

- Mann F.G, and Saunders, B.C. (2009) Practical Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), Singapore.
- Vogel A.I. (2012) Elementary Practical Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), Singapore.

Teaching Learning Process:

- Conventional chalk and board teaching,
- Class interactions and discussions

Assessment Methods:

- Class Tests at Periodic Intervals.
- Written assignment (s) / Presentation by individual students
- End semester University Theory and Practical Examination

Keywords: Polynuclear Aromatic Compounds, Active Methylene Compounds, Heterocyclic Compounds.

11.2.13. Course Code: CHEMISTRY(DSE-RM)

Course Title: RESEARCH METHODOLOGY FOR CHEMISTS

Total Credits: 04 (Credits: Theory-03, Practical-01)
(Total Lectures: Theory- 45, Practical-30)

Objectives: To make the students aware of fundamental but mandatory ethical practices in chemistry. To make the students aware of data analysis. To make the students aware of literature survey in different modes. To make the students aware of safety handling and safe storage of chemicals. This paper will help student to learn to avoid plagiarism. To learn different e-resources.

Learning Outcomes:

By the end of the course, the students will be able to:

- Ethical practices in chemistry
- Data analysis
- Literature survey in different modes
- Three R (recovery, recycling and reuse of laboratory chemicals).
- e-resources.
- Plagiarism, consequences

Unit 1: Literature Survey

Print: Sources of information: Primary, secondary, tertiary sources; Journals: Journal abbreviations, abstracts, current titles, reviews, monographs, dictionaries, text-books, current contents, Introduction to Chemical Abstracts and Beilstein, Subject Index, Substance Index, Author Index, Formula Index, and other Indices with examples.

Digital: Web resources, E-journals, Journal access, TOC alerts, Hot articles, Citation index, Impact factor, H-index, E-consortium, UGC infonet, E-books, Internet discussion groups and communities, Blogs, Preprint servers, Search engines, Scirus, Google Scholar, ChemIndustry, Wiki- Databases, ChemSpider, Science Direct, SciFinder, Scopus.

Information Technology and Library Resources: The Internet and World Wide Web. Internet resources for chemistry. Finding and citing published information. publications of scientific work. Writing ethics. Avoiding plagiarism.

(Lectures: 20)

Unit 2: Chemical Safety and Ethical Handling of Chemicals

Safe working procedure and protective environment, protective apparel, emergency, procedure and first aid, laboratory ventilation. Safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressures above or below atmospheric – safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system, incineration and transportation of hazardous chemicals.

(Lectures: 12)

Unit 3: Data Analysis

The Investigative Approach: Making and Recording Measurements. SI Units and their use. Scientific method and design of experiments. Analysis and Presentation of Data: Descriptive statistics. Choosing and using statistical tests. Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals, General polynomial fitting, linearizing transformations, exponential function fit, r and its abuse. Basic aspects of multiple linear regression analysis.

(Lectures: 13)

PRACTICALS (Credits: 01; Laboratory Periods: 30)

1. Collection of journal articles on a particular topic using Google Scholar and creating a database.
2. Collection of journal articles on a particular topic using Science Direct and creating a database.
3. Collection of journal articles on a particular topic using Scopus and creating a database.
4. Collection of chemical structure using ChemSpider and creating a database.
5. Collection of chemical structure using SciFinder and creating a database.
6. Curve fitting using freely available softwares/apps (any one)
7. Making of power point presentation
8. Experimental learning of safe storage hazardous chemicals
9. Experimental learning of handling of hazardous chemicals

REFERENCES:

- Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) Practical skills in chemistry. 2nd Ed. Prentice-Hall, Harlow.
- Hibbert, D. B. & Gooding, J. J. (2006) Data analysis for chemistry. Oxford University Press.

- Topping, J. (1984) Errors of observation and their treatment. Fourth Ed., Chapman Hall, London.
- Harris, D. C. Quantitative chemical analysis. 6th Ed., Freeman (2007) Chapters 3-5.
- Levie, R. de, how to use Excel in analytical chemistry and in general scientific data analysis. Cambridge Univ. Press (2001) 487 pages.
- Chemical safety matters – IUPAC – IPCS, Cambridge University Press, 1992.
- OSU safety manual 1.01.

TEACHING LEARNING PROCESS:

Conventional chalk and board teaching with power point presentation, you tube videos and presentations from/for students on relevant topics.

ASSESSMENT METHODS:

Internal assessment through assignments and class test. End semester written and practical examination.

KEYWORDS: Research methodology, Literature Survey, Chemical Safety, safe storage, disposal, Ethical Handling, Data Analysis, print, digital and Information Technology and Library Resources.

11.3. SKILL INHANCEMENT COURSES (SEC)

NOTE: These are suggestive SEC courses. A student may however choose any SEC from the central pool of chemistry, physics or maths.

11.3.1. Course Code: ANALYTICAL CHEMISTRY (SEC-1)

Course Title: CHEMISTRY LAB STANDARD OPERATIONS AND SAFETY MEASURES

Total Credits: 02 (Credits: Theory-00, Practical-02)
(Total Lectures: Theory- 00, Practical-60)

Objectives: The course is aimed at introduction to a Chemistry Laboratory and cultivation of working skills in chemistry laboratory among the students for enhanced learning and to create a trained workforce which can responsibly learn imbibe and explore verticals on structured knowledge safely, as envisaged in the syllabi of the discipline.

Learning Outcomes:

By the end of this course, students will be able to:

- Conversant about the safe working practices in chemistry laboratory.