



C. U. SHAH UNIVERSITY



**C. U. SHAH UNIVERSITY
WADHWAN CITY
FACULTY OF SCIENCE**

B.Sc. (PHYSICS)

SEM –V

**Syllabi (CBCS) of
Physics
WEF June 2015**



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Introduction to Mathematical Physics and Classical Mechanics

SUBJECT CODE: 4SC05MCC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-The general purpose of this course is

- To expose the student knowledge of Mathematical Physics.
- To expose the student knowledge of Classical Mechanics.

Prerequisites:-Fundamental knowledge of Mathematical Physics and Classical Mechanics.

Course outline:-

Sr. No.	Course Contents
1	Matrices & Curvilinear Co-ordinate System Matrices Basic concept of matrix and Matrix operations, Linear and orthogonal transformations, Eigen values, Eigen vectors and diagonalizing matrices Curvilinear Coordinate System Introduction to vector calculus and co-ordinate systems, Orthogonal curvilinear co-ordinates, Condition for orthogonality, Reciprocal sets of two triads of mutually orthogonal vectors, Gradient in terms of orthogonal curvilinear co-ordinates, Divergence in terms of orthogonal curvilinear co-ordinates, Curl in terms of curvilinear coordinates, Laplacian in terms of curvilinear co-ordinates, Equivalent expression for gradient, div and curl in rectangular co-ordinates, Cylindrical co-ordinates as a special curvilinear system, Spherical co-ordinates as a special curvilinear system, Related Numericals.
2	Fourier Series Definition and derivation of the coefficients of Fourier Series, Cosine & Sine Series, Solved problems on Fourier Series, Applications of Fourier analysis (square wave & full wave rectifier), Problems.
3	Lagrangian Formulation Introduction, Constraints, holonomic and non-holonomic constraints, scleronomic 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.



4	Variational Principle Lagrange's and Hamilton's Equations, Configuration space, Hamilton's principle, Equivalence of Lagrange's and Newton's equations, Advantages of the Lagrangian formulation-electro-mechanical analogies, Lagrange's undetermined multipliers, Applications of the Lagrangian method of undetermined multipliers, Hamilton's equations of motion, Some applications of the Hamiltonian formulation, Phase space, Problems.
----------	---

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of Mathematical Physics.
- Knowledge of Classical Mechanics.

Books Recommended:-

1. 'Mathematical Physics', **B. D. Gupta**, 2nd Revised Ed., *Vikas Publishing House Pvt. Ltd.*
2. 'Mathematical Physics', **Rajput**, *PragatiPrakashan*.
3. 'Mathematical Methods for Physics', **George B. Arfken and Hans J. Weber**, 4th Ed., *Academic Press, Inc.*
4. 'Mathematical Methods in the Physical Sciences', **Mary L. Boas**, *Wiley India Pvt. Ltd.*
5. 'Introduction to Classical Mechanics', **R. G. Takwale and P. S. Puranik**, *Tata McGraw Hill Pub. Company Ltd.*
6. 'Classical Mechanics', **H. Goldstein**, *Addison Wesley*.
7. 'Classical Mechanics', **Gupta, Kumar and Sharma**, *PragatiPrakashan*.

E-Resources:-

1. www.iitk.ernet.in/wiki/index.php
2. www.physic.about.com
3. www.physic.org
4. www.Physicsclassroom.com
5. www.howstuffwork.com
6. www.colorado.edu/physics/2000
7. www.ndrs.org.physic.com
8. www.physlinc.com
9. www.fearophysic.com
10. www.hyper physics.com

Useful CD Rom for e-learning:-

1. Hyper Physics.
2. Encyclopaedia of Science (D.K. Multimedia).
3. Physics Encyclopaedia.
4. Virtual Physics Junior (Original PC CD Rom).
5. Encyclopaedia Britannica-2008.



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Introduction to Solid State Physics

SUBJECT CODE: 4SC05SPC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-The general purpose of this course is

- To expose the student knowledge of Solid State Physics.

Prerequisites:-Fundamental knowledge of Solid State Physics.

Course outline:-

Sr. No.	Course Contents
1	X-ray diffraction Introduction of X-ray, Neutron and electron diffraction, Experimental diffraction methods, Rotating crystal Method and Powder Method for determination of crystal structure, Reciprocal lattice and Bragg's law, Concept of reciprocal lattice, Geometrical construction of reciprocal space, Vector algebraic discussion of reciprocal and real space vectors, Properties of reciprocal lattice, Analysis of X-ray diffraction pattern from crystal, Structure factor for bcc crystal, Structure factor of mono atomic diamond lattice, Structure factor of polyatomic crystal, Measurement of diffraction pattern of crystal, The Ewald construction.
2	Free electron Fermi gas Introduction of the free electron gas, Drude model, DC electrical conductivity of metals, Thermal conductivity of metals, Lorentz modification to Drude model, Energy levels and Density of orbital in one dimension, Effect of temperature on Fermi-Dirac distribution function, Free electron gas in three dimension, Heat capacity of the electron gas, Electrical Conductivity and Ohm's Law, Experimental Electrical resistivity of metals, Thermionic Emission, Motion in magnetic field (Hall effect), Hall voltage and Hall coefficient, Mobility and Hall angle, Importance of Hall effect.
3	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.
4	Superconductivity Flux exclusion-The Meissner Effect, Thermal Properties, The Energy Gap, Isotope Effect, Mechanical Effect, The Penetration Depth, Types of Superconductors, Experimental Aspects, Influence of external agents on Superconductivity, Critical field of Small Specimens, Thermodynamic of Superconducting transition, Alloys & Compounds, London's theory, Josephson effects, BCS theory, Applications of Superconductivity, SQUID.

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of Solid State Physics.



C. U. SHAH UNIVERSITY

Books Recommended:-

1. 'Solid State Physics', **S. O. Pillai**, *New Age International Pub.*
2. 'Solid State Physics', **M. A. Wahab**, *Narosa Publishing House.*
3. 'Elements of Solid State Physics', **J. P. Srivastava**, *Prentice-Hall of India.*
4. 'Introduction to Solid State Physics', **C. Kittel**, (8th Edition) *Wiley Eastern Ltd.*
5. 'Solid State Physics' **A. J. Dekker**, *MacMillan India Ltd.*

E-Resources:-

1. www.iitk.ernet.in/wiki/index.php
2. www.physic.about.com
3. www.physic.org
4. www.Physicsclassroom.com
5. www.howstuffwork.com
6. www.colorado.edu/physics/2000
7. www.ndrs.org.physic.com
8. www.physlinc.com
9. www.fearophysic.com
10. www.hyperphysics.com

Useful CD Rom for e-learning:-

1. Hyper Physics.
2. Encyclopaedia of Science (D.K. Multimedia).
3. Physics Encyclopaedia.
4. Virtual Physics Junior (Original PC CD Rom). Encyclopaedia Britannica-2008.



FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Optics and Spectroscopy

SUBJECT CODE: 4SC05OSC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-The general purpose of this course is

- To expose the student knowledge of Optics.
- To expose the student knowledge of Spectroscopy.

Prerequisites:-Fundamental knowledge of Optics and Spectroscopy.

Course outline:-

Sr. No.	Course Contents
1	Interferometer Michelson's interferometer, Applications of Michelson interferometer, Multiple beam interference, Fabry Perot Interferometer and Etalon, Lummer-Gehrcke Plate.
2	Polarization Polarization by Double refraction, Nicol Prism, Anisotropic Crystals, Calcite Crystal, Huygen's explanation of Double Refraction, Phase Difference between e-ray and o-ray, Superposition of waves linearly polarized at right angles, Types of polarized light, Retarders or wave plates, Analysis of polarized light, Babinet compensator (only construction), Artificial double refraction, LCDs.
3	Atomic Spectroscopy The spinning electron, Space quantization, Quantum numbers and their physical interpretations, Zeeman effect and experimental study of Zeeman effect, Classical interpretation of Normal Zeeman effect, Vector atom model and Normal Zeeman effect, Vector atom model and Anomalous Zeeman effect, Paschen-Back effect, Stark effect.
4	Molecular Spectroscopy Introduction, Theory of pure rotational Spectra, Molecule as a rigid/non-rigid rotator, Theory of rotational vibrational Spectra, Diatomic Molecule as symmetric spinning top, Salient features of vibrational - Rotational spectra, Theory of electronic band Spectra. Raman Spectra Raman effect and its Salient features, Observation of Raman Spectra, Classical theory of Raman effect, Quantum theory of Raman effect, Applications and its Importance.

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of Optics.
- Knowledge of Spectroscopy.

Books Recommended:-

1. 'A textbook of Optics', N. Subrahmanyam, Brij Lal and M. N. Avadhanulu, S. Chand & Company Ltd.



C. U. SHAH UNIVERSITY

2. 'Fundamentals of Optics', **Francis Arthur Jenkins and Harvey Elliott White**, *McGraw Hill*.
3. 'Optics', **Ajoy Ghatak**, *Tata McGraw Hill*.
4. 'Fundamental of Optics', **D. R. Khanna and H. R. Gulati**, *S.Chand & Company Ltd*.
5. 'Elements of Spectroscopy', **Gupta, Kumar and Sharma**, *PragatiPrakashan*.
6. 'Atomic Physics', **J. B. Rajam**, *S. Chand & Company Ltd*.
7. 'Optics and Spectroscopy', **R.Murugesan and K. Sivaprashatha**, *S. Chand & Company Ltd*.
8. 'Handbook of Optics-Vol. I to IV', **Michael Bass**, *McGraw Hill*.

E-Resources:-

1. www.iitk.ernet.in/wiki/index.php
2. www.physic.about.com
3. www.physic.org
4. www.Physicsclassroom.com
5. www.howstuffwork.com
6. www.colorado.edu/physics/2000
7. www.ndrs.org.physic.com
8. www.physlinc.com
9. www.fearophysic.com
10. www.hyper physics.com

Useful CD Rom for e-learning:-

1. Hyper Physics.
2. Encyclopaedia of Science (D.K. Multimedia).
3. Physics Encyclopaedia.
4. Virtual Physics Junior (Original PC CD Rom).
5. Encyclopaedia Britannica-2008.



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Electromagnetism and Nuclear Physics

SUBJECT CODE: 4SC05ENC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-The general purpose of this course is

- To expose the student knowledge of Electromagnetism.
- To expose the student knowledge of Nuclear Physics.

Prerequisites:-Fundamental knowledge of Electromagnetism and Nuclear Physics.

Course outline:-

Sr. No.	Course Contents
1	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.
2	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, Electric quadrupole radiation.
3	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.
4	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.

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of Electromagnetism.
- Knowledge of Nuclear Physics.



Books Recommended:-

1. 'Electromagnetics', **B. B. Laud**, 2nd Edition, Wiley Eastern Ltd.
2. 'Introduction to Electrodynamics', **David J. Griffiths**, Prentice-Hall of India.
3. 'Nuclear Physics - An Introduction', **S.B. Patel**, New Age International.
4. 'Introduction to Nuclear Physics', **H. Enge**, Addison Wesley Pub. Com.
5. 'Nuclear Physics', **D. C. Tayal**, Himalaya Publisher.
6. 'Modern Physics', **Kenneth Krane**, John Wiley and Sons.
7. 'Nuclear Physics', **Irvin Kaplan**, 2nd Edition, Addison Wesley Pub. Com.
8. 'Nuclear Physics', **S.N. Ghoshal**, S. Chand & Company Ltd.

E-Resources:-

1. www.iitk.ernet.in/wiki/index.php
2. www.physic.about.com
3. www.physic.org
4. www.Physicsclassroom.com
5. www.howstuffwork.com
6. www.colorado.edu/physics/2000
7. www.ndrs.org.physic.com
8. www.physlinc.com
9. www.fearophysic.com
10. www.hyperphysics.com

Useful CD Rom for e-learning:-

1. Hyper Physics.
2. Encyclopaedia of Science (D.K. Multimedia).
3. Physics Encyclopaedia.
4. Virtual Physics Junior (Original PC CD Rom).
5. Encyclopaedia Britannica-2008.



FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Physics Practical-V

SUBJECT CODE: 4SC05PHP1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
0	0	6	6	3	--	--	--	--	15	15	70	100	

Objectives:-The general purpose of this course is

- To expose the student knowledge of Practical related to theory.

Prerequisites:-Fundamental knowledge of Physics Practical.

Course outline:-

Sr. No.	Course Contents
1	Acceleration due to gravity by Kater's pendulum (fixed knife edges).
2	Study of Damped Simple Harmonic Motion.
3	Fabry-Perot etalon. Determination of the thickness of air film and wavelength of light using spectrometer.
4	Study of Lloyd's Mirror.
5	Absorption spectrum of Iodine molecule.
6	Study of Double Refraction in Calcite Prism.
7	Study of Babinet Compensator.
8	Determine the Mutual Induction of coils using Ballistic Galvanometer.
9	An optical method of determining dielectric constant, dipole moment and polarizability of a polar liquid using Hollow prism.
10	Study of Single stage Transformer coupled Amplifier.
11	Study of Series Voltage Regulator using Transistor.
12	Study of Hartley/RC phase shift Oscillator using Transistors.
13	Study of Hysteresis loop of Ferromagnetic Material.
14	Michelson interferometer. To determine the wavelength of monochromatic light.
15	Refractive index by total internal reflection using Gauss eye piece.
16	Study of Hall Effect.

- 20% of practicals may be altered or modified.

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of Physics Practical and its application in various fields.

Books Recommended:-

- 'B. Sc. Practical Physics', **C. L. Arora**, S. Chand & Company Ltd.
- 'Advanced Practical Physics', **M. S. Chauhan & S. P. Sing**, PragatiPrakashan.
- 'Experimental Physics', **University GranthNirman Board**, (Gujarati Medium).
- 'Physics through experiments Vol. I & II', **B. Sarafetal.**, Vikas Publishing House.
- 'Advanced Practical Physics', **S. L. Gupta and V. Kumar**, PragatiPrakashan.



C. U. SHAH UNIVERSITY

6. 'An advanced course in practical Physics', **D. Chattopadhyay and P. C. Rakshit**, *New Central Book Agency Pvt. Ltd.*
7. 'Electronic Laboratory Primer', **Poorna Chandra & Sasikala**, *S. Chand & Company Ltd.*
8. 'Advanced Practical Physics for students', **B. L. Wosnop and H. T. Flint**, *Methuen and Co. Ltd.*

E-Resources:-

1. www.iitk.ernet.in/wiki/index.php
2. www.physic.about.com
3. www.physic.org
4. www.Physicsclassroom.com
5. www.howstuffwork.com
6. www.colorado.edu/physics/2000
7. www.ndrs.org.physic.com
8. www.physlinc.com
9. www.fearophysic.com
10. www.hyperphysics.com

Useful CD Rom for e-learning:-

1. Hyper Physics.
2. Encyclopaedia of Science (D.K. Multimedia).
3. Physics Encyclopaedia.
4. Virtual Physics Junior (Original PC CD Rom).
5. Encyclopaedia Britannica-2008.



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Non-Conventional Energy Resources

SUBJECT CODE: 4SC05NCE1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-The general purpose of this course is

- To expose the students' knowledge towards need of alternative & non-conventional renewable energy sources, their optimal usage with existing non renewable energy sources and their management to reduce the pollution and make this earth more liveable for all living organisms.

Prerequisites:-Fundamental knowledge of Bachelor degree in Physics.

Course Outline:-

Sr. No.	Course Contents
1	Solar Energy Introduction, The Physics of the Sun, Solar Radiation - Beam and Diffused Radiation, Solar Constant, Earth Sun Angles, Attenuation and Measurement of Solar Radiation, Local Solar Time, Derived Solar Angles, Sunrise, Sunset and Day Length, Flat Plate Collectors, Concentrating Collectors, Advanced Solar Collectors, Solar Air Heaters-Types, Solar Driers, Storage of Solar Energy-Thermal Storage, Solar Pond, Solar Water Heaters, Solar Distillation, Solar Driers, Solar Cooker, Solar Heating & Cooling of Buildings, Photo Voltaic Effect, Semiconductor Photo Voltaic Solar Cells, Solar Photo Voltaic System, Applications and Limitations of PV Solar Cells, Environmental Impact of Solar Power. PV Hybrid System.
2	Geothermal Energy Introduction, Structure of Interior Earth, Geothermal Sites, Estimation and Nature of Geothermal Energy, Geothermal Sources and Resources Like Hydrothermal, Geo-Pressured Hot Dry Rock, Magma. Advantages, Disadvantages and Application of Geothermal Energy, Site selection, Prospects of Geothermal Energy in India, Problems and Limitations of Geothermal Energy Conversion.
3	Hydro Power, Oceanic Thermal and Tidal Energy Introduction, Principle Of Ocean Thermal Energy Conversion, Ocean Thermal Electric Conversion (OTEC) Systems Like Open Cycle, Closed Cycle, Hybrid Cycle, Prospects of OTEC in India, Applications and Limitations of OTEC, Wave Energy Conversion Mechanics, Energy From Tides, Basic Principle of Tidal Power, Single Basin and Double Basin Tidal Power Plants, Advantages, Limitation and Scope of Tidal Energy. Wave Energy and Power From Wave, Wave Energy Conversion Devices, Advantages and Disadvantages of Wave Energy. (DIRECT ENERGY CONVERSION), Need for DEC, Carnot Cycle, Limitations, Principles of DEC. Thermo-Electric Generators, Seebeck, Peltier and Joule Thomson Effects, Figure of Merit, Materials, Applications.



4	Fuel Cells Introduction, Design Principle and Operation of Fuel Cell, Types of Fuel Cells, Conversion Efficiency of Fuel Cell, Application of Fuel Cells. Hydrogen Energy Introduction, Properties of Hydrogen as renewable energy, Sources of Hydrogen, Hydrogen Production Methods, Hydrogen Storage, Hydrogen Transportation, Utilization of Hydrogen Gas, Hydrogen As Alternative Fuel For Vehicles, Problems and Limitations of Hydrogen Fuel, Hydrogen Cartridge Development, Economics of Hydrogen Fuel & its Applications.
----------	---

Learning Outcomes:-

After successful completion of this course, students will be able:

- To understand the renewable and non-renewable energy sources i.e. nonconventional energy sources and conventional energy sources.
- To know about alternative energy sources to meet energy requirement of global scenario.
- To have deep knowledge regarding availability, harnessing, conversion, storage and optimal management of solar energy, wind energy, bio-mass energy, geo-thermal energy, oceanic energy and magneto-hydro dynamic energy.
- To grasp the technological knowhow to get application of nonconventional energy sources with the conventional energy sources to fulfil the global energy need in affordable and economical way.
- To have knowledge of efficient energy management.

Books Recommended:-

1. 'Non-Conventional Energy Sources', **G.D.Rai**, *Khanna Publishers*.
2. 'Solar Energy: Fundamentals and Applications', **H.P.Garg & Jai Prakash**, *Tata McGraw Hill Pub.*
3. 'Solar Energy: Principles of Thermal Collection and Storage', **S.P.Sukhatme**, *Tata McGraw Hill Pub.*
4. 'Alternative Energy Sources', **B.L. Singhal**, *Tech Max Publication*.
5. 'Magneto Hydro Dynamics', **Kuliovsky and Lyubimov**, *Addison-Wisely Pub.*
6. 'Solar Engineering of Thermal Process', **Duffie and Beckman**, *John Wiley & Sons*.
7. 'Non-Conventional Energy Systems', **K. Mittal**, *Wheeler Pub.*
8. 'Renewable energy resources', **Tiwari and Ghosal**, *Narosa Pub.*
9. 'Renewable Energy Technologies', **Ramesh & Kumar**, *Narosa Pub.*
10. 'Renewable Energy Sources and Conversion Technology', *Tata McGraw Hill*.
11. 'Renewable Energy Sources and Emerging Technologies', **D.P.Kothari**, *Prentice Hall of India Pvt. Ltd.*
12. 'Non-Conventional Energy', **Ashok V.Desai**, *New Age International Publishers Ltd.*

E-Resources:-

1. www.iitk.ernet.in/wiki/index.php
2. www.physic.about.com
3. www.physic.org
4. www.Physicsclassroom.com
5. www.howstuffwork.com
6. www.colorado.edu/physics/2000
7. www.ndrs.org.physic.com
8. www.physlinc.com
9. www.fearophysic.com
10. www.hyperphysics.com



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCE
DEPARTMENT OF PHYSICS

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Nanoscience and Nanotechnology

SUBJECT CODE: 4SC05NNE1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-The general purpose of this course is

- To expose the student knowledge of Nanoscience and Nanotechnology.
- To expose the student knowledge of applications of Nanoscience and Nanotechnology.

Prerequisites:-Fundamental knowledge of Nanoscience and Nanotechnology.

Course outline:-

Sr. No.	Course Contents
1	Introduction to Nanoscience Introduction to Nanoscience, Some Nano Challenges, The fundamental Science Behind Nanotechnology, Tools for Measuring Nanostructures, Tools to Make Nanostructures, Point and Places of Interest (Sensors, Nanoscale Biostructures, Energy capture, Transformation and storage, Optics, Magnets, Fabrication, Electronics), Smart Materials (Self-Healing Structures, Recognition, Separation, Catalysts).
2	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.
3	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.
4	Analytical (Characterization) Technique Microscopes: Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), X-ray diffraction. Applications Electronics, Biotechnology and Medical, Automobiles, Space, Defence, Sports, Cosmetics, Cloth Industry.

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of Nanoscience and Nanotechnology.
- Knowledge about the applications of Nanoscience and Nanotechnology.



Books Recommended:-

1. 'Nanotechnology A Gentle Introduction to the Next Big Idea', **Mark Ratner and Daniel Ratner**, *Pearson Education*.
2. 'Introduction to Nanotechnology', **C.P. Poole Jr. and F.J. Ownes**, *Wiley Publication*.
3. 'Nanoscience and Technology', **Eds. R.W.Kelsall, I.W. Hemley& M. Geoghehan**, *John Wiley and Sons*.
4. 'Introduction to Nanoscience and Nanotechnology', **K.K. Chattopadhyay and A.N. Banerjee**, *PHI Learning Pvt. Ltd.*
5. 'Origin and Development of Nanotechnology', **P.K.Sharma**, *Vista International Pub. House*.

E-Resources:-

1. www.iitk.ernet.in/wiki/index.php
2. www.physic.about.com
3. www.physic.org
4. www.Physicsclassroom.com
5. www.howstuffwork.com
6. www.colorado.edu/physics/2000
7. www.ndrs.org.physic.com
8. www.physlinc.com
9. www.fearophysic.com
10. www.hyper physics.com

Useful CD Rom for e-learning:-

1. Hyper Physics.
2. Encyclopaedia of Science (D.K. Multimedia).
3. Physics Encyclopaedia.
4. Virtual Physics Junior (Original PC CD Rom).
5. Encyclopaedia Britannica-2008.



FACULTY OF: - Science

DEPARTMENT OF: - English

SEMESTER: - V

CODE:- 4SC05PEF1

NAME: – Professional Etiquettes-1

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Schemes (Hours)				Cr edi t	Evaluation Schemes							
		Th	Tu	Pr	To		Theory				Practical (Marks)		Total	
											Internal	University		
							Sessional Exam		University Exam		Pr	TW		Pr
							Marks	Hours	Marks	Hours				
4SC05PEF1	Professional Etiquettes-1	1	0	2	3	2	20	1	50	2	20	10	00	100

Course outline:

Detail Course Content:

Unit No.	Detailed Contents
	Section-A: Career Advancement Program (CAP)
1	Soft Skills <ul style="list-style-type: none"> • Introduction to soft skills • Difference between soft skills & hard skills • Importance of soft skills • Intelligence quotient, Emotional quotient, Spiritual quotient • Classification of soft skills: • Thinking Skills-Self Awareness, Problem-Solving, Decision Making, Critical Thinking, Creative Thinking • Social Skills-Interpersonal Relationships, Effective Communication, Empathy • Emotional Skills-Managing Feelings/emotions, Stress Management
2	Positive Attitude <ul style="list-style-type: none"> • Introduction • Importance of positive attitude • Ways to develop positive attitude • External and internal factors in bulging positive attitude
3	Leadership <ul style="list-style-type: none"> • Who is Leader? • Characteristics of Leader • Types of Leader • Importance of Leadership in Professional life • Case study of Swami Vivekanand Steve Jobs, Abdul Kalam, Bill Gates etc.



4	Self Esteem <ul style="list-style-type: none"> • Definition • Theory of Maslow • Advantages of High Self Esteem • High Self Esteem vs. Low Self Esteem • Causes of Low Self Esteem • How to Improve Self Esteem
5	Goal Setting <ul style="list-style-type: none"> • Introduction • Importance • 5 D's of Goal Setting: Direction, Dedication, Determination, Discipline, Deadline • Steps of Goal • Action Plan
6	Notice, Agendas of Meeting, Minutes of Meeting <ul style="list-style-type: none"> • Preparing notice • Preparing a list of agendas for meeting • Drafting minutes of conducted meeting
7	Meeting <ul style="list-style-type: none"> • Introduction • Participation in meeting • Key features • Etiquettes
	Section-B: Literature
8	Wings of Fire by Abdul Kalam-Orientation & Creation Chapters

References:

Sr No.	Title	Author	Publisher
1	Effective Personal Communication Skills for Public Relations	Green Andy	Kogan age Limited
2	Effective Technical Communication	M Ashraf Rizvi	Tata Mc Graw hill
3	Personality Development and Soft Skills	Mitra Barun	OUP
4	Resumes and Interviews	M Ashraf Rizvi	Tata Mc Graw hill
5	Managing Soft Skills for Personality Development	B.N. Ghosh	Tata Mc Graw hill
6	You Can Win	Shiv Khera	
7	The Monk Who Sold His Ferrari	Robin Sharma	Harper Collins
8	Wings of Fire	Abdul Kalam	University Presss