

## Cluster University of Srinagar

Course Code: UG-ICH-18C-602

Course Title: Green and Polymer Chemistry

M. Marks: 90

Continuous Assessment: 28+6 (Attendance)

Credits: 06 (4+2)

Contact hours: 60 + 60

End Term: 56 Mark

**Unit I: Green Chemistry-Theory****(16 hours)**

Green Chemistry: Introduction, Selection of starting materials for green chemistry, Microwaves and Sonication, Twelve principles of Green Chemistry, Water as green solvent for chemical reactions, Unique properties of water.

**Unit-II: Green Chemical Processes****(16 hours)**

Prevention of waste/ byproducts; Maximum incorporation of the materials used in the process into the final products (Atom Economy), Selection of appropriate auxiliary substances (solvents, separation agents), Green solvents, Solventless processes.

**Unit III: Polymerization Techniques****(16 hours)**

Classification of polymers, Types of polymerization reactions: Addition, Condensation and Copolymerization. Mechanism of addition polymerization: Free radical, Ionic and Coordination polymerization. Polymerization techniques: Bulk, Solution, Suspension and Emulsion polymerization.

**Unit IV: Commercially Important Polymers****(16 hours)**

Commercial manufacture and applications of: Polyethylene, Phenol-Formaldehyde resin, Styrene-Butadiene Rubber(SBR), Nylons.

Composites: History and classification, Conducting polymers, applications of conducting polymers.

**Lab Course****Unit V:**

32 hours

1. Microwave assisted Oxidation of alcohol using aqueous  $H_2O_2$ .
2. Synthesis of bio-diesel from vegetable oils.
3. Separation of organic dyes by TLC using green solvents.
4. Separation of Metal ions by TLC using green solvents.
5. Separation of food dyes using green solvents by TLC.

**Unit VI:**

32 hours

1. Preparation of urea formaldehyde resin.
2. Preparation of phenol formaldehyde resin.
3. Preparation of nylon 66 and its hydrolysis to recover the raw material.
4. Preparation of polystyrene using styrene.
5. Determination of acid value of a given plastic material.

**Books Recommended:**

1. Green Chemistry- Theory and Practice; P. T. Anastas and J. C. Warner; oxford; 2000
2. Green Chemistry- Environment Friendly Alternatives; Rashmi Sanghi & M. M. Srivastava; Narosa; 2007
3. Textbook of polymer science, 2<sup>nd</sup> edition; Fred W. Billmeyer, Jr ; Wiley interscience New York ; 1974.
4. Introduction to polymer chemistry; Raymond B- Seymour; McGraw Hill Book Company; 1971.
5. Industrial Chemistry. B.K.Sharma; Goel Publishing House, Meerut.

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