

# **SYLLABUS**

**M. Phil. COURSE**

**IN**

**CHEMISTRY**



**2014-2015**

**PT. RAVISHANKAR SHUKLA UNIVERSITY**  
**RAIPUR - 492 010, CHHATTISGARH**

## M. Phil. IN CHEMISTRY

**DURATION : 01 YEAR**

**M.M. : 500**

### COURSES

Name of Course		Total Marks
Course I : Research Methodology in Chemistry		100
Course II : Medicinal and physical organic chemistry		100
Course III: Advanced environmental chemistry		100
Seminar	Based on Theory	50
Dissertation	Seminar based on dissertation	50
	Script Writing	75
	Viva-voce	25
<b>Total Marks</b>		<b>500</b>

**Note :** A Student shall submit a dissertation based on his/her Practical work.

# M. Phil.

## COURSE - I

### RESEARCH METHODOLOGY IN CHEMISTRY

M.M. - 100

#### UNIT-I

##### RESEARCH METHODOLOGY

Purpose of research; Research project Conceptualization, choice of methods; Elements of a research proposal, operationalization choices and illustrations. Research design: formulation, pre-testing of research instruments and procedures, units of analysis, time dimension.

Experimental design and use of indicators in research.

Survey Research: Guidelines for asking question and questionnaires construction, Self-administered questionnaires, Interview and other survey methods; their strength and weaknesses.

Sampling: the logic of sampling , concepts and terminologies , population and Sampling frames , types of sampling design .Field studies : steps in the conducting field study ; evaluation research: how to carry out evaluation research .

#### UNIT-II

##### Literature Search Technique

IUPAC rule for nomenclature –Introduction to chemical abstracts –Subject Index, Substance Index, Author Index, Formula Index and other indices-Uses of these indices with examples- current contents –organization –methods of using the titles and index –other similar abstracts for special topics related to chemistry. Use of computer browsing for literature search and downloading – basics of internet services –various sources of abstracts ,articles and papers of browsing and downloading , Techniques of conversion from one format to another Structure drawing programs and their uses –searches through structure .

#### UNIT-III

##### INSTRUMENTAL TECHNIQUES

Principle, instrumentation and application of electro-analytical, spectrophotometry, fluorimetry, AAS, AES, XRF and NMR techniques.

Principle instrumentation and application of chromatography and MS techniques.

#### UNIT-IV

##### SAMPLING AND MODELING

Mesearment and sampling technique of air pollutants using air monitors in selected atmospheric receptors. Statistical approach in environmental monitoring and analysis using selected parameters(correlation and regression analysis, factor analysis etc.) and graph plotting ( Boxplot ,histogram etc.)

#### UNIT-V

##### DATA STATISTICAL ANALYSIS

Various types of errors – precision and accuracy- significant figures, various statistical tests on the accuracy of results, positive and negative deviation from accurate results the binomial distribution, the Gaussian distribution - the normal distribution of random errors, mean value, variance and standard deviation, reliability interval, deviations, from the Gaussian law of error distribution, student's t-distribution, and t-test- comparison of the mean with the expected value, comparison of

the results of two different methods, comparison of the precision of two methods by F-test, Gross errors and elimination of outlying results, graphical methods- Linear regression line, standard deviation, correlation coefficient-Multiple linear regression (one variable with two other variables).

#### **BOOK SUGGESTED:**

1. Thesis and Assignment Writing – J. Anderson, B.H. Dursten and M.Poole, Wiley Eastern (1977).
2. A Hand Book of Methodology of Research – P. rajamal and P. Devadoss, R.M.M.Vidya Press (1976).
3. instrumental Methods of Analysis – H.H. Willard, L.L.Merritt, J.a.Dean, F.A. Settle, CBS Publishers & Distributors, 1986.
4. Practical Process, Research and Development – Neal G. Anderson, Amazow

## **COURSE – II**

### **MEDICINAL AND PHYSICAL ORGANIC CHEMISTRY**

**M.M. - 100**

#### **UNIT – I**

Classification of drugs, Identification of active part: Pharmacophore, drug likeliness. Binding Forces: covalent bonds, ionic bonds, hydrogen bonds and van der waal's bonds.  
Lipid, Membrane and Cell coats: Liped structure, Membrane Structure, Membrane Proteins, transport of molecules through Membrane, the extracellular matrix and cell walls.

#### **UNIT – II**

Chemistry of Drug (and related compound) Metabolism: General Pathway, Sites of drug biotransformation, oxidative reactions : of aromatic moieties, olefins, benzylic carbon atoms, allylic carbon atoms, oxidation of carbon atom to carbonyls and imines, aliphatic and alicyclic carbon atoms, oxidation involving carbon-heteroatom systems. Reductive reactions of aldechydes, ketones, nitro and azo compounds. Hydrolytic reactions of esters and amides.  
Conjugation reactions of sulfate, glycine, glutamine. Acetylation and methylation reactions, during metabolism.

#### **UNIT – III**

##### **MICELLAR CHEMISTRY**

Physical and chemical properties of surfactants and micelles in aqueous solutions, micelle formation and structure thermodynamics, miceller effects on hydrophobic interactions of protein structure, effect of additives on the CMC ,principle of micellar catalysis, micellar catalysis of hydrolysis, solvolysis , micellar enzymology.

#### **UNIT –IV**

**STRUCTURAL EFFECTS ON REACTIVITY** : Linear free energy relationships (LFER). The Hammett equation, substituent constants, theory of substituent effects. Interpretation of □-

values. Reaction constant  $\rho$ . Deviations from Hammett equation. Dual parameter correlations, Inductive substituent constant. The Taft model,  $\rho_1$ - and  $\rho_R$ -scales.

**KINETIC ISOTOPE EFFECT** : Theory of isotope effect. Primary and secondary kinetic isotope effects. Heavy atom isotope effect. Tunneling effect, Solvent effects and solvent isotope Effects

## UNIT –V

**SOLVATION AND SOLVENT EFFECTS** : Qualitative understanding of solvent solute effects on reactivity, Classification of solvents, Solvation, Thermodynamics of Solvation, effects of solvation on Reaction Rates and Equilibria, Various Empirical indexes based on Physical properties, Dielectric Constant, Grunwald- Winstein Parameters. Koppel Palm Treatment, Solvent sensitive Reaction Rates, Spectroscopic parameters and Scales for Specific Solvation, use of solvation Scales in Mechanistic studies, solvent effect from curve Crossing models

### BOOK SUGGESTED:

1. Introduction to Medicinal Chemistry, A Gringuage, Wiley – VCH.
2. Wilson and Gisvold's Test Book of organic Medicinal and Pharmaceutical Chemistry, Robert F. Dorde.
3. An Introduction to Drug Design, S.S. Pandeya and J.R. Dimmock, New Age International.
4. Burger's Medicinal Chemistry and Drug Discovery, Vol – 1(Chapter – 9 and Ch-14), Ed. M.E. Wolff, John Wiley.
5. Goodman and Gilman's Pharmacological Basis of Therapeutics, Mc Graw – Hill
6. The Organic chemistry of Drug Synthesis and Design Action, R.B. Silverman, Academic Press.
7. Strategies for Organic Drug Synthesis and Design, D. Lednicer, John Wiley.
8. Medicinal Chemistry, Alex Cringauz, Wiley-VCH, NY.
9. Comprehensive Medicinal Chemistry, Ed. Corwin Hanch, Vol. 1-6, Elsevier.
10. Biochemistry, the Chemical Reactions of Living Cells, David E. Metzler, Vol. I, Harwart Academic Press.
11. Micells & Y.Moroi
12. Mechanism and Theory in Organic Chemistry, T H Lowry and KS. Richardson, harper and Row.
13. Physical Organic Chemistry, N.S. Isaacs
14. The physical Basis of Organic chemistry, H.Maskil.
15. Text book of Organic, Medicinal and Pharmaceutical Chemistry, J.L.Delgado and W.A.Remers, Lippincott Williams of Williams.

## COURSE – III

### ADVANCED ENVIRONMENTAL CHEMISTRY

**M.M. - 100**

## UNIT-I

**HEAVY METAL TOXICOLOGY**: concept, heavy metals in environment (i.e. Arsenic, Selenium, Cadmium, Mercury, Thallium, Lead), sources, toxicity, transformations, biochemical effects, remedial measures

**ORGANIC POLLUTANT TOXICOLOGY:** introduction, application potential, limitation of pesticides uses, toxicology of major pesticides, environmental impacts of pesticides, pesticide persistence, bioaccumulation and biomagnifications pesticide resistance

**RADIATION HAZARDS:** introduction, atomic radiations, natural radiations, effects of radiations, radioactivity and effects on man, impacts of radioactive radiations, radioactive waste, ionizing radiation and effects, radiation protection

## UNIT-II

**INDUSTRIAL AND SLUDGE WASTE MANAGEMENT:** Municipal, sediment, steel plant, cement plant and thermal power plant.

**HEALTH IMPACTS:** human disease (i.e. infection disease, chemicals, diet, water born pathogens, vector born, Minamata disease), radiation damage, climate hange and human health, respiratory hazards.

**RISK ASSESSMENT:** Concept, risk evaluation (i.e. hazard identification, exposure assessment, hazard assessment and risk characterization), public perception of risk, risk communication.

## UNIT-III

**STANDARD FOR ENVIRONMENTAL QUALITY ASSESSMENT AND MONITORING:** Introduction, Environmental Protection standards in India, international standards, environmental quality monitoring: ISO14000, ISO14000-impact on developing countries

**ENVIRONMENTAL IMPACT ASSESSMENT:** concept, process, evaluation methodology, and approaches

**ENVIRONMENTAL AUDIT:** Concept, setting an audit programme, typical audit process, carrying out the audit, benefits of environmental auditing, environmental audit programmed in India

## UNIT-IV

Biotechnological approach of environment, Biodegradation of pollutants, toxic site reclamation, removal of spilled oil & grease deposits, reducing environmental impacts of herbicides and pesticides, biosensors.

Biotechnological energy and agricultural production management.

Biomass, biogas, bioethanol, biohydrogen, biofertilizers, biopesticides.

**BIOLOGICAL ENERGY:** Biofuels, natural vegetations, energy tree plantations, specific energy crops, power from biomass, biomass programmes, biomass and the environment.

## UNIT-V

**SUSTAINABILITY :** Concept, sustainable uses of natural resourced materials and waste management, sustainability in agriculture

**MODELS :** Mathematical models, approaches, model applications in air, aquatic and land environments.

**NATURAL DISASTERS :** Earthquakes, Tsunami, windstorms, floods, drought, volcanoes, el-nino, ozone hole, smog, pollen and their allergens, atmospheric turbidity.

### BOOK SUGGESTED:

1. Perry, G. 1980. Introduction of Environmental Toxicology, Elsevier, Netherland.
2. Santra, S.C. 1994, Ecology; Basic and Applied , M.D. Publication, New Delhi (India).
3. Santra, S.C. 2001, Enviromental Science, New Central Book Agency (P) Ltd. Calcutta (India).