

1.3.1. SYLLABI OF COURSES ADDRESSING 'ENVIRONMENT & SUSTAINABILITY'

All UG Programmes	Part IV / Environmental Studies	UEVS21
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UEVS21 -ENVIRONMENTAL STUDIES

Semester II

No. of Credits – 2

Objectives:

- 1) To develop knowledge base of students about the demographic and environmental factors affecting Business.
- 2) To make the students aware of environmental problems related to Business and Commerce.
- 3) To inculcate values of Environmental ethics amongst the students.
- 4) To build knowledge about the environment which is helpful to the society.

UNIT I

Environmental Studies: Definition – Multidisciplinary nature – Scope and importance – Need for public awareness. Natural Resources : Forest resources: Use and over- exploitation – Deforestation – Timber extraction – Mining – Dams and their effects on forests and tribal people – Water Resources: Use and over utilization of surface and ground water – Flood – Drought – Conflicts over water – Dams- Benefits and problems – Mineral resources: Use and exploitation – Environmental effects of extracting and using mineral resources – Food resources: World food problems – changes caused by agriculture and overgrazing – Effects of modern agriculture – Fertilizer and pesticides problems – Water logging – Salinity – Energy Resources: Growing energy needs – Renewable and non-renewable energy sources – Use of alternate energy sources – Land Resources: Land as a resource – Land degradation – Man induced landslides – soil erosion- Desertification – Case studies – Role of individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT II

Ecosystems: Concept – Structure and function – producers, consumers and decomposers – Energy flow – Ecological system – Food chains, food webs and ecological pyramids – Introduction, characteristics, Types, structure and function of Forest ecosystem – Grassland ecosystem – Desert ecosystem – Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT III

Biodiversity and its Conservation: Definition, Genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: Consumptive use – Productive use – Social, Ethical, Aesthetic and Option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: Habitat loss – Poaching of wild life, man wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-Situ and Ex-Situ conservation of biodiversity.

UNIT IV

Environmental Pollution: Definition- Causes, effects and control measures of Air, Water, Soil, Marine, Noise, Thermal pollution and Nuclear hazards – Solid waste management; Causes, effects and control measures of urban and industrial wastes- Disaster management: Floods, earthquakes, cyclone and landslides – Role of individual in prevention of pollution – Case studies.

UNIT V

Social Issues and the Environment: From unsustainable to sustainable development – Urban problems related to energy – water conservation, rainwater harvesting, watershed management – Resettlement and rehabilitation of people – Its problems and concerns – Environmental ethics; Issues and solutions – Climate change, Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust – Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environment legislation – Public awareness.

Human population and the Environment: Population growth – variation among nations – Population explosion – Family welfare program – Environment any human health – Human rights – value education – HIV/AIDS – Women and child welfare – Role of Information Technology in environment and human health – Case studies.

Field Work (25 marks)

- Visit to a local area to document environmental assets – River, Forest, grassland, hill, mountain.
- Visit to a local polluted site -Urban, rural, industrial, Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-pond, river, hill slopes etc.,

Text & Reference:

1. Arul P, (2008) "A Textbook of Environmental Studies" Selvi Publications.
2. Miller T.G. "Environmental Science: Wadsworth Publishing Co.
3. Townsend C, Harper J and Michael Gagon "Essentials of Ecology", Blackwell Science.
4. Trivedi R.K and Goel P.K "Introduction to Air Pollution", Techno-Science Publication.
5. Jadhav, H &Bhosafe, V.M (1995) "Environmental Protection and Laws", Himalaya Publishing house.

B.Sc., Chemistry	Part IV / SBE – III / Everyday Chemistry	UCHS53
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Programme: B.Sc.,

Subject: Chemistry

Semester: V

Course: Everyday Chemistry

Course Type: Part – III/ SBE-III

Credits: 2

Hours Required: 2 Hrs / Week

CIA: 25

CA: 75

Course Outcomes:

Description of COs	Bloom's Taxonomy Level
Comprehending the chemistry in all the products at home	Comprehension (Level 2)
Providing knowledge on the various components of objects	Knowledge (Level 1)
Explaining the cause and effect of using such products	Knowledge (Level 1)
Analyzing the safety measures to be followed	Analysis (Level 4)
Creating products and becoming entrepreneurs	Creation (Level 6)

COURSE CONTENT

Unit – I

Dairy chemistry milk – definition – general composition of milk – constituents of milk lipids, proteins, carbohydrates, vitamins and minerals. Physical properties of milk – colour, odour, acidity, specific gravity, viscosity and conductivity. Factors affecting the composition of milk – pasteurization, homogenization, toning, standardization, reconstitution of milk - adulteration of milk.

Unit – II

Mineral metabolism: calcium – source, daily requirement, blood calcium, hypocalcemia, phosphorus – functions of phosphate, requirement, source, normal serum level, functions. Sodium – normal level of sodium, excretion of sodium, restriction of sodium in diet, hypernatremia.

Unit – III

Preparation of tooth powder, paste, talcum powder, shampoo, handkerchief perfumers, dry perfume sachets, soap powder, diswashing powder, various soaps, toilet cleaning liquids.

Unit – IV

Wax products – candles, boot polish, furniture polish paste. Ink – blue, red, blue black, white board marker, printing ink, ink for stamp pad.

Unit-V

Safety matches –agarbathies naphthalene balls – chalk crayons – insecticides such as lice killer, mosquito repellent, cockroach terminator, mosquito repellent. Simple medicines: pain balm, digestive tablet, disinfectant solutions

Books for study

1. Swaminathan M. Advanced Text Book on Food and Nutrition , volume I and II Printing and Publishing CO., Ltd., Bangalore. 1993.
2. Swaminathan M. Text Book on Food chemistry, Printing and Publishing CO., Ltd., Bangalore. 1993.
3. Norman N. Potter , Food science, CBS publishers and distributors, New Delhi. 1994.
4. Lillian Hoagland Meyer, Food Chemistry, CBS publishers and distributors, New Delhi. 1994.

Books for Reference

1. Owen R Fennema, Food Chemistry, Marcel Decker Inc., New York. 1996.
2. Srilakshmi B., Food Science, New age International Pvt. Ltd. Publishers, III ed. 2003.
3. Siva Sankar B., Food Processing and Preservation. Prentice – Hall of India Pvt. Ltd., NewDelhi. 2002.
4. Ramakrishnan S., Prasannam K.G and Rajan R –Principles. Text book of medical biochemistry. Orient Longman Ltd. III ed. 2001.
5. ShakuntalaManay N. and Shadaksharaswamy M. FOODS: Facts and Principles. New age International Pvt. Ltd. Publishers, II ed. 2002

Online Resources:

1. <https://ncert.nic.in>
2. <https://www.gale.com>

B.Sc., Chemistry	Part IV SBS – I / Water Treatment	UCHS31
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Programme: B.Sc.,

Subject: Chemistry

Semester: III

Course: Water Treatment

Course Type: Part – IV/ SBE -I

Credits: 2

Hours Required: 2 Hrs / Week

CIA: 25

CA: 75

Course Outcomes:

Description	Blooms' Taxonomy Level
Gaining knowledge of water quality parameters, ground water and surface water pollution and its control measures.	Knowledge (Level 1)
Practising the water treatment methods, sewage and industrial effluent treatment methods and water resources management.	Synthesis (Level 6)
Applying various methods to avoid pollutants and their effect on environment and on human health	Application (Level 3)
Comprehending the concept of BOD & COD	Comprehension (Level 2)
Learning the basic information of water treatment methods for domestic and industrial purposes	Knowledge (Level 1)

COURSE CONTENT

UNIT – I

Uses of water – safe and wholesome water – sources of water supply: Rain: hydrological cycle, acid rain, artificial rain, rain water harvesting. Surface water: impounding reservoir, river and tanks – their characteristics and impurities. Ground water; wells and springs. Water borne diseases/substances affecting the potability of water.

UNIT – II

Effects of impurities in natural waters: colour taste and odour, turbidity and sediment and micro organism. Dissolved mineral matter – hardness types – estimation (EDTA method) – methods of softening – boiling, addition of lime – addition of sodium carbonate – ion exchange method.

UNIT – III

Clarification of water: sedimentation and filtration. Coagulation of water electrochemical coagulation – flocculants – sterilization and disinfection of water: chemical methods and physical methods.

UNIT- IV

Demineralization of water – ion exchange process – desalination of sea water: electrodialysis method, reverse osmosis methods. Water analysis: physical examination – chemical examination bacteriological examination – BOD, COD.

UNIT – V

Miscellaneous methods of water treatment: color, odour and taste removal – iron and manganese removal – fluoridation – defluoridation, prevention of plumb solvency – removal of slime and algae from water - de- oxygenation of water.

Text Books:

Environmental Chemistry, B.K. Sharma and H. Kaur, Goel Publishing House.1996.

Environmental Chemistry, A. K. De, 5th Edn., New Age International Publisher, 2005.

Environmental Chemistry, B. K. Sharma, 11th Edn., Krishna Prakashan Media L t d , 2007

Reference Books:

Chemical and Biological Methods for Water Pollution Studies, R.K. Trivedy and P.K. Goel, Environmental Publications, 1986.

Engineering Chemistry, P.C. Jain and Monica Jain, Dhanpat Rai and Sons, 1993.

Water Quality and Defluoridation Techniques, Rajiv Gandhi National Drinking Water Mission Publication, 1994.

M.Sc., Chemistry	Elective –III: Option – I: Environmental Chemistry and Green Chemistry	PCHE33
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Programme: M.Sc.,

Subject: Chemistry

Semester: III

Course: Environmental Chemistry and Green Chemistry

Course Type: Core Paper-I

Credits: 5

Hours Required: 5 Hrs / week

CIA: 5 CA: 5

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description of COs	Bloom's Taxonomy Level
Analysing the effect of Pollution and its prevention measures	Analysis (Level 4)
Designing the bio-catalytic reactions	Creation (Level 6)
Exploring the causes of global warming and its effects	Analysis (Level 4)
Applying the control and remedial measures of green house effect	Application (Level 3)
Evaluating about the various analytical green methods and protecting the environment	Evaluation (Level 5)

COURSE CONTENT

Unit I – Water Pollution

Types of water pollution, -Physical, chemical and biological types, ground water and surface water pollution – sources and harmful effects – sources and effects of major water pollutants – inorganic pollutants – oxygen demanding wastes - organic pollutants – plant nutrients – detergents – radioactive wastes – nuclear pollution – sources effects of ionizing and non-ionizing radiation. Significance of various water pollutants- thermal pollution

Unit II – Air Pollution

Atmosphere-structure – functions and photochemical reactions – sources of air pollution- natural and manmade – acid rain, classification and effects of air pollutants – CO, CO₂, SO₂, SO₃, NO and NO₂ – hydrocarbon as pollutant – reactions of hydrocarbons and effects – particulate pollutants – sources and effects of Organic particulate and Inorganic particulate Green House effect – impact on global climate – role of CFC's – ozone holes – effects of ozone depletion – smog-components of photochemical smog-effects of photochemical smog.

Unit III – Pesticides and Soil Pollution

Soil Pollution: Sources, Types, Pesticides – classification, mode of action – toxic

effects of chlorinated hydro carbons, organophosphorous compounds and carbamates
– alternatives to chemical pesticides – (pheromones, Juvenile hormones,
chemosterilization)

Unit IV – Treatment of drinking water

Removal of suspended impurities, removal of micro-organisms, Treatment of Effluents, 1^o
treatment,- Filtration, Coagulation, - 2^o treatment –oxidation ponds- 3^o treatment-reverse
osmosis, electrodialysis- Nanofiltration. uses of

Treatment of water for Industrial purpose- Hardness-softening methods-Zeolite-Limo-
soda- Ion Exchange methods.

Unit V Green Chemistry

Green Chemistry - Definition, principles and requirements, water mediated reactions -
solventless reactions – microwave assisted reactions – solid supported reactions – uses of
ionic liquids and supercritical carbon dioxide reaction in organized media –
calixarene, zeolites, cyclodextrin and other supramolecules as media for selection reactions -
clay catalysed reactions – definitions and examples of multicomponents reaction and
tandem reactions – atom economy reactions.

Books for study

1. Asim K.Das, Environmental Chemistry with Green Chemistry, Books & Allied (P)
Ltd, Kolkata, 2012.
2. B.K.Sharma, Environmental Chemistry, Goel Publishers, 2001.

Books for Reference

1. A.K. De, Environmental Chemistry, New Age International, Fifth Edition, 2005.
2. C. J. Gonzalez, D. J. C. Constable, Green Chemistry and Engineering, A practical
Design approach, Wiley Interscience, 2011
3. S. Parsons, B. Jefferson, Introduction to potable water treatment processes, Wiley
– Blackwell, 2006.

Online Resource

1. <https://static1.squarespace.com>
2. http://www.ilakes.org/config/hpkx/news_category/2015-06-03/ContaminatedSediments-2009.pdf

M.Sc., Chemistry	Core X: Chemistry of Natural Products and Bioinorganic Chemistry	PCHT41
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Programme: M.Sc.,

Subject: Chemistry

Semester: IV

Course: Chemistry of Natural Products & Bioinorganic Chemistry

Course Type: Core Paper-I

Credits: 5

Hours Required: 5 Hrs / week

CIA: 25 / CA: 75

Course Outcomes:

After completion of the course, certain outcomes are expected from the learners.

Description of COs	Bloom's Taxonomy Level
Analyzing the essential Chemicals present in the natural products.	Analysis (Level 4)
Identifying, comparing and explaining aspects related to drug design, drug action	Analysis (Level 4)
Assigning the future research in DNA, RNA properties	Application (Level 3)
Evaluating the role of metal ions in biological system	Evaluation (Level 5)
Drawing and residing the structure of DNA, RNA, Steroids, fatty acids, alkaloids, terpenoids	Creation (Level 6)

COURSE CONTENT

Unit I Proteins, peptides, Nucleic acid, Fats and Lipids

Structure and properties of amino acids and proteins, Zwitterions and purification of proteins

Nucleic acids – nucleotides and nucleosides – structure of purine and pyrimidine

bases; Phosphodiester bond, double helical structure of DNA. Structure of RNA

(tRNA)

Fatty acids - structure and classification, lipids classification and function (Simple,

compound and derived lipids)

Unit II Terpenoids

Classification of terpenoids with examples – isoprene rules – General methods of structural

determination of terpenes – structure and synthesis of *alpha*-pinene, cadinene, zingiberene

and abietic acid

Unit III Alkaloids

General methods of structure analysis of alkaloids – Hoffmann, Emde and von Braun

degradations – Structure and synthesis of quinine, papavarine, atropine, narcotine, reserpine

and lysergic acid.

Unit IV Steroids

Types of steroids – structure, stereochemistry and synthesis of cholesterol – Structural features of bile acids – Sex hormones – androsterone, testosterone, estrone, estradiol, estradiol, progesterone - Structure of ergosterol.

Circular birefringence, optical rotary dispersion, circular dichroism – Cotton effect curves – octant rule – axial haloketone rule - Applications of chiroptical properties in configurational assignments.

Unit V Bioinorganic Chemistry

Metal ions in biological systems: heme proteins, hemoglobin, myoglobin, hemerythrin, hemocyanin, ferritin, transferrin, cytochromes and vitamin B12; Iron-sulphur proteins: rubredoxin, ferredoxin and model systems. Classification of copper proteins and examples - Electron transfer (Cu, Zn) – Blue copper proteins

Metalloenzymes: active sites, carboxy peptidase, carbonic anhydrase, superoxide dismutase, xanthine oxidase, peroxidase and catalase; photosynthesis, water oxidation, nitrogen fixation, nitrogenase; ion pump, metallo drugs.

Books for study:

1. I.L. Finar, Organic Chemistry, Vol.II, ELBS 1985
2. S.J. Lippard, J.M. Berg, Principles of Bioinorganic Chemistry, Panima Publishing Company, 1977.
3. Gurdeep R Chatwal, Organic Chemistry Of Natural Products, Volume I , Himalaya Publishing House, 2009
4. L. Stryer, Biochemistry, 4th Ed., W. L. Freeman and Co, New York, 1995.
5. D. L. Nelson, M. M. Cox, Lehninger Principles of Biochemistry, 5th Ed.

Books for reference:

1. W. Kaim, B. Schwederski, Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, John Wiley & Sons, 1994.
2. Bioinorganic Chemistry, Chem. Education, 62, No. 11, 1985.
3. G.L. Eichorn, Inorganic Biochemistry, Volumes 1 & 2, 2nd Ed., Elsevier, 1973.
4. J.N. Davidson, The Biochemistry of Nucleic acids, ELBS, 1965.

Online resource

1. <https://www.routledge.com/Introduction-to-Natural-Products-Chemistry/Xu-Ye-Zhao/p/book/9781439860762>
2. <https://lecturenotes.in/m/25725-chemistry-of-natural-products>