Bhavan's Sheth R. A. College of Science
B. Sc. (PHYSICS) Semester – III
Syllabus for Physics Theory

Paper	Unit	Topic	Name / Email
201	I	Solid State Physics	Prof. F. M. Dhruv navkar18@gmail.com
	II	Electronics	Prof. V. M. Vashisth vmvashisth@yahoo.co.in
	III	Modern Physics and elementary quantum mechanics	Prof. J. C. Kaku jckaku64@yahoo.co.in
	IV	Wave Optics	Prof. A. K. Shah atzeel@yahoo.com
202	I	Mathematical Physics	Prof. M. M. Jotani mmjotani@gmail.com
	II	Classical Mechanics	Prof. S. P. Seth seth2002@yahoo.co.on
	III	Nuclear Physics	Prof. P. M.Trivedi premurvi@yahoo.com
	IV	Dielectrics & Magnetostatics	Prof. D. N. Bhavasar div.bhavsar@gmail.com

PHY – 201 (4 Credit)

UNIT-I: Solid State Physics

A. The crystalline State: Crystalline, polycrystalline and glassy materials; Basis of crystal structure; Unit cell-Primitive cell structures; Symmetry operations- translation, point, hybrid operations; Classification of Crystal types-two dimensional crystal lattice and three dimensional crystal lattices; Indices of a lattice direction and a lattice plane (Miller indices); Crystal point groups and space groups, space groups, space groups; Common crystal structures, simple cubic structure, BCC, FCC, closed packed and hexagonal close-packed structure, diamond structure.

B. Reciprocal lattice and Crystal Diffraction : Reciprocal lattice; Bragg Law, Laue‟s interpretation of X-ray diffraction by crystals, Construction of reciprocal lattice, Relationship between a, b, c and a*, b*, c*, Experimental Diffraction Methods, Laue method, Rotating crystal method, powder method, Determination of lattice constants; Selection of incident beam.

Text book: Elements of Solid State Physics (2 Edition) by J. P. Srivastava, PHI Learning

For A - Chapter 1. Art No. 1.1 to 1.7

For B - Chapter 3. Art. No 3.1, 3.2, 3.3, 3.4, 3.5, 3.8.2, 3.9, 3.10
Reference Books:
1. Solid State Physics (6th Edition) by S.O. Pillai, New Age International Publishers
2. Solid State Physics (4th Edition) by S.L Kakani & C. Hemrajani, Sultan Chand & Sons
3. Introduction to Solid State Physics (7th Edition) by C. Kittle, Wiley (India)

UNIT-II:
Electronics

Basic characteristics of the Transistor: Basic Transistor amplifier, Two diode analogy for a transistor, Transistor input characteristics, Transistor collector characteristics, collector cut off current $I_{CEO,}$ Forward current transfer ratio CE , Permissible operating area of a transistor CE, The basic common base amplifier, CB, Forward current transfer ratio CB, relation between and β, collector cut off current $I_{CBO,}$ physical explanation of CB and CE amplifying action, reduction of CE leakage current to ICO, common collector amplifier, identifying the transistor leads

The common emitter amplifier: Graphical analysis of CE class A amplifier, input and output resistance, effect of adding a class A amplifier, conversion efficiency of class A amplifier with a direct coupled resistive load, phase relationship in CE amplifier, input waveform consideration, comparison of basic transistor amplifier

Solid state electronics Devices: Zener diode, Zener diode specification, the voltage regulator circuit, design of a voltage regulator circuit, effect of supply voltage variation, Zener break down mechanism, the tunnel diode, application of tunnel diode ,Introduction of silicon controlled rectifier and Uni junction transistor

Text Book: **Electronics Devices and Circuits By Allen Mottershed, PHI**

Article no, 9.1 to 9.15, 9.18, 11.1 to 11.6, 11.9, 6.1 to 6.6, 6.11, 6.12, 28.1, 28.5

Reference Book: Electronic Principles (7 th Edition) by Albert Malvino & David J. Bates, TMcGHill Pub. Electronic Devices and Circuits by Sanjeev Gupta, Dhanpatrai & Sons

UNIT- III: Modern Physics and Elementary Quantum mechanics

A. Historical origins of quantum theory, Difficulties with Classical: models, optical spectra Black body radiation, Frank- Hertz experiment, Stationary states of atoms. The correspondence principle, Bohr atom, Spectroscopic series, Quantization of the orbits. The Elliptic Orbits, Particle in a box, rigid rotator, Harmonic oscillator, Compton effect, particle diffraction, Wave packets and Einstein De Broglie relation

Text book: Quantum Mechanics by Powel and Crasemann, Addison and Wesley

Articles Nos.: 1.1, 1.2, 1.3, 1.5, 1.7 to 1.10, 1.12 to 1.16, 2.1, 2.2, 2.7

Concept of Modern Physics, Arthur Beiser, TMH Edition

B. The Schrodinger equation and stationary states, a free particle in one dimension, Generalization to three dimensions, Operator correspondence And the Schrodinger equation for a particle subjected to force, Physical Interpretation of wave function, Normalization, Non normalizable wave functions and box normalization, conservation of probability.

Text book: A textbook of Quantum Mechanics, P.M. Mathews, K. Vankatesan

Article Nos. : 2.1 to 2.6

Reference books: 1. Concept of Modern Physics by Arthur Beiser, Tata McGraw Hill Edition 2. Principles of Modern Physics by A.K. Saxena, Narosa Publishing House 3. Modern Physics by Kenneth Krane, Jon Wiley & Sons

UNIT – IV: Wave Optics

A. Diffraction of Light (Fresnel class): Frensnel‟s half period zones, zone plate, difference between interference & diffraction,

B. Fraunhofer class: Fraunhofer diffraction at two slits, diffraction at N slits, Plane diffraction grating, Dispersive power of grating, Grating at oblique incidence.

C. Resolving power of optical Instrument: Resolving power, Rayleigh‟s criterion of resolution, resolving power of telescope, relation between magnifying power & the resolving power of telescope, Resolving power of a plane diffraction grating, difference between resolving power & dispersive power of grating, comparison of prism & grating spectra.

Text Book: Optics & atomic physics by Singh, Agrawal (Pragati Prakashan, Meerat)
For A - Chapter 7. Article Nos. : 7.3 and 7.5
For B - Chapter 8. Article Nos. : 8.6 to 8.8, 8.15,8.16
For C - Chapter 9. Article Nos. : 9.1 to 9.4, 9.8 to 9.10
Reference Books: 1**.** Optics by Ajay Ghatak, Tata McGraw Hill Ltd.
2. A Textbook of Optics by N. Subrahmanyam & Brij Lal (S. Chand & Company Ltd.)

PHYSICS : PHY – 202 (4 Credit)

UNIT - I: Mathematical Physics

Fourier series: Introduction, Simple Harmonic motion & wave motion – Periodic functions, Applications of fourier series, Average value of a function, Fourier co-efficients, Dirchlet conditions, complex form of fourier series, other intervals, Even & odd functions, Parsevel‟s theorem, Applications/Numericals on Fourier series.

Text book: Mathematical Methods in Physical Sciences by Mary L. Boas (John Willey & Sons) Article Nos. : 7.1 to 7.8. 7.11

Reference Book: 1. Mathematical Physics by H.K. Das, S. Chand Publishing Co. 2. Mathematical Physics by Satya Prakash, Pragati Prakashan

UNIT – II: Classical Mechanics

Motion in a Central force field: General features of the motion, Motion in an inverse square law force field, Equation of the orbit, Kepler‟s laws of planetary motion

Collision of particles : Elastic & inelastic scattering, Elastic Scattering : Laboratory & Centre of mass system, Kinematics of elastic scattering in the laboratory system, inelastic scattering, cross-section, The Rutherford formula

Text Book: Classical mechanics by R.G. Takewale & P.S. Puranik, Tata McGraw Hill

Article Nos. : 5.2 to 5.6, 7.1 to 7.6

UNIT – III: Nuclear Physics

A. Physical tools: Introduction, Interaction between particles & Matter, brief survey, Detectors for Nuclear particles (i) Proportional counter (ii) The Geiger counter (iii) Scintillation counter (iv) Solid state or semi-conductor detectors (v) Cloud & Bubble chambers (vi) Spark chamber; Particle Accelerators : Need for an accelerator of charged particles, (i) Van de Graff Generator (ii) The cyclotron (iii) Synchrotron (iv) The Betatron; Beta ray spectrometer.
Text book: Nuclear physics, An introduction by S. B. Patel, New Age International (P) Ltd.
For A - Chapter 1: Article Nos.: 1.1.1 to 1.1.5
Reference Book: 1. Nuclear Physics by D.C. Tayal, Himalaya Publishing House

UNIT – IV: Dielectrics & Magnetostatics
A. Electrostatics in dielectrics: Polarization, Laws of electrostatics field in presence of dielectrics, Energy of the field in the presence of a dielectric, Boundary conditions, Gaseous non polar dielectrics, Gaseous polar dielectrics, Non- polar liquids,
B. Magnetostatics: Magnetic effects, The magnetic field, force on a current, Biot Savart law, The laws of magnetostatics, the magnetic potentials, Magnetic dipole in non-uniform magnetic field, Magnetic vector potential due to a small current loop, Magnetic media, Magnetisation, Magnetic field vector, Magnetic susceptibility & permeability, Boundary conditions, Uniformly magnetized sphere in external magnetic field, A comparison of static electric & magnetic fields
Text Book: Electromagnetics by B. B. Laud, Willey Eastern Limited
For A - Chapter 2: Article Nos. : 2.7 to 2.13
For B - Chapter 4: Article Nos. : 4.1 to 4.9, 4.11 to 4.20
Reference books: 1. Introduction to Electrodynamics by D. J. Griffith (3 edition), rd PHI learning
2. Electromagnetic Theory & Electrodynamics by Satya Prakash, Kedar Nath Ram Nath, Meerut

Bhavan's Sheth R. A. College of Science
B. Sc. (PHYSICS) Semester – V
Syllabus for Physics Theory

Paper	Unit	Topic	Name / Email
301	I	Mathematical Physics	Prof. F. M. Dhruv navkar18@gmail.com
	II	Mathematical Physics	
	III	Classical Physics	Prof. P. M.Trivedi premurvi@yahoo.com
	IV	Quantum Mechanics	Prof. J. C. Kaku jckaku64@yahoo.co.in
302	I	Molecular Spectra	Prof. S. P. Seth seth2002@yahoo.co.on
	II	Molecular Spectra	
	III	Statistical Mechanics	Prof. D. N. Bhavasar div.bhavsar@gmail.com
	IV	Solid State Physics	Prof. S. P. Seth seth2002@yahoo.co.on
303	I	Electromagnetism	Prof. J. C. Kaku jckaku64@yahoo.co.in
	II	Electromagnetism	
	III	Nuclear Physics	Prof. T. N. Shah tejal.shah999@gmail.com
	IV	Nuclear Physics	Prof. A. K. Shah atzeel@yahoo.com
304	I	Electronics	Prof. V. M. Vashisth vmvashisth@yahoo.co.in
	II	Electronics	
	III	Electronics	
	IV	Electronics	
305	I	Introduction to Nanomaterials	Prof. M. M. Jotani mmjotani@gmail.com
	II	Methods of Synthesis of Nanomaterials	
	III	Analytical (Characterization)	

		Technique	

PHY – 301: MATHEMATICAL PHYSICS, CLASSICAL MECHANICS & QUANTUM MECHANICS (4 Credit: 4 hrs/week)

Unit – I: Differential equations: Some partial differential equations in physics, the method of Separation of variables, separation of Helmholtz equation in Cartesian coordinates, in spherical polar and cylindrical Coordinates, Laplace's equation in various coordinates, Choice of coordinate system and separability of a partial differential equation, Parabolic coordinates system, Prolate Spheroidal coordinates system, various examples based on the separation of variables.

Unit – II: 2nd order differential equations: Ordinary and Singular points, Series solution around an ordinary point, Series solution around a regular singular point: the method of Frobenius, Getting a second solution, Alternative method of getting the second solution, System of linear first order differential equations, Non-linear differential equations, related examples.

Text Book: Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
Article Nos.: Chapter 2: 2.1, 2.2 (A – E), 2.3, A.3 (3, 4) Chapter 3: 3.1 to 3.7 including examples.
Reference Book: 1. Mathematical Methods for Physicists by G. Arfken, Academic Press
2. Mathematical Methods in the Physical Sciences by Mary L. Boas, Wiley India Pvt. Ltd.

Unit – III: Classical Mechanics: Lagrangian Formulation: Introduction, Constraints, holonomic and non-holonomic constraints, scleronomous and rheonomous constraints, generalized coordinates, D'alembert's principle, Lagrange's equations, a general expression for kinetic energy, Symmetries and the laws of conservation, Cyclic or ignorable coordinates (including illustrations), Velocity dependent potential of electromagnetic field, Rayleigh's dissipation function.
Moving Co-ordinate System: Rotating co-ordinate system, The Coriolis force, Motion on the earth, Effect of Coriolis force on freely falling particles.

Text Book: Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
Article Nos.: Chapter 8: 8.1 to 8.9; Chapter 9: 9.2 to 9.5;
Reference Book: 1. Classical Mechanics by A. B. Bhatia, Narosa Publication.
2. Classical Mechanics by H. Goldstein, Addison Wesley.
3. Classical Mechanics by J. C. Upadhyaya, Himalaya publications

Unit – IV: Quantum Mechanics: Exactly soluble Eigenvalue problems General Formalism of wave mechanics:
The uncertainty principle, states with minimum value for uncertainty product, Commuting observables, Removal of Degeneracy, Evolution of system with time, constants of the motion, Non- interacting & interacting systems, systems of identical particles.
Introduction, the simple harmonic oscillator, the Schrödinger equation and energy eigenvalues, the energy eigenfunctions, properties of stationary states, the abstract operator method, the angular momentum operators, the eigenvalue equation for L^2, separation of variables, admissibility conditions on solutions, eigenvalues, the eigenfunctions, Spherical harmonics, Physical interpretation, Parity.

Text Book: A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
Article Nos.: Chapter 3: 3.11 to 3.16, Chapter 4: 4.1 to 4.4, 4.6 to 4.11
Reference Book: 1. Quantum Mechanics: Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited.
2. Quantum Mechanics by F. Schwabl, Narosa Publishing House
3. Quantum Mechanics by G. Aruldhas, PHI

PHY – 302: MOLECULAR SPECTRA, STATISTICAL MECHANICS & SOLID STATE PHYSICS (4 Credit: 4 hrs/week)

Unit – I: Types of Molecular Spectra and Molecular Energy States: Separation of electronic and nuclear motion - The Born Oppenheimer approximation, types of molecular spectra. Pure Rotational Spectra: Salient features of Rotational spectra, Molecular requirement for rotation spectra, experimental arrangement, Molecule as a rigid rotator, explanation of rotational spectra (without the process of solving Schrodinger equation to get energy formula), the non-rigid rotator, Isotope effect on rotational spectrum, tunable laser and pulse laser - introduction Vibrational - Rotational Spectra: salient features of vibrational - Rotational spectra, Molecule as a harmonic oscillator, Molecule as anharmonic oscillator, Vibrational frequency and force constant for anharmonic oscillator, Fine structure of Infrared bands: Molecule as vibrating rotator, Diatomic molecule as symmetric top, Thermal distribution of vibrational and rotational levels.
Unit – II: Raman Spectra: Nature of the Raman spectra, experimental arrangement for Raman spectra, Classical theory of Raman effect, Quantum theory of Raman effect, Raman spectra and Molecular structure, Infrared spectra versus Raman spectra, Laser as intense source. Classification of Molecular Electronic States: Molecular electronic states, Symmetry properties of electronic eigenfunctions (symmetry classification of electronic states) Fluorescence and Phosphorescence: Luminescence, Mechanism of fluorescent emission, Mechanism of phosphorescent emission, Fluorescence spectrum compared with Raman spectrum.

Text Book: Atomic and Molecular Spectra: Laser by Rajkumar, Kedar Nath & Ram Nath
Article Nos: Chapter 17: 1, 2, Chapter 18: 1 – 6, Chapter 19: 1 – 4, 6 – 8, Chapter 20: 1 – 6, Chapter 23: 1 – 4, Chapter 24: 1,2

Unit – III: Formulation of Quantum Statistics: Density matrix, Liovilles theorem in Quantum Statistical Mechanics, Condition for Statistical equilibrium, Ensemble in Quantum Mechanics, Problems Bose Einstein and Fermi Dirac Distributions: Symmetry of wave functions, the Quantum Distribution functions, the Boltzmann limit of Boson and Fermions Gases, Evaluation of the Partition function, Partition function for Diatomic Molecules (a) translation partition function (b) rotational partition function (c) vibration partition function (d)electronic partition function Equation of state for an Ideal gas, The quantum mechanical Para magnetic susceptibility, problems

Text Book: Fundamentals of Statistical Mechanics by B. B. Laud, New Age International Publishers
Article Nos.: 7.1 – 7.4, 8.1 – 8.7 Reference Book: 1. Statistical Mechanics - Theory and Application by S K Sinha, TMH Publishing Company Limited New Delhi: 2. Statistical Mechanics - An introduction by Evelyn Guha, Narosa publication. 3. Statistical Mechanics by R.K. Patharia, Pergamon Press 4. Statistical Mechanics by B.K. Agarwal & Melvin Eisner, Wiley Eastern

Unit – IV: Solid State Physics Elastic constants and elastic waves: Analysis of elastic strains, Dilation, stress components, Elastic compliance and stiffness constants, Elastic energy density, elastic stiffness constants of cubic crystals, Bulk modulus and compressibility. Elastic waves in cubic crystals, waves in the [100] direction, waves in the [110] direction and waves in the [111] direction. Free electron Fermi gas: Introduction, Energy levels in one dimension, Effect of temperature on the Fermi-Dirac distribution, Free electron gas in three dimensions and density of states, Heat capacity of the electron gas and experimental heat capacity of metals, Electrical conductivity and ohm's law, Experimental electrical resistivity of metals, Thermal conductivity of metals, ratio of thermal to electrical conductivity.

Text Book: Introduction to Solid State Physics by C. Kittel, (Eight Edition) John Wiley and Sons.
Article Nos.: Chapters 3 & 6
Reference book: Elements of Solid State Physics by J. P. Srivastava, Prentice-Hall of India Private Limited, New Delhi

PHY- 303: ELECTROMAGNETISM AND NUCLEAR PHYSICS (4 Credit: 4 hrs/week)

Unit – I: Electromagnetic induction: Hysteresis, Maxwell's equations, Decay of free charge, Potentials of electromagnetic fields, More about the Lorentz gauge condition, Field energy and Field momentum.
Electromagnetic waves: Plane waves in non-conducting media, Polarizations, Energy flux in a plane wave, Radiation pressure and Momentum, Plane waves in conducting medium, Skin effect.

Unit – II: Electromagnetic Radiation: Retarded Potential, Radiation from an oscillating dipole, Linear Antenna, Lienard-Wiechert Potentials, Potentials for a charge in uniform motion – Lorentz formula, Fields of an accelerated charge, Radiation from an acceleration charged particle at low velocity, Radiation when the velocity and acceleration of the particles are collinear, Radiation from a charged particle moving in a circular orbit, Elective quadrupole radiation.

Text Book: Electromagnetics by B. B. Laud, 2nd Edition, Wiley Eastern
Ltd. Article Nos.: 5.7 - 5.12, 6.1 - 6.6 Article Nos.: 9.1 – 9.10

Unit – III: Alpha and Beta Rays:

Alpha Rays: Range of alpha particles, Disintegration energy of the spontaneous alpha decay, Alpha decay paradox - barrier penetration.
Beta Rays: Introduction, Continuous Beta ray spectrum - difficulties encountered to understand it, Pauli's Neutrino Hypothesis, Fermi's theory of Beta decay, the detection of neutrino, Parity non-conservation in Beta decay.

Unit – IV: Gamma Rays and The liquid drop model of the nucleus: Gamma Rays: Introduction,
Gamma-ray emission – selection rules, Internal conversion, Nuclear isomerism.

The liquid drop model of the nucleus: Introduction, Binding energies of nuclei: plot of B/A against A., Weizsacher's semi empirical mass formula Mass parabolas: prediction of stability against Beta decay for members of an isobaric family, Stability limits against spontaneous fission, Barrier penetration - decay probabilities for spontaneous fission, Nucleon emission.

Text Book: Nuclear Physics - An Introduction by S.B. Patel, New Age International. Article Nos.: 4 – II - 1 to 4 – II - 3, 4 – III - 1 to 4 – III - 6, 4 – IV - 1 to 4 – IV - 4, 5.1 to 5.7
Reference books:
1. Introduction to Nuclear Physics by H.Enge, Addison Wesley
2. Nuclear Physics by D. C. Tayal, Himalaya Publisher
3. Nuclear Physics by Irvin Kaplan 4. Modern Physics by Kenneth Krane, John Wiley and sons.

PHY – 304: LINEAR & NON-LINEAR ELECTRONICS CIRCUITS (4 Credit: 4 hrs/week)

UNIT – I: General amplifier characteristics: Introduction, concept of amplification, amplifier notations, current gain, voltage gain, power gain, amplifier input resistance, amplifier output resistance, maximum power transfer, conversion efficiency, classes of amplifier operation, harmonic distortion, three point method of calculating harmonic distortion, five point method of calculating harmonic distortion, oscilloscope display of an amplifier dynamic transfer curve, measurement of harmonic distortion, other types of amplifier distortion, decibels, other equations for decibel computation, zero dB reference level, use of voltmeter as dB indicator, voltmeter range correction factor, impedance correction factor, frequency response curves, amplifier bandwidth, phase relationship in amplifier square wave testing.

Text Book: Electronic Devices and circuits – An Introduction by Allen Mottershead, Printice-Hall of India Private Limited Article Nos. 7.1 - 7.16, 8.1 - 8.8, 8.10, 8.11

UNIT – II: Frequency response of a transistor amplifier:
Low frequency response of a transistor amplifier: Effect of an emitter by pass capacitor on low frequency response, effect of coupling capacitor on low frequency response, cascading of CE stages, mid frequency gains, low frequency response of cascaded stages amplifier, low frequency response to a square wave, transformer coupled transistor amplifier, low frequency response of TC amplifier, step response of a TC amplifier.

High frequency response of a transistor amplifier: High frequency model for a CE amplifier, approximate CE high frequency model with a resistive load, CE short circuit current gain, high frequency current gain with a resistive load, high frequency response of cascaded CE stages, amplifier high frequency response to a square wave high frequency response of a transformer coupled amplifier.

Text Book: Electronic Devices and circuits – An Introduction by Allen Mottershead, Printice-Hall of India Private Limited Article Nos.: 15.1 – 15.8, 16.1 – 16.7

UNIT – III: Circuit analysis, design and Flip-Flop: Circuit analysis and design: Boolean laws and theorems, sum of products method, truth table to Karnaugh map, pairs, quads and octets, Karnaugh simplification, don't care conditions, product of sums method, product of sums simplification, Exclusive OR gate.

FLIP- FLOP: RS flip flop, clocked RS flip flop, D flip flop, Edged triggered D flip flop, JK flip flop, JK master slave flip flop Book recommended: Digital Principles and Applications by Malvino and Leach Article Nos.: 2.1 - 2.8, 3.7

UNIT – IV: Network Transformations: Reduction of complicated network, conversion between T and π sections, bridge T network, the lattice network, superposition theorem, the reciprocity theorem, thevenin's theorem, Norton theorem, maximum power transfer theorem, compensation theorem.

Resonance: Definition of Q, the figure of merit, series resonance, Bandwidth of the series resonant circuit, parallel resonance or antiresonance, current in antiresonant circuits, Bandwidth of antiresonant circuits.

Text Book: Network Lines and Field by J D Ryder. (1.4 to 1.13, 2.1 to 2.4, 2.6, 2.8)

Reference Books: 1. Network Analysis by M. S. Van Valkenburg,

2. Network Analysis by G K Mithal

PHY – 305: SEC_A: NANOSCIENCE AND NANOTECHNOLOGY (2 Credit: 3 hrs/week)

Unit – I: Introduction to Nanomaterials:

Introduction to nano-sized materials and structures, Definitions of nanomaterials, Brief history of Nanomaterials and challenges in Nanotechnology, Properties of Nanomaterials: Effect of reduction of dimensions, quantum size effects, Mechanical, Thermal, Optical and Magnetic properties of nanomaterials

Unit – II: Methods of Synthesis of Nanomaterials:

Bottom-up and Top-down approaches - Mechanical method: High Energy Ball Milling, Methods based on evaporation (Physical Vapour Deposition), Chemical Vapour Deposition, Chemical Methods: Colloidal Method and Sol-gel Method

Special Nanomaterials:

Carbon Nanotubes (CNT), Types –Single walled, multiwalled CNT, Structures and properties of CNTs, Synthesis of carbon nanotubes

Unit – III: Analytical (Characterization) Technique:

Microscopes: Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), X-ray diffraction

Applications: Electronics, Biotechnology and Medical, Automobiles, Space, Defense, Sports, Cosmetics, Cloth Industry.

Text Book: Nanotechnology: Principles and Practices by Sulbha K Kulkarni, Capital Publishing Co. New Delhi.

Reference:

1. Introduction to Nanotechnology, C.P. Poole Jr. and F.J. Ownes, Wiley Publication.
2. Nanoscience and Technology eds. R. W. Kelsall, I.W. Hemley & M. Geoghehan, John Wiley and sons
3. Introduction to Nanoscience and nanotechnology by K.K. Chattopadhyay and A.N. Banerjee, PHI Learning Pvt. Ltd. 2012
4. Origin and Development of Nanotechnology, P. K. Sharma, Vista International Publishing House