Central University of Himachal Pradesh
(ESTABLISHED UNDER CENTRAL UNIVERSITIES ACT 2009)
Dharamshala, Himachal Pradesh-176215

NAAC Criterion-I

Key Indicator –1.3.2

Brochure and course content and course outcome of value added courses offered

1.3.2Evidences

Department of Chemistry and Chemical Science

Central University of Himachal Pradesh, Dharamshala, Kangra

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Department of Chemistry and Chemical Science

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CCS 415- GREEN CHEMISTRY AND ITS APPLICATIONS (Credit -2)

UNIT I: **Introduction to Green Chemistry**

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry

UNIT II: **Principles of Green Chemistry and Designing a Chemicalsynthesis**

Twelve principles of Green Chemistry, solvent-free organic reactions. Green solvents– water, super critical fluids as a solvent for organic reactions, ionic liquids. Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy

UNIT III: **Examples of Green Synthesis/ Reactions and some real world cases**

Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis). Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid; microwave assisted reactions in organic solvents: Diels-Alder reaction and Decarboxylation reaction. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction, Cannizaro reaction, Strecker synthesis, Reformatskyreaction

UNIT IV: **Future Trends in Green Chemistry**

Oxidation reagents and catalysts; Biomimetic multifunctional reagents; Green chemistry in sustainable development.

CCS 538- BIOCHEMISTRY-I (Credit-2)

UNIT I: Proteins: Classification, Amino acid, property, primary, secondary, tertiary and quaternary structure of protein. Determination of primary structure. Enzyme: Classification, nomenclature, Kinetic of enzyme action, comparative, uncooperative and non comparative inhibition, allo enzyme, isozymes.

UNIT III: Vitamins and Hormones: Fat soluble and water soluble vitamins .Vitamins as co enzymes and co-factor.NAD, FAD, TPP, Folic acid, Vit.B6, Vit.B2, Lipoic acid, Co ASH, Epinephrine, nor epinephrine, Steroid hormones.

UNIT III: Chemistry of lipids: Structure and function of bio membranes. Structure and function of lipids. Chemistry of carbohydrates: Classification and importance constitution plants and bacterial cell wall. Animal cell coat.

UNIT IV: Bioenergetics: The ATP cycle. Nucleic Acids: DNA and RNA. Type of RNA and their function. Property of DNA in solution. Watson - Crick Model of DNA structure. Replication, Transcription and translation, (in detail). Regulation of gene expression.

CCS 539- BIOCHEMISTRY-II (Credit-4)

UNIT I: **Carbohydrates and Lipids**: Conformation of monosaccharides, structure and functions of important derivatives of monosaccharides. N-acetylmuramic acid, sialic acid, disaccharides and polysaccharides. Structural polysaccharides-starch and glycogen. Carbohydrate metabolism-Kreb's cycle, glycolysis, glycogenesis and glycogenolysis, gluconeogenesis, pentose phosphate pathway. Fatty acids, essential fatty acids, structure and function of triacylglycerols, glycerophospholipids, sphingolipids, cholesterol, bile acids, lipoproteins-composition and function, role in atherosclerosis. Properties of lipid aggregates-micelles, bilayers, liposomes and their possible biological functions. Biological membranes. Fluid mosaic model of membrane structure.

UNIT II: **Amino acids, Peptides, Proteins and Nucleic Acids**: Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing. Secondary structure of proteins, forces responsible for holding of secondary structures. A – helix, β-sheets, super secondary structure, triple helix structure of collagen. Tertiary structure of protein- folding and domain structure. Quaternary structure. Amino acid metabolism- degradation and biosynthesis of amino acids, sequence determination: chemical/enzymatic/mass spectral, recemization/detection. Chemistry of oxytocin and tryptophan releasing hormone (TRH). RNA and DNA Purine and pyrimidine bases of nucleic acids, base pairing via Hbonding. Structure of ribonucleic acids (RNA) and deoxyribonucleic acids (DNA), double helix model of DNA and forces responsible for holding it. Chemical and enzymatic hydrolysis of nucleic acids. The chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code. Regulation of gene expression.

UNIT III: **Enzyme and Co-enzyme Chemistry**: Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic powder,

specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by use of inhibitors, affinity labeling and enzyme modification by site directed mutagenesis. reversible and irreversible inhibition. Transition-state, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortation. Examples of some typical enzyme mechanisms for chymotrypsin, ribonuclease, lysozyme and carboxypeptidase A. Cofactors as derived from vitamins, coenzymes, prothetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD^+, $NADP^+$, FMN, FAD, lipoic acid, vitamin B12. Mechanisms of reactions catalyzed by the above cofactors.

UNIT IV: **Organic Macromolecules**: Rise of the concept of polymers, general method of preparation, polymerization techniques, mechanistic understanding Polymer geometry, structural unit variety, and structural unit orientation. Synthesis and modifications of Macromolecules: Polylolefins, polystyrene and styrene copolymers poly vinyl chloride and related polymers, poly vinyl acetate. Acrylic fluoro polymers. Aliphatic polyethers. Polyamides, polyimides, polyesters, phenolformaldehyde polymers. Amino-polymers Polyurethanes, oxides. Polydienes rubbers. Modification in natural polymers such as cellulose and proteins.

CCS 549- ELECTRONIC SPECTROSCOPY (ABSORPTION AND EMISSION) (Credit-2)

UNIT I: Qualitative treatment of Born-Oppenheimer separation, Frank-Condon principle, selection rules, characteristics of π-π^*, n-π^*, d-d transitions and their intensities. Apparent violation of selection rule (vibrational and spin-orbit couplings). Potential energy curves, mirror-image symmetry, deactivation – internal conversion and intersystem crossing, radiationless deactivation, fluorescence and phosphorescence.

UNIT II: Quenching of fluorescence, Life-time variation in presence of quencher. Excimers and exciplexes. Intermolecular energy transfer (FRET). Energy transfer and conformation distributions of biopolymers, protein fluorescence. Excited state proton transfer. Einstein theory – A, B coefficients, Principles of LASER and characteristic features.

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