DEPARTMENT OF CHEMISTRY

 **GOVERNMENT DEGREE COLLEGE-PALAKONDA**

### Course6-D: Environmental Chemistry

### UNIT-I Introduction 10h

Environment Definition – Concept of Environmental chemistry- Scope and importance of environment in nowadays – Nomenclature of environmental chemistry – Segments of environment– Effects of human activities on environment – Natural resources–Renewable Resources–Solar and biomass energy and Nonrenewable resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydro logical cycle.

### UNIT-II

**Air Pollution 10h**

Definition – Sources of air pollution – Classification of air pollution – Ambient air quality standards- Climate change – Global warming – Pollution from combustion systems- Acid rain – Photochemical smog – Greenhouse effect – Formation and depletion of ozone – Bhopal gas disaster–Instrumental techniques to monitor pollution – Controlling methods of air pollution.

### UNIT-III

**Water pollution 10h**

Unique physical and chemical properties of water – Water quality standards and parameters – Turbidity- pH Dissolved oxygen – BOD, COD, Suspended solids, total dissolved solids, alkalinity– Hardness of water–Methods to convert temporary hard water in to soft water – Methods to convert permanent hard water into soft water – eutrophication and its effects –Industrial waste water treatment.

# UNIT-IV

### Chemical Toxicology 10h

Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium- Solid waste management.

###  UNIT-V

**Ecosystem and biodiversity 10h Ecosystem**

Concepts–structure–Functions and types of ecosystem–Abiotic and biotic components – Energy flow and Energy dynamics of ecosystem– Food chains – Food web– Tropic levels–Biogeochemical cycles (carbon, nitrogen and phosphorus)

### Biodiversity

Definition – level and types of biodiversity – concept- significance – magnitude and distribution of biodiversity–trends-bio geographical classification of India–biodiversity at national, global and regional level.

###  Course6-D: Environmental Chemistry – Practical syllabus

 **Practical (Laboratory) Syllabus**: (**30hrs**) (Max.50Marks)

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* 1. Identification of various equipment in the laboratory.
	2. Determination of carbonate and bicarbonate in water samples by double titration method.
	3. Determination of hardness of water using EDTA
		1. Permanent hardness b) Temporary hardness
	4. Determination of Chlorides in water samples by Mohr’s method.
	5. Determination of pH, turbidity and total solids in water sample.
	6. Determination of Ca+2 and Mg +2 in soil sample by flame photometry.
	7. Determination of PH in soil samples using pH metry.

 **Course7- D: Green Chemistry and Nanotechnology**

### UNIT-I Green Chemistry: Part- I

###  10 hrs

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

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

### UNIT- II Green Chemistry: Part- II 10 hrs

* 1. **Selection of solvent:**
1. Aqueous phase reactions
2. Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation. Iii) Solid supported synthesis
	1. **Supercritical CO2:** Preparation, properties and applications, (decaffeination, drycleaning)
	2. Green energy and sustainability.

### UNIT-III Microwave and Ultrasound assisted green synthesis: 10 hrs

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

### UNIT-IV Green catalysis and Green synthesis 10 hrs.

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 Nanotechnology in Green chemistry 10 hrs

Basic concepts of Nano science 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.

**Course7-D: Green Chemistry and Nano Technology – Practical syllabus**

**Practical (Laboratory) Syllabus: (30 hrs.)** (Max.50 Marks).

* 1. Identification of various equipment in the laboratory.
	2. Acetylation of 10 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 adipicacid
	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.