

## **7-Point Scale Grading for PhD Course Work**

**As per UGC Gazette Notification (May 2016) and**

**Combined Ordinance No.11 of M. P. Government**

<b>Letter Grade</b>	<b>Grade Points</b>	<b>Description</b>	<b>Range of Marks</b>
O	7.00	Outstanding	92.5 – 100
A	6.37	Excellent	85 – 92.5
B	5.74	Very good	77.5 – 85
C	5.11	Good	70 – 77.5
D	4.48	Average	62.5 – 70
E	3.85	Pass	55 – 62.5
F	0	Fail	0 – 54
Ab	0	Absent	Absent

Summary of Grade determination:

$$55\% \text{ of } 7 = 3.85; 7 - 3.85 = 3.15; 3.15 / 5 = 0.63$$

Increment of 0.63 in 5-grades to reach 7.00 CGPA

$$\text{Equivalent percentage marks} = \text{CGPA} \times 100/7$$

## Ph.D. Course Work in Chemistry

### Paper I: Research Methodology

#### 1. Introduction to Research Design

Nature and objectives of research, Methods of research: Historical, descriptive and experimental, research process, research approaches, criteria for good research, meaning of research design, need of research design, features of good design, different research designs & basic principles of experimental designs, designs of experiments.

#### 2. Data collection and Analysis

Types of data, methods and techniques of data collection, primary and secondary data, meta analysis, historical methods content analysis, devices used in data collection, pilot study and pretest of tools, choice of data collection method.

#### 3. Data processing and Analysis

Measures of Central Tendency, Measures of Dispersion, Measures of Variation, Measures of Central Tendency vs Measures of Dispersion, Normal Distribution, Measures of Skewness and Interpretation, Correlation and Regression: Types and Applications.

#### 4. Test of Significance

Significance of difference in means: Standard deviation and standard error; Z-test, 't' test and Chi-square test: purpose and use, Analysis of variance.

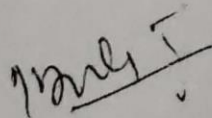
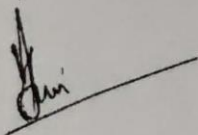
#### 5. Paper Writing and report generation

Basic concept of paper/ thesis writing, and report generation, writing Research Abstract. Introduction, Review of Literature, Results, Conclusion, Concepts of Bibliography and References, significance of Report Writing, Types of Research Reports, Methods of presentation of Reports, Formats of publication in Research Journals.

#### Reference Books\*:

1. Research Methodology: Methods and Techniques – C.R. Kothari, New Age Publisher.
1. Research Methodology: R.N. Trivedi and D.P. Shukla, College Book Depot, Jaipur.
2. Research Methodology: D. Chakraborty, Lotus Press.
3. Research Methodology for Life Sciences: N. Arumugam, Saras Publication.
4. Random Data Analysis and Measurements Procedures: Bendat and Piersol, Wiley Interscience.
5. Research Methodology: Bin Taylor, G. Sinha and T. Ghoshal, Prentice Hall of India Pvt. Ltd.
6. Methods in Biostatistics: B.K. Mahajan, Jaypee Brothers Medical Publishers, N.Delhi, India.
7. Research Design: J.W. Creswell, Sage Publications, INC.
8. Principles of Biostatistics: Marcello Pagano, CRC Press, Taylor and Francis

\*Latest Editions of the Books



Ph.D. Course Work in Chemistry

Paper III : Computer Applications and Bioinformatics

1. **Computer Fundamentals**

Computer Basics and Terminology, Input and output devices, Computer memory, Computer generation and Classification, Types of software, Operating System, Their Types, Basic terms related to Windows OS, Computer Networks, LAN, MAN, WAN. Research Polishing Tool- MS Word, Creating, editing and saving an word document, Use of Autotext Tables related operations, graphics.

2. **Introduction to Spreadsheet and Presentation**

Introduction to Excel, use of Spreadsheet in Research, Data Storing, Various Data Types, Use of Formula and Functions, Calculate, Manipulate and Analyses of Data preparing charts.

M.S. Power Point, Features and Functions, Creating presentation, Animation, Customizing presentation.

3. **Introduction to Internet and Computer Applications**

Introduction to Internet, WWW, Searching on Internet, Literature survey, website, Search Engines, Anti- Plagiarism software, Viruses and its Types, Protection from Viruses.

Introduction of computers in Research: Literature Search using various Search Engines, Writing References, Software for Reference arrangement, Statistical Packages: Sigma plot etc.

4. **Bioinformatics**

Applications of Bioinformatics in Life Sciences, Biological Database: Primary, Secondary and Composite Database, Sequence Database: Nucleic acid (EMBL and GenBank), Protein Database (PIR and SWISS-PROT), Structure Database: Protein Data Bank.

Sequence Analysis: Biological Motivation of Sequence Analysis, Homology, Base Pair

Alignment: Local, Global and Tools for Base Pair Alignment: BLAST and FASTA, Multiple Sequence Alignment: Methods.

5. **Phylogenetic Analysis, Protein Structure Predication, Drug Designing**

Phylogenetic Analysis: Methods, character based and distance based methods, tree evaluation.

Protein Structure Predications: homology modeling, threading, ab-initio methods.

Expression Sequence Tags (EST) and its Applications, Microarray Database and its Applications.

**Reference Books\*:**

1. An Introduction to Computational Biochemistry: C. Stan and T. Sal
2. Introduction to Bioinformatics: A Theoretical and Practical Approach: S.A krawetz & D.D. Womble. .
3. Bioinformatics, Genes, Proteins and Computers: C.a. Orengo, D.T. Jopnes, J.M. Thornton.

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## **Syllabus for PhD Course Work in Chemistry**

### **Paper-IV: Recent Advances in Chemistry**

**Course Objective:** This paper is to impart knowledge about

- Green Chemistry
- Applications of Spectroscopy
- X-ray Diffraction Techniques
- Electron & Neutron Diffraction Techniques
- Recent trends in Chemistry research

#### **UNIT-I: Green Chemistry**

Basic Principles of Green chemistry, designing a green synthesis, choice of starting materials, choice of reagents, choice of catalysts, choice of solvents, Green reagents, Green catalysts, Phase transfer catalyst for green synthesis, Organic synthesis in solid phase. Versatile ionic liquids as green solvents. Some examples of synthesis involving basic principles of green chemistry of industrial importance.

#### **UNIT-II Applications of Spectroscopy**

NMR techniques in the identification and characterization of organic and inorganic compounds. Two-dimensional and three-dimensional NMR methods including various pulse techniques.

#### **UNIT-III: X-ray Diffraction-I**

Crystal Lattice, Unit cell, asymmetric unit, Lattice types, Miller indices, X-ray diffraction by crystals (Bragg's Law), reciprocal lattice, Symmetry elements, Space groups, Centrosymmetric and non-centrosymmetric space groups, Systematic absences in crystal data.

## **UNIT-IV: X-ray Diffraction-II**

Structure solution: Phase problem (Fourier transform), Solution by Direct methods, Solution by Patterson methods. Refining crystal data: The least square method, fractional coordinates and atomic displacement parameters, Constraints and restraints, Disorder and Twinning, Publication of crystal data.

## **UNIT-V: Electron and Neutron Diffraction**

Electron and Neutron diffraction techniques in the identification and characterization of organic, inorganic and organometallic compounds.

### **Suggested readings:**

1. Ahluwalia, V.K. & Kidwai, M.R. *New Trends in Green Chemistry*, Anamalaya Publishers (2005).
2. Anastas, P.T. & Warner, J.K.: *Green Chemistry - Theory and Practical*, Oxford University Press (1998).
3. Matlack, A.S. *Introduction to Green Chemistry*, Marcel Dekker (2001).
4. Ryan, M.A. & Tinnesand, M. *Introduction to Green Chemistry*, American Chemical Society, Washington (2002).
5. Lancaster, M. *Green Chemistry: An Introductory Text* RSC Publishing, 2nd Edition, 2010.
6. NMR Spectroscopy by H. Gunther, Jon Wiley & Sons, 1996.
7. NMR Spectroscopy by Bovey, Jelinski and Mirau, Academic Press, 1988.
8. Principles of X-ray Crystallography by Li-ling Ooi, Oxford University Press, 2009.
9. X-ray Structure Determination by G. H. Stout and L. H. Jensen, John Wiley & Sons, 1989.
10. Electron and Neutron Diffraction by G D Arora, IVV Publishing House, 2009.