5. Spectrophotometry

   (i) Verification of Lambert-Beer's law and determination of concentration of a coloured species ($CuSO_4$, $KMnO_4$, $CoCl_2$, $CoSO_4$)

   (ii) Determination of concentration of coloured species via following methods;

   (a) Graphical method
   (b) Epsilon method
   (c) Ratio method
   (d) Standard addition method

References (Theory):

1. Willard, H.H.(1988),**Instrumental Methods of Analysis**, 7th Edition, Wardsworth Publishing Company.
2. Christian, G.D.(2004),**Analytical Chemistry**, 7th Edition, John Wiley & Sons, New York.
3. Harris, D. C.(2007),**Quantitative Chemical Analysis**,7th Edition, Freeman.
4. Khopkar, S.M. (2008), **Basic Concepts of Analytical Chemistry**, New Age International Publisher.
5. Skoog, D.A.; Holler F.J.; Nieman, T.A. (2017), **Principles of Instrumental Analysis,** Thomson Asia Pvt. Ltd.

References (Practical):

1. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C.(1989),**Vogel's Textbook of Quantitative Chemical Analysis**, John Wiley and Sons.

Credit Distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Basics of Polymer Chemistry	04	02	--	02	Class 12th with Physics, Chemistry, Mathematics	NA

Learning Objectives

The Learning Objectives of this course are as follows:

- To help the student to know about the synthesis, properties and applications of polymers.
- To give glimpse of polymer industry to the student and help them to choose their career in the field of polymer chemistry.

Learning Outcomes:

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

- Know about history of polymeric materials and their classification
- Learn about different mechanisms of polymerization and polymerization techniques
- Learn about different methods of finding out average molecular weight of polymers
- Differentiate between glass transition temperature (Tg) and crystalline melting point (Tm)
- Determine Tg and Tm
- Learn properties and applications of various useful polymers in our daily life.

Unit 1: Introduction to Polymeric Materials Hours:10

History of polymeric materials, Different schemes of classification of polymers, Polymer nomenclature
Molecular forces and chemical bonding in polymers, Physical and chemical properties of polymers
Solubility and Criteria for polymer solubility, Texture of Polymers, modification of polymers, Structure and property relationships, Introduction to conducting and biodegradable polymers.

Unit 2: Characterization of Polymers: Hours:10

Thermal characterisation of polymer: Glass transition temperature (Tg), thermal stability and decomposition of polymers, Molecular weight of polymers (Mn, Mw, etc.) by end group analysis, viscometry, light scattering technique and osmotic pressure methods.
Structural characterisation of polymers by IR and NMR spectroscopy.

Unit 3: Preparation, Properties and Uses of Polymers: Hours:10

Brief introduction to polymerisation, mechanism, properties and application of the following polymers: polyolefins, polystyrene, poly(vinyl chloride), poly(vinyl acetate), polyurethanes, acrylic polymers and polyamides. Phenol formaldehyde and urea formaldehyde, Silicone polymers, Conducting Polymers: polyacetylene, polyaniline, polypyrrole, polythiophene., Biopolymer: Cellulose and Chitosan.

Practical:
(Credits: 2, Laboratory periods: 60)

1. Preparation of nylon 6,6.
2. Redox polymerization of acrylamide.
3. polymerization of acrylonitrile.
4. Preparation of urea-formaldehyde resin.
5. Preparations of phenol-formaldehyde resin.

6. Determination of molecular weight of different polymers in water by viscometry.
7. Estimation of the amount of HCHO in the given solution by sodium sulphite method.
8. Demonstration for chemical structure and functional group in polymers using IR spectroscopy.
9. Purification of monomer and polymerisation of Styrene and Polymethylmethacrylate using BPO (Benzoyl Peroxide).
10. Polymerization of aniline and pyrrole by chemical polymerisation method.
11. Preparation of poly methylacrylate by emulsion and bulk polymerisation and compare the results.
12. Characterisation of polymers by IR spectroscopy.

References (Theory):

1. Ahluwalia V.K. & Mishra A**. Polymer Science :A Textbook**(2009) Anne Books.
2. Odian, G. (2004), **Principles of Polymerization**, John Wiley.
3. Billmeyer, F.W. (1984),**Text Book of Polymer Science**,3rd Ed., John Wiley.
4. Ghosh, P. (2001),**Polymer Science & Technology**, Tata Mcgraw-Hill.
5. Lenz, R.W. (1967),**Organic Chemistry of Synthetic High Polymers**, Interscience (Wiley).

References (Practical):

1. Hundiwale ,D.G.,Athawale V.D ,Kapadi, U.R.& Gite V.V, **Experiments in Polymer Science ,**New Age International Publishers .
2. Allcock, H.R.; Lampe, F. W.; Mark, J. E. (2003), **Contemporary Polymer Chemistry**, Prentice-Hall.
3. Fried, J.R. (2003), **Polymer Science and Technology**, 2nd Ed, Prentice-Hall.
4. Munk, P.; Aminabhavi , T. M. (2002), **Introduction to Macromolecular Science,** John Wiley & Sons.
6. Sperling, L.H. (2005), **Introduction to Physical Polymer Science**, John Wiley & Sons.