

IPP Syllabus 2013-09-10
School of Physical Sciences
Department of Chemistry

IPP: 501

(University level)
(Common to all in Science Stream)

Marks: 100

Title: Research Methodology.

Unit-I. Methods of acquiring knowledge: Traditional, empirical, rational, interpretative, dialectical & scientific. Meaning of role of assumption, constructs, laws, theory, hypothesis, propositions, axioms and postulates. Types of research: Basic research, applied research, action research. Method of research: theoretical, descriptive, experimental & analytical.

Unit-II. Research Problem, selection of problem, process of designing a research proposal , steps to be followed in formulating a research proposal, objective of research , sources of research materials, Review of literature , Rational of the study, Research questions, Statement of the problem, objective of the study, the hypothesis of the study, scope of the study, delimitation of the study, operational definitions of the terms. Preparation of Research Report/Thesis.

Unit-III. (Computer Applications):

1. Introduction to computer: Hardware & Software.
2. Application of MS-office in research
3. Introduction to databases (Pub med) required for literature.
4. Data analysis using MS-Excel and related soft wares.

Unit-IV:

1. Intellectual Property Rights (IPR) Issues and Bio safety.
2. Ethics in Science.
3. History of Science and National Science Policies.

Suggested Reading:

1. "Research Methodology- Method and Technique" New Age International C.R. Kothari, 2nd Edn. New Delhi(2008)
2. "Research Methodology-Techniques and Trends" A.P.H.Publishing Corporation Y.K.Singh and R.B.Bajpai 1st Edn. , New Delhi (2007).
3. MS Word (2003) for Dummies - Dan Gookin , John Wiley & Sons, 2003
4. MS Power point (2003) for Dummies – Dong Lowe, John Wiley & Sons, 2003
5. MS Microsoft Office 2003 for Dummies, Wallace Wang, John Wiley & Sons, 2003

Title: Essential Topics in Physical Sciences

Unit-I. Nanotechnology: Introduction to nanotechnology .Different classes of nanomaterials and their properties. Fabrication methods and characterization techniques of nanomaterials. Applications of nanomaterials in electronics (electronic switch, FET), photonic (detector/source/switch) and nonlinear optics (optical filter, frequency converter). Introduction to DFT (density functional theory).

Unit-II. Network and data communication: Network, TYMNET, ARPANET, ISDN, LAN, X.25, Protocol, Interest communication TGP/IP, Packet, switching, different navigational tools, w.w.w other tools for accessing documents and data through Library and other networks.

Unit-III. Computer simulations: Introduction to mathematical and simulation models, deterministic and stochastic simulation models, continuous and discrete and simulation, Random number generation techniques, sampling techniques, moutecarlo simulations GPSS (General purpose system Simulation).

Unit-IV. Theory of Errors: (a) Definitions, classifications of errors. Random error of a measured quantity, Gaussian and poison distribution propagation of error, special topics in the adjustment of data statistical and non-statistical samples. (b) Least-Squares fitting computer programming and application using basic /FORTRAN Languages.

Suggested Reading:

1. Jr P.P.Charles, Frank O.J. Quantum Will, Wires, & Dots, Introduction to Nanotechnology .A John Willey & Sons Inc.2003.
2. G.Timp, Nanotechnology, Spinger-Verlag New York Inc. (2005).
3. K.E.Drexler. Nano system: Moleculer Machinery Manufacturing and computing, Wiley, New York (1992).
4. Data and computer communications-W.Stallings, Mc Millan Pub.Co. New York (1976).
5. Oueqeing system-Vol.2-D, Kleinrock, John Wiley & Sons. Inc New York (1976).
6. Computer Network: - A Tanebaum-Prentice Hall Ind.Englewwood cliffs N.J (1981).
7. Introduction to the theory of error: Yardley Beers Addison Wesle Pub.Com., New York (1967).
8. Probability, Random variables and stochastic processes: A Papole Mc Graw Hill Book Company (1965).
9. Statistical Methods: In experimental physics, WT Eadie, D.Drijard, F.E.James, N.Roos and B.Sadonlet, North Holland Pub.Com. Amsterdam (1971).
10. Data reduction and error analysis: Beveington Philips R.Mc Graw Hill New York (1969).
11. Fortran Programming: Raja Ramanna Mc Graw Hill Book Company, (2004).
12. Text book of research Ethics: Theory and Practice Sana haul, Kluwer , Academic/Plenum Publishers

IPP: -503

(Departmental Level)

Marks: 100

Title: Modern Topics in Chemistry

Unit-I. Green Chemistry: concept, principles, techniques and examples of some well studied cases. Natural Products: extraction, isolation and characterization, bioactivity of extracts & structure elucidation through spectroscopic methods (5-6 typical examples).

Unit-II. Nanomaterials: definition and concepts, classification and its differences from bulk materials, size, shape, surface to volume ratio, and quantum size effect of nanomaterials. Properties: electrical, optical, thermodynamic, mechanical and chemical properties of nanomaterials. Some typical examples of metal, metal oxide and carbon nanomaterial (synthesis, properties and their potential applications).

Unit-III. Instrumentation techniques: basic concepts & application related to the following instrumental techniques: UV-Visible, Spectrofluorimetry, FT-IR spectroscopy, Raman spectroscopy, GC-Mass, AAS, TGA, DSC, Cyclic voltametry, HPLC, LCR meter, Hyper Polarizability measurement (Nd-YAG Laser). Microscopy: Optical microscopy and Atomic force microscopy

Unit-IV. Familiarity with advance techniques: 2-D NMR & application of COSY, NOESY, HSQC, Field emission scanning electron microscope (FESEM), High resolution transmission electron microscopy (HRTEM), Scanning tunneling microscopy (STM), Energy Dispersive X-ray (EDX) Analysis/ X-ray Diffraction (single crystal and powder pattern): basic principle, application with some typical examples.

Suggested Reading:-

1. P.T.Anastas and J.C.Warner, Green Chemistry: Theory & Practice, Oxford University Press, USA, (2000) ISBN-10:0198506988.
2. M.Lancaster, Green Chemistry, Royal Soc.Chemistry , 2002, ISBN-0854046208.
3. P.T.Anastas and T.C Williamson, Green chemistry: Frontiers in benign chemical Synthesis and Processes, Oxford University Press, New York, (1998).
4. Introduction to Nanoscale Science and Technology, (Ed) M.D.Ventra S.Evoy and J.R.Heflen Kluwer Academic Publisher, Boston. , (2004).
5. "Nanomaterials Chemistry: Recent Developments and New Directions" C.N.R. Rao, A.Muller and A.K.Cheetham, Wiley VCH (2007).
6. "Chemistry of Nanomaterials", C.N.R Rao, A.Muller and A.K.Cheetham (Eds) Wiley-VCH, Weinheim, 2004, Reprinted 2006.
7. "Drago, Principles of Instrumental Techniques" H.H.Willard, L.L. Merritt.Jr and J.A.Dean, Instrumental Methods of Analysis, Van Nostrand Company, New York (1965) Revised edition-2008.
8. Tensiometry Heide Schatten and J.B.Pawley, Biological "Low Voltage Scanning Electron Microscope" Springer (2007), ISBN-10:0387729704.
9. D.C.Bell, Energy Dispersur X –Ray Analysis in the Electron Microscope ,BIOS Scientific Publisher Ltd.(2003).
10. New Trends in Green Chemistry, 2nd Edn, 2007, V.K. Ahluwalia & M. Kidwai
11. Natural Products, Chemistry, Biochemistry & Pharmacology, Narosa Publishing House, Kolkata Editor : G. Brahmachari , (1st Edn 2009)
12. Organic Chemistry, Vol-2, Natural Products (5th Edn 1995), I.L.Finar, ELBS, Longmau, Singapore
13. Organic Chemistry, Natural Products Vol-II, Revised Edn 2003, O.P. Agarwal, Goel Publishing House, Meerut.

IPP: -504

(Term Paper)

Marks: 100

A prospective Ph.D. scholar shall prepare a term paper (not exceeding 10-15 pages) preferably on related areas of the proposed topic of research giving appropriate introduction and references or on some frontier area of contemporary chemistry under the guidance of the Supervisor /co-supervisor. A seminar may also given on the term paper .