Chandra CBS Publishers  
Page Nos 474-493 : Fundamentals of Solid State Physics  
BY Saxena, Gupta, Saxena Pragati Publication, Meerut

**Unit IV:** Charge Particle Motion under - uniform B, nonuniform B, Curved B, grad B // B (magnetic mirror effect), Plasma as Fluid, Plasma waves/Oscillations in Plasma (Concept & Physical interpretation)

Books: Page Nos 19-38 : Introduction to Plasma Physics & Controlled Thermonuclear Fusion  
By F.F.Chen Plenum Press (N.Y.)  
Page Nos 60-84 : Textbook of Plasma Physics, By Suresh Chandra CBS Publishers