GREEN CHEMICAL ENGINEERING
(Professional Elective-II)

COURSE CODE:15CH1123

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3	0	0	3

COURSE OUTCOMES:

At the end of the course the student shall be able to

CO 1 Review the importance of Green Chemistry.

CO 2 Analyze the concepts of green chemistry in catalytic industry.

CO 3 Recognize the importance of green chemistry in organic synthesis.

CO 4 Analyze the role of green chemistry in bio catalysts.

CO 5 Classify the operating equipment for process intensification.

UNIT-I (10 LECTURES)

PRINCIPLES OF SUSTAINABLE AND GREEN CHEMISTRY

Green Chemistry and Industry, Waste Minimization, Reduction of Material Use, Reduction of Energy requirements, Reduction of Risk and Hazard, Concept of Sustainability, Green Chemistry and Sustainability Parameters.

Life Cycle Assessment: Tool for Identification of more sustainable products and processes

Life Cycle Methodology, Application of Life Cycle assessment.

UNIT-II (10 LECTURES)

Industrial Processes using Solid acid catalysts

1 Concept of Acidity and solid acid catalyst

2 Industrial application of solid acid catalysts

3 Recent developments in Catalytic materials and processes Micelle- templated silica as catalysts in Green Chemistry

4 Mesoporous materials : introduction

5 Catalytic applications : Oxidation Reactions like epoxidation, metal free epoxidation, arene hydroxylation, alkane oxidation, and base catalysis(other than oxidation)

UNIT-III (10 LECTURES)

Polymer supported reagents for organic synthesis

- Polymeric tools for organic synthesis: Polymeric reagents, Polymeric carriers, polymeric catalysts.
- Synthesis with polymer supported reagents
- Acids Chlorides and Anhydrides
- Alcohols, Aldehydes, Ketones, Amides, amines, azodyes, carbodiamides, epoxides, Esters, ethers, fluoro derivatives etc

UNIT-IV (10 LECTURES)

BIO CATALYSIS:

- Chemical Production using biocatalysis: bulk chemicals, Pharmaceuticals, Flavours and fragrance, Carbohydrates, polymers
- Green Biocatalytic processes: Biocatalysis in waste treatment and hydro-desulfurization
- Application of Sonochemistry, Microwave irradiation, electrochemistry and photochemistry in Green Chemistry

UNIT-V (10 LECTURES)

PROCESS INTENSIFICATION IN GREEN CHEMISTRY:

- Spinning Disc reactor, Micro reactors, Intensified cross-corrugated multifunctional membrane

TEXT BOOK:

Allen. D.T. and Shonnard, D.R., "Green Engineering: Environmentally Conscious Design of Chemical Processes", Prentice Hall, New Jersey, 2001.

REFERENCES:

Clark..J., and McQuarrie,D. (editors), "Handbook of Green Chemistry

and Technology", Blackwell Science, Oxford, 2002.