

U.P. TECHNICAL UNIVERSITY LUCKNOW



Syllabus

1. Mathematics –III
2. Science Based Open Electives
3. Industrial Psychology
4. Industrial Sociology
5. Human Values and Professional Ethics
6. Cyber Security

[Effective from the Session : 2014-15]

COMMON COURSES

MATHEMATICS –III

NAS 301/NAS 401

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Unit – I: Function of Complex variable

8

Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem, Evaluation of real integrals of the type

$$\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta \text{ and } \int_{-\infty}^{+\infty} f(x) dx$$

Unit – II: Integral Transforms

8

Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations

Z- transform and its application to solve difference equations

Unit – III: Statistical Techniques

8

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non – linear and multiple regression analysis, Binomial, Poisson and Normal distributions, Tests of significations: Chi-square test, t-test

Unit – IV: Numerical Techniques – I

8

Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

Unit – V: Numerical Techniques –II

8

Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss-Seidal method.

Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third and three-eight rules,

Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.

Test Books:-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers

Reference Books:-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House,.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, New Delhi
4. E. Balagurusamy, Numerical Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi
5. T. Veerajan & T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, New Delhi

List of Open Electives for B. Tech. Courses

SCIENCE BASED OPEN ELECTIVE

NOE-031 / NOE-041	Introduction to Soft Computing (Neural Networks, Fuzzy Logic and Genetic Algorithm)
NOE-032 / NOE-042	Nano Sciences
NOE-033 / NOE-043	Laser Systems and Applications
NOE-034 / NOE-044	Space Sciences
NOE-035 / NOE-045	Polymer Science & Technology
NOE-036 / NOE-046	Nuclear Science
NOE-037 / NOE-047	Material Science
NOE-038 / NOE-048	Discrete Mathematics
NOE-039 / NOE-049	Applied Linear Algebra

SCIENCE BASED OPEN ELECTIVES

NOE-031/NOE-041: INTRODUCTION TO SOFT COMPUTING
(Neural Networks, Fuzzy Logic and Genetic Algorithm)

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Unit-I : Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory. 8

Unit-II : Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propogation algorithm, factors affecting backpropagation training, applications. 8

Unit-III : Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. 8

Unit-IV : Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications. 8

Unit-V : Genetic Algorithm(GA)

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications. 8

Text Books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.
2. N.P.Padhy,”Artificial Intelligence and Intelligent Systems” Oxford University Press.

Reference Books:

3. Siman Haykin,”Neural Netowrks”Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.
5. Kumar Satish, “Neural Networks” Tata Mc Graw Hill

UNIT -1 :

Introduction:

Definition of Nano-Science and Nano Technology, Applications of Nano-Technology. 1

Introduction to Physics of Solid State:

Structure: Size dependence of properties; crystal structures, face centered cubic nanoparticles; Tetrahedrally bounded semiconductor structures; lattice vibrations.

Energy Bands: Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors; effective masses; Fermi Surfaces.

Localized Particles: Acceptors and deep traps; mobility; Excitons. 6

UNIT-2

Quantum Theory For Nano Science:

Time dependent and time independent Schrodinger wave equations.

Particle in a box, Potential step: Reflection and tunneling(Quantum leak). Penetration of Barrier, Potential box(Trapped particle in 3D:Nanodot), Electron trapped in 2D plane(Nano sheet), Quantum confinement effect in nano materials. 4

Quantum Wells, Wires and Dots

Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infrared detectors; Quantum dot laser Superconductivity. 3

Properties of Individual Nano particles

Metal Nano clusters: Magic Numbers; Theoretical Modelling of Nanoparticles; geometric structure; electronic structure; Reactivity; Fluctuations Magnetic Clusters; Bullets to Nano structure.

Semi conducting Nanoparticles: Optical Properties; Photofragmentation; Coulombic explosion.

Rare Gas & Molecular Clusters: Inert gas clusters; Superfluid clusters molecular clusters.

UNIT-3

Growth Techniques of Nanomaterials:

Lithographic and Nonlithographic techniques, Sputtering and film deposition in glow discharge, DC sputtering technique(p-CuAlO₂ deposition). Thermal evaporation technique, E-beam evaporation, Chemical Vapour deposition(CVD), Synthesis of carbon nano-fibres and multi-walled carbon nanotubes, Pulsed Laser Deposition, Molecular beam Epitaxy, Sol-Gel Technique (No chemistry required), Synthesis of nanowires/rods, Electrodeposition, Chemical bath deposition, Ion beam deposition system, Vapor-Liquid-Solid (VLS) method of nanowires. 8

UNIT -4

Methods of Measuring Properties:

Structure: Crystallography, particle size determination, surface structure,

Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy (TEM)

Spectroscopy: Infra red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luminescence. 8

UNIT-5

Bucky Ball:

Nano structures of carbon (fullerene):

Carbon nano-tubes: Fabrication, structure, electrical, mechanical, and vibrational properties and applications.

Nano diamond, Boron Nitride Nano-tubes, single electron transistors, Molecular machine, Nano-Biometrics, Nano Robots. **7**

Text/Reference Books:

1. C.P. Poole Jr F.J. Owens, "Introduction to Nanotechnology".
2. "Introduction to S.S. Physics" - (7th Edn.) Wiley 1996.
3. S. Sugano & H. Koizuoni, "Microcluster Physics" –Springer 1998
4. "Handbook of Nanostructured Materials & Nanotechnology" vol.-5. Academic Press 2000
5. A.K. Bandyopadhyay, "Nano Materials" New Age International.

NOE-033/NOE-043: LASER SYSTEMS AND APPLICATIONS

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UNIT-I & II

Introduction:

Review of elementary quantum physics, Schrodinger equation, concept of coherence, absorption, spontaneous emission and stimulated emission processes, relation between Einstein's A and B coefficients, population inversion, pumping, gain, optical cavities. **15**

UNIT-III & IV

Lasers & Laser Systems:

Main components of Laser, principle of Laser action, introduction to general lasers and their types. Three & four level Lasers, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement. **18**

UNIT-V

Applications:

Laser applications in medicine and surgery, materials processing, optical communication, metrology and LIDAR and holography. **7**

Text/ Reference Books:

1. K.R. Nambiar, "Laser Principles, Types and Application" New Age International.
2. S. A. Ahmad, "Laser concepts and Applications" New Age International.

NOE-034/NOE-044: SPACE SCIENCES

L T P
3 1 0

1. Introduction:

Introduction to space science and applications, historical development

2. Solar System:

Nebular theory of formation of our Solar System.

Solar wind and nuclear reaction as the source of energy.

Sun and Planets: Brief description about shape size, period of rotation about axis and period of revolution, distance of planets from sun, Bode's law, Kepler's Laws of planetary motion, Newton's deductions from Kepler's Laws, Newton's Law of gravitation, correction of Kepler's third law, determination of mass of earth, determination of mass of planets with respect to earth.

Brief description of Asteroids, Satellites and Comets.

3. Stars:

Stellar spectra and structure, stellar evolution, nucleo-synthesis and formation of elements.

Classification of stars: Harvard classification system, Hertzsprung-Russel diagram, Luminosity of star, variable stars; composite stars (white dwarfs, Neutron stars, black hole, star clusters, supernova and binary stars); Chandrasekhar limit.

4. Galaxies:

Galaxies and their evolution and origin, active galaxies and quasars.

5. Creation of Universe:

Early history of the universe, Big-Bang and Hubble expansion model of the universe, cosmic microwave background radiation, dark matter and dark energy.

Text Books / Reference Books:

1. K. S. Krishnaswami, "Astrophysics: A modern Perspective" New Age International.
2. K. S. Krishnaswami, "Understanding cosmic Panorama" New Age International.

NOE-035/NOE-045: POLYMER SCIENCE AND TECHNOLOGY

L T P
3 1 0

UNIT –I & II

POLYMERS:

Introduction, chemistry of polymer synthesis, polymer reaction kinetics, physical properties and characterization of polymers, effect of structure on properties of polymers, organic polymers. Introduction to high performance polymers and composites and their processing. **18**

UNIT –III & IV

POLYMERIZATION:

Introduction, step-growth polymerization, free radical chain growth polymerization, emulsion polymerization, ionic and cationic polymerization, chain statistics and rubber elasticity. **13**

UNIT – UNIT –V & VI

PREPARATION AND APPLICATIONS:

Preparation, properties and technical applications of thermo-plastics (PVC, PVA), thermostats (PF, UF) and elastomers (SBR, GR-N), silicones. Application of polymers in space, ocean, electronics, medical, agriculture, automobile, sports and building construction. **9**

NOE-036/NOE-046 : NUCLEAR SCIENCE

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UNIT-I

Nucleus and Its Basic Features:

Nuclear structure; nuclear forces and their properties, nuclear stability, nuclear radius and its measurement, nuclear spin, nuclear magnetic and electrical moments. **8**

UNIT-II

Nuclear Models:

Single particle model, liquid drop model and semi-empirical mass formula, nuclear potential and shell model, collective model. **8**

UNIT-III

Nuclear Reaction:

Nuclear reaction and laws of conservation, types of nuclear reaction, mechanism of nuclear reaction, nuclear fission & binuclear fusion and their explanation by liquid drop model. **8**

UNIT-IV

Nuclear Decay:

Decay constant, half life period and mean life, alpha decay, beta decay, gamma decay, interaction of nuclear radiation with matter. **6**

Nuclear Instruments-I

Mass spectrograph,: General principle, Aston's Mass Spectrograph. **2**

UNIT-V

Nuclear Instruments-II

Accelerators: Van de Graph Generator, Cyclotron, Synchrotron. **6**

Detectors: G M Counter, Scintillation counter, cloud chamber, Bubble Chamber, production and detection of neutrons and Gamma-photon.

Application of Nuclear Techniques: Nuclear magnetic resonance, positron emission topography, radiotracer techniques and applications in material science and agriculture. **2**

Text Books:

1. Tayal, "Nuclear Physics" Himalaya Publishing House.
2. S.N. Ghosal, "Nuclear Physics" S. Chand & Co.
3. S. B. Patel, "Nuclear Physics: An Introduction New Age International.
4. H. B. Lal, "Introductory Nuclear Physics" United Book Depot.
5. Wang, "Introductory Nuclear Physics", PHI Learning

Reference Books:

6. Roy & Nigam, "Nuclear Physics" John Wiley & sons.
7. W.E. Burcham, "Nuclear Physics" Longmans Publications.
8. Green, "Nuclear Physics" McGraw Hill.

NOE-037/NOE-047:

MATERIAL SCIENCE

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3 1 0

UNIT-I

Introduction: Historical perspective, importance of materials, Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bonding. 4

Crystallography and imperfections:

Concept of unit cell, space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques, imperfections, Defects & Dislocations in solids. . 3

UNIT-II

Mechanical Properties and Testing: Stress strain diagram, Ductile and brittle materials, stress Vs strength, toughness, hardness, fracture, fatigue and creep. Testing, such as Strength testing, Hardness testing, Impact testing, Fatigue testing Creep testing, Non-destructive testing (NDT)

Micro Structural Exam: Microscope principle and methods, Preparation of samples and microstructure exam and grain size determination, comparative study of microstructure of various metals and alloys, such as Mild steel, CI, Brass. 2

Phase Diagram and Equilibrium Diagram: Uniary and Binary diagrams, Phase rules, Types of equilibrium diagrams: solid solution type, eutectic type and combination type, Iron-carbon equilibrium diagram. 4

UNIT-III

Ferrous materials: Iron and steel manufacture, furnaces, various types of carbon steels, alloy steels and cast irons, its properties and uses. 3

Heat Treatment: various types of heat treatment, such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams. 2

Non-Ferrous metals and alloys: Non-ferrous metals, such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various types of Brass, Bronze bearing materials their properties and uses. Aluminum alloys, such as Duralumin, Other advanced materials/alloys. 3

UNIT-IV

Magnetic properties: Concept of magnetism- Dia, para, ferro magnetic materials, Hysteresis, Soft and hard magnetic materials, Magnetic Storages. 2

Electric Properties: Energy band, concept of conductor, insulator and semi conductor. Intrinsic and extrinsic semi-conductors, P-n junction and transistors, Basic devices and their applications. diffusion of Solid 3

Super conductivity and its applications, Messier effect. Type I & II superconductors. High Temp. superconductors. 2

UNIT-V

Ceramics: Structure, types, properties and applications of ceramics. Mechanical/Electrical behaviour and processing of ceramics. 2

Plastics: Various types of polymers/plastics and their applications. Mechanical behaviour and processing of plastics, Future of plastics. 2

Other Materials: Brief description of other materials, such as optical and thermal materials, concrete, composite materials and their uses. 2

Other Materials: Brief description of other materials, such as optical and thermal materials, concrete, composite materials and their uses. 2

Performance of materials in service: Brief theoretical consideration of fracture, fatigue, and corrosion and its control. 3

Text / Reference Books:

1. W.D. Callister Jr. "Material Science & Engineering Addition" - Wesley Publishing Co.
2. Van Vlash, "Elements of Material Science & Engineering", John Wiley & Sons
3. V. Raghvan, "Material Science", Prentice Hall of India
4. Narula, "Material Science", Tata Mc.Graw Hill
5. Srivastava, Srinivasan, "Science of Materials Engineering" New Age International.

NOE-038 / NOE-048 : DISCRETE MATHEMATICS

**LTP
310**

UNIT-I

Set Theory: Definition of Sets, Venn Diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle.

Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation.

Function: Definition and types of function, composition of functions, recursively defined functions. **10**

UNIT-II

Propositional logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification.

Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example. **7**

UNIT-III

Combinatorics: Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (n^{th} order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.) **7**

Unit-IV

Algebraic Structure: Binary composition and its properties definition of algebraic structure; Grouyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results). **6**

UNIT-V

Graphs:

Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number.

Tree: Definition, types of tree (rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, postorder).

Finite Automata: Basic concepts of Automation theory, Deterministic finite Automata (DFA), transition function, transition table, Non Deterministic Finite Automata (NFA), Mealy and Moore Machine, Minimization of finite Automata. **10**

Text/Reference Books:

1. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Mc.Graw Hill, 2002.
2. J.P.Tremblay & R. Manohar, “Discrete Mathematical Structure with Applications to Computer Science” Mc.Graw Hill, 1975.
3. V. Krishnamurthy, “Combinatorics:Theory and Applications”, East-West Press.
4. Seymour Lipschutz, M.Lipson, “Discrete Mathemataics” Tata Mc Graw Hill, 2005.
5. Kolman, Busby Ross, “Discrete Matheamtical Structures”, Prentice Hall International.

APPLIED LINEAR ALGEBRA

NOE-039/NOE-049

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UNIT-1

Fields, Vector-spaces, sub-spaces, linear-combination, linear-dependence and independence. Basis, dimensions and coordinates (each and every fact to be illustrated by suitable examples). (8)

UNIT-2

Linear-transformation, definition and examples, matrix representation, similarity, range and kernel, rank-nullity theorem and its consequences. (8)

UNIT-3

Singular and non singular linear transformations, sum and product of linear transformations, vector space of linear transformations, nilpotent linear transformations. (6)

UNIT-4

Inner product spaces, definition and examples, orthogonality, Cauchy-Schwartz Inequality, Minkowski Inequality, polarization Identity, complete ortho normal set, Bessel’s Inequality, Gram-Schmidt’s orthogonalization process. (8)

UNIT-5

Linear functional, definition and examples, vector space of linear functional, dual vector spaces, adjoint, self adjoint, unitary and normal operators, examples and properties, eigen values and eigen vectors, diagonalisation of linear operators, quadratic forms, principle axis theorem(without proof), some applications to engineering problems. (10)

TEXT/REFERENCE BOOKS

1. Dym, H. Linear Algebra in action, University Press.2012
2. Halmos, P.R.: Finite Dimensional Vector Spaces (1990) Narosa.
3. Hoffman, K. and Kunze, R.: Linear Algebra PHI (2012)
4. Kolman, B. And Hill, D.R.: Introductory linear algebra with applications(2008) Pearson
5. Lipschutz, S. and Lipson M.: Linear Algebra (2005) Schaum’s Series.
6. Noble, B. And Daniel, J.W.: Applied linear algebra. (1988) PHI

NHU-301/NHU-401: INDUSTRIAL PSYCHOLOGY

Unit-I

Introduction to Industrial Psychology – Definitions & Scope. Major influences on Industrial Psychology- Scientific Management and Human relations -Hawthorne Experiments. Implications of Industrial Psychology on Modern Industries.

Unit-II

Individual in Workplace

Motivation and Job satisfaction . Stress management. Organizational culture, Leadership and Group dynamics.

Unit-III

Work Environment & Engineering Psychology-fatigue, Monotony, Boredom. Accidents and Safety. Job Analysis, Recruitment, Selection and Interview– Reliability & Validity of recruitment tests.

Unit –IV

Performance Management : Training & Development.

References :

1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.
2. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.
3. Aamodt, M.G. (2007) Industrial/Organizational Psychology : An Applied Approach (5th edition) Wadsworth/Thompson : Belmont, C.A.
4. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi : Tata McGraw Hill.
5. Bisen Vikram & Priya (2008), Industrial Psychology (third edition), New Age International *Publishers*, New Delhi

NHU-302/NHU-402

INDUSTRIAL SOCIOLOGY

Unit-I

Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organisation in Industry- Bureaucracy, Scientific Management and Human Relations.

Unit-II

Rise and Development of Industry : Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.

Unit-III

Industrialization in India. Industrial Policy Resolutions – 1956. Science, Technology and Innovation Policy of India 2013.

Unit-IV

Contemporary Issues : Grievances and Grievance handling Procedure. Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals,

References :

1. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIA C.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHA G.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.
5. NADKARNI, LAKSHMI, Sociology of Industrial Worker, Rawat, Jaipur, 1998.
6. BHOWMICK SHARIT, Industry, Labour and Society, Orient, 2012.

A Foundation Course
in
Human Values & Professional Ethics
(Syllabus for the Value Education course to be introduced in UPTU Colleges)
Course Code: AUC-001

Course Objective

This introductory course input is intended

- a. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.
- c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much needed orientational input in Value Education to the young enquiring minds.

Course Methodology

- The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence.
- It is free from any dogma or value prescriptions.
- It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as proposal and the students are facilitated to verify it in their own right based on their Natural Acceptance and Experiential Validation.
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and within the student himself/herself finally.
- This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.

Total no. of Lectures: 28

[L-T-P: 2-0-2]

Total no. of Practice Sessions: 14 (of 2 hrs each)

Content for Lectures:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education [6]

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

[6]

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - *Sukh* and *Suvidha*
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure *Sanyam* and *Swasthya*
- Practice Exercises and Case Studies will be taken up in Practice Sessions.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship [6]

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
Trust (Vishwas) and *Respect (Samman)* as the foundational values of relationship
15. Understanding the meaning of *Vishwas*; Difference between intention and competence
16. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals
18. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj*), Universal Order (*Sarvabhaum Vyawastha*)- from family to world family!

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence [4]

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
21. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
22. Holistic perception of harmony at all levels of existence

- Practice Exercises and Case Studies will be taken up in Practice Sessions.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics [6]

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics:
 - a) Ability to utilize the professional competence for augmenting universal human order.
 - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.
 - c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to Universal Human Order:
 - a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
 - b) At the level of society: as mutually enriching institutions and organizations

Content for Practice Sessions:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

PS 1: Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

Expected outcome: the students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

PS 2: Now-a-days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. – all these seem to be man-made problems threatening the

survival of life on Earth – What is the root cause of these maladies & what is the way out in your opinion?

On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc – what do you think, is the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

Expected outcome: the students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all problems and the sustained solution could emerge only through understanding of human values and value based living. Any solution brought out through fear, temptation or dogma will not be sustainable.

PS 3:

1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of

i) What is Naturally Acceptable to you in relationship- Feeling of respect or disrespect?

ii) What is Naturally Acceptable to you – to nurture or to exploit others?

Is your living the same as your natural acceptance or different?

2. Out of the three basic requirements for fulfillment of your aspirations- right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

Expected outcome:

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
3. The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

PS 4: List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

Expected outcome: the students are able to see that they can enlist their desires and the desires are not vague. Also they are able to relate their desires to 'I' and 'Body' distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the

physical facility is related to the body. They are also able to see that 'I' and 'Body' are two realities, and most of their desires are related to 'I' and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of 'I' too.

PS 5:

1. a. Observe that any physical facility you use, follows the given sequence with time :
Necessary & tasteful → unnecessary & tasteful → unnecessary & tasteless → intolerable
b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment!
2. List down all your activities. Observe whether the activity is of 'I' or of Body or with the participation of both 'I' and Body.
3. Observe the activities within 'I'. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

Expected outcome:

1. The students are able to see that all physical facilities they use are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.
2. the students are able to see that activities like understanding, desire, thought and selection are the activities of 'I' only, the activities like breathing, palpitation of different parts of the body are fully the activities of the body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body.
3. The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance.

PS 6:

1. Chalk out programs to ensure that you are responsible to your body- for the nurturing, protection and right utilisation of the body.
2. Find out the plants and shrubs growing in and around your campus. Find out their use for curing different diseases.

Expected outcome: The students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases.

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

PS 7: Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are :

- 1a. Do I want to make myself happy?
- 2a. Do I want to make the other happy?
- 3a. Does the other want to make him happy?
- 4a. Does the other want to make me happy?

What is the answer?

Intention (Natural Acceptance)

- 1b. Am I able to make myself always happy?
- 2b. Am I able to make the other always happy?
- 3b. Is the other able to make him always happy?
- 4b. Is the other able to make me always happy?

What is the answer?

Competence

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others' intention & competence.

Expected outcome: The students are able to see that the first four questions are related to our Natural Acceptance i.e. Intention and the next four to our Competence. They are able to note that the intention is always correct, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention as a result we conclude that I am a good person and other is a bad person.

PS 8:

1. Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

Expected outcome: The students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms, and so on so forth. All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

PS 9:

1. Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group.
2. Develop three chapters to introduce 'social science- its need, scope and content' in the primary education of children

Expected outcome: The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

PS 10: List down units (things) around you. Classify them in four orders. Observe and explain the mutual fulfillment of each unit with other orders.

Expected outcome: The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them. They are also able to see that human beings are not fulfilling to other orders today and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.

PS 11:

1. Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.
2. Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

Expected outcome: The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

Module 5: Implications of the above Holistic Understanding of Harmony at all Levels of Existence

PS 12: Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

Expected outcome: The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

PS 13:

1. Suggest ways in which you can use your knowledge of Technology/Engineering/Management for universal human order, from your family to the world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

Expected outcome: The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/ Management to ensure mutually enriching and recyclable productions systems.

PS 14: The course is going to be over now. Evaluate your state before and after the course in terms of

- a. Thought b. Behavior c. Work and d. Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

Expected outcome: The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for a happy and prosperous society.

Term Paper

Text Book and Reference Material

a. The text book:

R R Gaur, R Sangal, G P Bagaria, 2009, *A Foundation Course in Human Values and Professional Ethics*, Excel Books Private Limited, New Delhi.

b. Teacher's manual:

R R Gaur, R Sangal, G P Bagaria, 2009, *Teacher's Manual: A Foundation Course in Human Values and Professional Ethics*, Excel Books Private Limited, New Delhi.

Video CD of Teacher Orientation Workshop will be made available on website.

c. Reference Books

1. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *Limits to Growth – Club of Rome's report*, Universe Books.
5. A Nagraj, 1998, *Jeevan Vidya ek Parichay*, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
7. A N Tripathy, 2003, *Human Values*, New Age International Publishers.
8. Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, *Fundamentals of Ethics for Scientists & Engineers*, Oxford University Press
10. M Govindrajan, S Natrajan & V.S. Senthil Kumar, *Engineering Ethichs (including Human Values)*, Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, *Foundations of Ethics and Management*, Excel Books.

12. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.

d. Relevant websites, CDs, Movies and Documentaries:

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology – the Untold Story*
6. Anand Gandhi, *Right here right now*, Cyclewala production

AUC-002 : CYBER SECURITY

UNIT-1

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT-2

Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control.

Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

UNIT-3

Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design

Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control,CCTV and intrusion Detection Systems, Backup Security Measures.

UNIT-4

Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies.

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions,Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

References :

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security ", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India.
- 3.Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill.
5. CHANDER, HARISH," Cyber Laws And It Protection ", PHI Learning Private Limited ,Delhi ,India