



GAYATRI VIDYA PARISHAD
COLLEGE FOR DEGREE AND PG COURSES(A)
B.Sc. THIRD YEAR REVISED SYLLABUS BY CBCS
SEMESTER-V, CHEMISTRY PAPER-VII
(GREEN CHEMISTRY AND NANOTECHNOLOGY)
(w.e.f. the admitted batch of 2020-21)

60 hrs per semester
CREDITS: 4

4hrs per week

Unit-I (CO1) : (12hrs)

Green Chemistry: Part- I

Introduction-Definition of green Chemistry, Need for green chemistry, Goals of Green chemistry Basic principles of green chemistry. Green synthesis- Evaluation of the type of the reaction

i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required and examples of sonochemical reactions (Heck, Hund's dicker and Wittig reactions).

Unit-II (CO2) : (12hrs)

Green Chemistry: Part- II

A) Selection of solvent:

i) Aqueous phase reactions

ii) Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation

iii) Solid supported synthesis

B) Supercritical CO₂: Preparation, properties and applications, (decaffeination, drycleaning)

C) Green energy and sustainability.

Unit-III (CO3) : (12hrs)

Microwave and Ultrasound assisted green synthesis:

Apparatus required, examples of MAOS (synthesis of fused anthraquinones, Leukart reductive amination of ketones) - Advantages and disadvantages of MAOS. Aldol Condensation –Cannizzaro reaction- Diels-Alder reactions-Strecker's synthesis.

Unit-IV (CO4) : (12hrs)

Green catalysis and Green synthesis

Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis - bio catalysis: Enzymes, microbes Phase transfer catalysis (micellar /surfactant)

1. Green synthesis of the following compounds: adipic acid, catechol, disodium menudo acetate (alternative Strecker's synthesis)

2. Microwave assisted reaction in water –Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols–microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction.

3. Ultrasound assisted reactions–sonochemical Simmons–Smith reaction (ultrasonic alternative to iodine)

Unit-V (CO5) : (12hrs)**Nanotechnology in Green chemistry**

Basic concepts of Nanoscience and Nanotechnology – Bottom-up approach and Top down approaches with examples – Synthesis of Nano materials – Classification of Nanomaterial – Properties and Application of Nanomaterial. Chemical and Physical properties of Nanoparticles – Physical synthesis of nanoparticles – Inert gas condensation - aerosol method - Chemical Synthesis of nanoparticles – precipitation and co-precipitation method, sol-gel method.

Course outcomes:

1. Engage in Microwave Assisted Organic Synthesis.
2. Demonstrate using the alternate Green Solvents in synthesis.
3. Demonstrate and explain Enzymic Catalysis.
4. Analyze alternate sources of energy and carry out Green Synthesis.
5. Carry out the chemical method and nanomaterial synthesis.
6. Understand the importance of Green Chemistry and Green Synthesis.

LABORATORY COURSE -VII

Practical Course-VII (Green Chemistry Practicals)

(At the end of Semester- V)

30 hrs per semester

2hrs per week
CREDITS : 1

Lab Work Course Outcomes:

On successful completion of this practical course, student shall be able to:

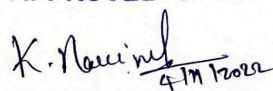
1. List out, identify and handle various equipment in the laboratory.
 2. Learn the procedures of green synthesis.
 3. Demonstrate skills in the preparation of Nanomaterials.
 4. Acquire skills in Microwave assisted organic synthesis.
 5. Perform some applications of Nanomaterials.
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1. Identification of various equipment in the laboratory.
 2. Acetylation of 1^o amine by green method: Preparation of acetanilide
 3. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
 4. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
 5. Green oxidation reaction: Synthesis of adipic acid
 6. Preparation and characterization of biodiesel from vegetable oil/ waste cooking oil
 7. Preparation and characterization of Nanoparticles of gold using tea leaves.
 8. Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.
 9. Photo reduction of Benzophenone to Benzopinacol in the presence of sunlight.

Reference books:

1. Green Chemistry Theory and Practical. P.T. Anastas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)
5. Principles and practice of heterogeneous catalysis, Thomas J.M., Thomas M.J., John Wiley
6. Green Chemistry: Environmental friendly alternatives R S Sangli and M.M Srivastava, Narosa Publications
7. Nanotechnology: Health and Environmental Risks, Jo Anne Shatkin, CRC Press (2008).
8. Green Processes for Nanotechnology: From Inorganic to Bioinspired Nanomaterials, Vladimir A. Basiuk, Elena V. Basiuk Springer (2015)
9. Web related references suggested by the teacher.


Head of the Department
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SYLLABUS APPROVED & RATIONALED


CHAIRMAN
B.O.S.