

Scheme of teaching, learning & Examination leading to the Degree Bachelor of Science (Three Years ... Six Semesters Degree Programme - C.B.C.S)**B.Sc. Part II Semester-III Subject – Environmental Science**

Sr. No	Subjects	Subject Code	Teaching & Learning Scheme							Duration of Exams Hrs.	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks						Minimum Passing
			L	T	P	Total	Theory/Tutorial	Practical	Total	Duration of Exam Hours	Theory + M.C.Q External	Skill Enhancement Module Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
1	DSC-III Environmental Chemistry	EVS (3S)	6	-	-	6	4.5	-	4.5	03	80	20	-	-	100	40	p
2	Lab	EVS (3S) PR	-	-	6	6	-	2.25	2.25	08	-	-	25	25	50	25	P
Total			6		6	12	4.5	2.25	6.75	06	80	20	25	25	150	65	P

L: Lecture, T: Tutorial, P: Practical

Note : Internship /Field Work / Work Experience will be conducted after I semester till Vth semester in vacations for minimum 150 hrs. It's credits and grades will be reflected in final semester IV credit grade report.

- OEC (Optional) can be studied during semester I to VI, Its credits and grades will be reflected in final semester VI credit grade report

B.Sc. Part - II Semester - III Environmental Chemistry

Syllabus Prescribed for Second Year UG Programme

Programme-	Code of the course/Subject	Title of the course/ subject	Total Number of Periods
B.Sc.- Semester- 3	EVS TH 3/ Environmental Science	Environmental Chemistry	84

CO's

By the end of this program, the learners will be able to-

1. Understand basics of Environmental chemistry.
2. Acquires knowledge of toxicants, its interactions to living beings.
3. Physico- chemical properties of water
4. Understand distribution of different toxic chemical species of specific element distributed in environment.
5. Understand importance and role of macro and micro nutrient element in living beings.
6. Apply knowledge of environmental factors affects solubility of gases in water.

Unit	Content	Periods
I	A) Fundamentals of Environmental Chemistry- Laws of Thermodynamics, Chemical potential, chemical equilibrium, acid base reaction, solubility of gases in water, saturated and unsaturated hydrocarbons. B) Chemistry of biologically important elements- sources, role and effects (1) Energy exchange elements – Oxygen, Hydrogen (2) Activators and Inhibitors – Na, K, P, Ca (3) Trace elements – Ni, Mg, Mo, Cu, Fe.	14
II	Chemistry of Bio molecules – A) (1) Carbohydrates – Biological importance, classification, 2) Oils & Fats (Lipids)- Biological importance, (3) Proteins - Biological importance, types of proteins,(4) Enzymes – definition, classification, B) 1) Structure of Glucose & Sucrose 2) Fatty acids, properties of fatty acids 3) Amino acids, properties of amino acids. 4) Properties of enzyme and mechanism of action.	14
III	Toxicology- I A) (1) Definition, Scope, toxicants – definition, sources. (2) Factors influencing toxicity (acute, chronic and sub chronic exposures) B) (3) Evaluation of toxicity – acute toxicity – LC50, LD50 Sub acute toxicity test, chronic toxicity test (4) Bio magnification, biotransformation and Bioaccumulation.	14

IV	Toxicology-II A) (1) Bioremediation –definition, types.(2) Xenobiotics – definition & mechanism of Detoxification. B) Routs of exposure, mode of actions and physiological effects of – (a) aldrin, (b) B HC (c) DDT, (d) Synthetics detergents.	14
V	Chemistry of Water: A) (1) Chemical structure of water, Physico-chemical properties of water. B) (2) Chemical speciation of heavy metals – Hg – Distribution and Identification. Pb- Distribution and Identification.	14
VI	Renewable Energy Resources: A) (1) Solar Energy – Concept, Solar Collectors, Photovoltaics, Solar Water Heater, Solar Cooling, Solar Ponds, Solar Chimney (2) Wind Energy - Concept & Mechanism, Significance B) (3) Hydro power - Concept & Mechanism, Significance (4) Bioenergy – Biomass, Bio-alcohol, Biogas (5) OTEC – Principles, mechanism and significance.	14
SEM	<ul style="list-style-type: none"> • Study of properties of water. • Demonstration of solar / wind energy into electrical/ heat energy • Study of Bio energy sources. • Symptomatic diagnosis of deficiency of nutrient elements in plants. • Availability of pesticides (their Chemical Composition & toxicity) in market 	
Activ ities	Visit to Electric Power generation Plan (Solar, Wind, thermal/ Biogas Plant.	

Reference Books-

1. Environmental Chemistry by- Ayodhya Singh
2. Environmental Chemistry by- Reddy
3. Environmental Chemistry by- S.S. Dara
4. Environmental Chemistry by- H. Kaur.
5. Chemistry for Environmental Eng. and Sc by – C. N.Swayer , P.L. Macclly , G. F.Parkin.
6. Environmental Chemistry by- Chandrashekhhar Reddy.
7. Environmental Science – by S.C. Santra.
8. Environmental Chemistry by B.K. Sharma.
9. Environmental Chemistry by – A. K. Dey.
10. Concept of Environmental Chemistry – G. S. Soudhi ; Narosa publishing , New Delhi.
11. Environmental Chemistry by – R. C. Rsswell ; Edward Armolic Press.
12. Elements of Environmental Chemistry by –H. V. Jadhav.; Himalaya pub. House.

Sant Gadge Baba Amravati University, Amravati
Syllabus Prescribed for Second Year UG Programme
Programme- B.Sc.-II Semester- III (PR)

Code of the Course/ Subject	Title of the Course/ Subject (Lab/Pract)	No. of period.
EVS PR3/ Environmental Science	Environmental Chemistry	26 per Semester

COs

1. Demonstrate non-conventional energy sources.
2. Determines presences of bio-molecules in matter.
3. Analyses - effects of temperature on properties of enzymes.
4. Acquire the technique of paper chromatography.
5. Understand the effect of toxic substance on human health.

Expt. No	Title experiment.
1	Estimation of trace elements by paper chromatography.
2	Estimation of normality of given acid/alkali.
3	Estimation of residual chlorine by titration method.
4	Study the effects of temperature on activity of enzyme.
5	Qualitative estimation of carbohydrates from sample.
6	Estimation of proteins / amino acids by Ninhydrin test.
7	Demonstration of immobilization of enzyme.
8	To study the activity of amylase enzyme on starch.
9	Study solubility of Oxygen /CO ₂ in water at different temperatures.
10	To study toxicological parameters given in leaflets of Toxic Products from market.
11	Toxic effect of chemicals on the seed germination
12	To determine acidity / Alkalinity of water sample.
13	Demonstration of non-conventional energy sources by working models. (i) Solar cells, (ii) Solar cooker, (iii) Wind mills, (iv) Solar water Heaters.

B.Sc – II SEM - III

Distribution of Practical Marks. (INTERNAL)(Max. Marks. – 25)

Time : 5 Hrs.

Q.1 Laboratory regularity and punctuality	10
Q.2 Assignment based on practical	05
Q.3 Participation in Local visit and Excursion	05
Q. 4 Test based on practical	05

Total Marks : 25

B.Sc – II SEM - III

Distribution of Practical Marks. (EXTERNAL) (Max. Marks. – 25)

Time : 5 Hrs.

Q.1 Any one major experiment based on environmental Chemistry	07
Q.2 Any one minor experiment based on Toxicology / Biochemistry	05
Q.3 Experiment on Renewable Energy	05
Q.4 Practical record	05
Q.5 Viva – voce	03

Total Marks : 25

Scheme of teaching, learning & Examination leading to the Degree Bachelor of Science (Three Years ... Six Semesters Degree Programme - C.B.C.S)**B.Sc. Part II Semester-IV Subject – Environmental Science**

Sr. No	Subjects	Subject Code	Teaching & Learning Scheme							Duration of Exams Hrs.	Examination & Evaluation Scheme						
			Teaching Period Per week				Credits				Maximum Marks					Minimum Passing	
			L	T	P	Total	Theory/Tutorial	Practical	Total	Duration of Exam Hours	Theory + M.C.Q External	Skill Enhancement Module Internal	Practical		Total Marks	Marks	Grade
													Internal	External			
1	DSC-IV Environmental Pollution	EVS (4S)	6	-	-	6	4.5	-	4.5	03	80	20	-	-	100	40	p
2	Lab	EVS (4S) PR	-	-	6	6	-	2.25	2.25	05	-	-	25	25	50	25	P
Total			6		6	12	4.5	2.25	6.75	08	80	20	25	25	150	65	P

L: Lecture, T: Tutorial, P: Practical

Note : Internship /Field Work / Work Experience will be conducted after I semester till Vth semester in vacations for minimum 150 hrs. It's credits and grades will be reflected in final semester IV credit grade report.

- OEC (Optional) can be studied during semester I to VI, Its credits and grades will be reflected in final semester VI credit grade report

B.Sc. Part - II Semester - IV Environmental Pollution

Syllabus Prescribed for Second Year UG Programme

Programme-	Code of the course/Subject	Title of the course/subject	Total Number of Periods
B.Sc.- Semester- 4	EVS TH 4 /Environmental Science	Environmental Pollution	84

CO's

By the end of this program, the learners will be able to-

1. Understand concept of environmental pollution.
2. Evaluate degree of environmental pollution.
3. Acquire knowledge of sources of environmental pollution
4. Apply knowledge to control pollution and suggest steps to protect natural resources
5. Aware about major global environmental issues.
6. Identifies possible effects of specific pollutant on environment.

Unit	Content	Periods
I	A) Air pollution – Classification, sources of air pollution, major air pollutants, types of air pollution, B) Effects of air pollutants on plants, effects of air pollutants on human, effects of air pollutants on materials, status of air pollution in India.	14
II	A) Water pollution – Definition, sources of water pollution, major pollutants, types of water pollution – fresh water (rivers, streams, ponds, lakes and underground water resources), marine water (coastal and estuarine), B) Effects of water pollution on plants, animals and human beings, eutrophication, water pollution status in India, drinking water quality standards.	14
III	A) Land pollution – Definition, Process of soil formation causes of soil pollution, major soil pollutants, B) Effects of soil pollutants on plants and animals, nutrients in soil (NPK), domestic, municipal, industrial, and agricultural wastes and their relation with soil degradation, soil salination	14
IV	A) Noise pollution – Definition, sources, effects of noise pollution, psychological and physiological effects of noise pollution, unit of noise, B) Monitoring of noise pollution , noise pollution standards, techniques of measurements of noise pollution, Indian scenario of noise pollution.	14
V	A) Radiation pollution – Definition, sources, major radioactive isotopes, nuclear fusion & fission reactions, units of radiations,	14

	B) Application of radioactive isotopes in various field, effects of radioactive pollution, effects of nuclear weapons, radioactive fallout, health and environmental effects of radioactive fallout.	
VI	A) Major Environmental Issues: (A) Climate change, Global Warming, Green House Effect (causes, consequences and control measures) Ozone depletion mechanism, consequences and control measures. (B) Case Studies and Episodes (i) Bhopal Gas Tragedy (ii) London Smog (iii) Fluoride Pollution in India.	14
SEM	<ul style="list-style-type: none"> • Sampling and analysis of air pollutants. • Determination of pollutants in local water bodies. • Study of eutrophication and local water body. • Study of excessive use of chemical fertilizers on soil. • Analysis of soil from solid waste dumping site. • Measurement of noise levels. 	
Activities	Visit to Lake / Pond / River to study sources and consequences of pollution status and process of Eutrophication.	

Reference Books-

1. Ecology and Environment – P.D. Sharma
2. Environmental Chemistry – V.P. Khudesia
3. Environmental Chemistry – B.K. Sharma
4. Environmental Chemistry – Kaur.
5. Industrial Chemistry – B. K. Sharma
6. Environmental Biology & Toxicology – P.D.Sharma
7. Environmental Toxicology – Mido,
8. Biochemistry- Leninger
9. Biochemistry- Satyanarayan
10. Environmental Engineering – S.S.Deswal
11. Water supply & Sanitary Engineering – Rangawala
12. Environmental pollution control Engineering– C.S.Rao, Newage international publication
13. Solar Energy – Sukhatme.
14. Indian Industry – A Geographical perspective- K. Siddhartha,S.Mukherjee
15. Renewable Energy – 2nd edition- Godfrey Boyle (Oxford)
16. Shreve's Chemical Process industries- George T. Austin
17. Environmental Chemistry – Chhatwal Anand
18. Plant Physiology – Salisbury & Ross
19. non-Conventional energy Resources – G. D. Rai
20. Experimental Methods for General & Environmental Chemistry – Dr. Anita Rajor
21. Environmental Guidelines and Standards in India – P. K. Goel & K.P. Sharma, Techno Science Publications, Jaipur
22. Environmental Sciences, Daniel Botkin & Edward Keller, John Wiley & sons, New York
23. Environmental Sciences, Eldon D. Enger and Bradley F.Smith, WCB Publishers, Boston
24. Environmental Chemistry – A.K. De, Wiley Eastern ltd. New Delhi
25. Physico Chemical Examination of Water , Sewage, and Industrial Effluent, Pragati prakashan, Meerut.

Sant Gadge Baba Amravati University, Amravati
Syllabus Prescribed for Second Year UG Programme
Programme- B.Sc. - II Semester - IV

Code of the Course/ Subject	Title of the Course/ Subject (Lab./ Pract.)	No. of period.
EVS PR-4 / Environmental Science	Environmental Pollution	26 per Semester

CO's

1. To Acquire the technique of High Volume Sampler.
2. Evaluate degree of SPM by paper method .
3. Acquire knowledge of sampling of SO_x/ NO_x
4. To understand water quality by different water analysis technique.
5. Identifies possible effects of solid waste on environment.
6. To understand hazardous effects of noise.

Expt. No	Title Experiment.
A Experiments on Air	
1	To estimate RSPM by High Volume Sampler
2	To determine settleable Particulate Matter by paper method in your area.
3	Sampling and analysis of SO _x / NO _x
4	Estimation of CO ₂ from air.
5	To prove, the PM/ Smoke, Sox and CO ₂ liberate during combustion of Coal.
B Experiments on Water	
1	Estimates the Chloride from given water sample.
2	Determination of Total Hardness of given water sample
3	Determination of D.O. of given water sample
4	Determination Sulfates from given water sample.
5	Determination Phosphate from given water sample
6	Estimation of oil and grease from given water sample
7	Determination of Nitrogen from soil by Kjeldhals Method
8	Identification and enumeration of bacteria from air and water
C Experiments on Soil/ Solid waste	
1	Physico chemical Analysis of soil from waste dumping Yard.
2	Determination of physical and chemical properties of Solid waste
3	To study composition of solid waste
4	To study Principle and working of Noise Level Meter
5	Survey of Noise Levels Institute/ Traffic/Market.

B.Sc – II SEM - IV

Distribution of Practical Marks. (INTERNAL)(Max. Marks. – 25)

Time : 5 Hrs.

Q.1 Laboratory regularity and punctuality	10
Q.2 Assignment based on practical	05
Q.3 Participation in Local visit and Excursion	05
Q. 4 Test based on practical	05

Total Marks : 25

B.Sc – II SEM - IV

Distribution of Practical Marks. (Max. Marks. –25)

Time : 5 Hrs.

Q.1 Any one major experiment based on Air Pollution	07
Q.2 Any one minor experiment based on Water Pollution	05
Q.3 Any one experiment based on Soil/ Solid waste	05
Q.4 Practical record.	05
Q.5 Viva – voce	03

Total Marks : 25