

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY**CIRCULAR NO.SU./B.Sc.CBC & GS/11/2022**

It is hereby inform to all concerned that, on the recommendation of Faculty of Science & Technology Meeting dated 24.08.2022, **the Academic Council at its meeting held on 29 August 2022 has accepted the following Syllabi of B.Sc. Degree under the Choice Based Credit & Grading System along with Rules and Regulation** as appended herewith:-

1.	B.Sc.Computer Science (Optional)	Ist and IInd semester
2.	B.Sc.Computer Application (Optional)	Ist and IInd semester
3.	B.Sc.Computer Application (Degree)	Ist and IInd semester
4.	B.Sc.Computer Science (Degree)	Ist and IInd semester
5.	B.Sc.Horticulture (Optional)	Ist to VIth semester
6.	B.Sc.Botany (Optional)	Ist to VIth semester
7.	B.Sc. Agrochemical & fertilizer (Optional)	Ist to VIth semester
8.	B.Sc.Home Science (Optional)	Ist and IInd semester
9.	B.Sc.Automobile Technology (Degree)	Ist and IInd semester
10.	B.Sc.Workshop Technology (Degree)	Ist and IInd semester
11.	B.Sc.Refrigeration and Air Conditioning (Degree)	Ist and IInd semester
12.	B.Sc.Environmental Science (Optional)	Ist and IInd semester
13.	B.Sc.Biotechnology (Degree)	Ist and IInd semester
14.	B.Sc.Biotechnology (Optional)	Ist and IInd semester
15.	B.Sc.Dairy Sci.& Tech (Optional)	Ist and IInd semester
16.	B.Sc.Zoology (Optional)	Ist to VIth semester
17.	B.Sc.Polymer Chemistry (Optional)	Ist and IInd semester
18.	B.Sc.Fisheries Science (Optional)	Ist and IInd semester
19.	B.Sc.Instrumentation Practice (Optional)	Ist semester
20.	B.Sc.Biochemistry (Optional)	Ist and IInd semester
21.	B.Sc.Non Conventional & Conventional Energy (Degree)	Ist and IInd semester

This is effective from the Academic Year 2022-23 and onwards.

All concerned are requested to note the contents of this circular and bring notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.

Ref.No. SU/B.Sc./2022/ 8428-35

Date:-29.08.2022.

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[Signature]
Deputy Registrar,
Academic Section

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Copy forwarded with compliments to :-

- 1] **The Principal, concerned affiliated College,**
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
- 2] **The Director, University Network & Information Centre, UNIC, with a
request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examinations & Evaluation,
- 2] The Section Officer,[B.Sc.Unit] Examination Branch,
- 3] The Programmer [Computer Unit-1] Examinations,
- 4] The Programmer [Computer Unit-2] Examinations,
- 5] The In-charge, [E-Suvidha Kendra],
Rajarshi Shahu Maharaj Examination Branch,
- 6] The Public Relation Officer,
- 7] The Record Keeper,

JS*29082022/-

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Dr. Babasaheb Ambedkar Marathwada University
Aurangabad - 431004 (MS) India



Undergraduate Bachelor Degree Program
in Science (B. Sc.)
Environmental Science (Optional Subject)

Course Structure and Curriculum
(Outcome based Curriculum)

Choice Based Credit System
(Effective from Academic Year 2022-23)

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad – 431004 (MS) India

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1. Preamble

The course curriculum for undergraduate studies under choice based credit system (CBCS) for B.Sc. in Environmental Science is framed in this document. This exercise was undertaken as part of the nationwide curriculum restructuring initiative by the National Education Policy.

As enshrined in the National Education Policy vision of introducing course curriculum for undergraduate studies under Choice Based Credit System (CBCS), the main objective of framing this curriculum of B.Sc. in Environmental Science is to impart the students a holistic understanding of the subject giving substantial weightage to the core contents, skill, value-based and ability enhancement. The syllabus has given due importance on the main streams of the body of knowledge on 'Environment' with due recognition of its wide spectrum. The ultimate goal of the syllabus is to enable the students to have an in-depth knowledge on the subject and enhance their scope of employment at every level of exit. Adequate emphasis has been given on the new and emerging techniques and understanding of the subject under the changing regime and global context.

There is need to strengthen the students to understand essential aspects of environmental science in diverse subject areas such as ecology, environmental chemistry, environmental pollution, environmental geo-science, atmospheric sciences, biodiversity, natural resources management, global warming, climate change and waste management. The curriculum lays focus on creating new knowledge, acquiring new skills and capabilities in Environmental Science producing an intelligent human resource serving the Environment and society, focusing on problem solving critical thinking, team work and collaboration. There is also an additional emphasis in providing opportunities to understand the integration of modern disciplines such as environmental modeling, geographical information systems and remote sensing, environmental sustainability, corporate governance and their applications to environmental sciences. Students would be encouraged to go beyond the classroom and conduct active action-research, research projects, technology based learning and internships in industry/ private/government/manufacturing and service sectors based on suitability. Lectures and classroom sessions are accompanied with on-field visits, industrial visits, seminars, laboratory experiments and in-plant training. Educational visits are an integral part of teaching Environmental Science. These interventions are compulsory and essential aspects of the curriculum. There are optional subject that can be chosen by the students as per their desire and their professional choices. It is hoped that a student with a four years B.Sc. Environmental Science degree, after having the rigor of the courses outlined here, will feel adequately equipped to meet the challenges of career development. At the same time, there is sufficient content for those who wish to continue academic life at the University beyond the under-

graduate level. Due care has been taken to maintain necessary academic wholesomeness and depth in the course content so that the learning outcomes from these courses will lead to intellectual growth of a student. The need for a Basic course in Environmental Sciences is necessitated by our country's requirement and also the acceptability of the subject by young students from the view point of career opportunity. There is a demand for the subject in our country and as Educationists we have a societal obligation to meet such aspirations of the youths. It is equally expected that Environmental Science graduates will significantly contribute to the vision of 'Zero Defect, Zero Effect' policy initiative of Government of India.

2. Structure and Curriculum for Bachelor of Science (B. Sc.) Environmental Science (Optional Subject)

(Choice Based Credit System)

**Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad**

Choice Based Credit System (CBCS)

Curriculum For

Faculty of Science and Technology

Course Structure and Scheme of

Examination

B.Sc. Three Year Undergraduate Degree Program

Semester I

	Course Code	Course Title	Total periods (Teaching periods/week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1A) Core Courses	EVS-111	Core Course (Theory Paper-I) Foundation of Environment	45(3/week)	2	50	10	40	20
	EVS -112	Core Course (Theory Paper-II) Chemical Aspects of Environment	45(3/week)	2	50	10	40	20
	EVS -121	Lab course 1 (based on EVS -111 and EVS-112)	45(3/week)	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-1)	XXX-131	Communication skills in English-I	45(5/week)	3	50	10	40	20
	XXX-132	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-I)	45(4/week)	3	50	10	40	20
			225	11.5	250	50	200	100

Total Credits for Semester I : 11.5 (Theory : 10 ; Laboratory : 1.5)

Semester II

	Course Code	Course Title	Total periods (Teaching periods/week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1B) Core Courses	EVS-211	Core Course (Theory Paper-III) Natural Resources Management	45(3/week)	2	50	10	40	20
	EVS - 212	Core Course (Theory Paper-IV) Solid waste and Hazardous waste management	45(3/week)	2	50	10	40	20
	EVS -221	Lab course II (based on EVS - 211 and EVS -212)	45(3/week)	1.5	50	10	40	20
Ability Enhancement compulsory courses (AECC-2)	XXX -231	Communication skills in English-II	45(5/week)	3	50	10	40	20
	XXX-232	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-II)	45(4/week)	3	50	10	40	20
Non-Credit Course	XXX-213	Constitution of India	45(3/week)	2*	50			
Non-Credit Course /additional credits	XXX-214	Compulsory Computer Course	45(3/week)	2*	50			
			225	11.5	250	50	200	100

Total Credits for Semester II : 11.5 (Theory : 10 ; Laboratory : 1.5)

Semester III

	Course Code	Course Title	Total periods (Teaching periods/week)	Credits	Scheme of Examination			
					Max Mark	CIA	UA	Min Marks
Optional I (DSC-1C) Core Courses	EVS -311		45(3/week)	2	50	10	40	20
	EVS - 312		45(3/week)	2	50	10	40	20
	EVS -321	Lab course 3 (based on EVS -311)	45(3/week)	1.5	50	10	40	20
	EVS -322	Lab course 4 (based on EVS -312)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-1)	XXX-313	SEC-1 Any one skill to be chosen out of two SEC-1(A) , SEC-1 (B)	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-3)	XXX-331	Communication skills in English-III	45(5/week)	3	50	10	40	20
	XXX-332	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-III)	45(4/week)	3	50	10	40	20
			315	15	350	70	280	140

Total Credits for Semester III : 15 (Theory : 12 ; Laboratory : 3)

Semester IV

	Course Code	Course Title	Total periods (Teaching periods/week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSC-1D) Core Courses	EVS-411		45(3/week)	2	50	10	40	20
	EVS- 412		45(3/week)	2	50	10	40	20
	EVS-421	Lab course 4 (based on EVS-411)	45(3/week)	1.5	50	10	40	20
	EVS-422	Lab course 5(based on EVS-412)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-2)	XXX-413	SEC-2 Any one skill to be chosen out of two SEC-2(C) , SEC-2 (D)	45(3/week)	2	50	10	40	20
Ability Enhancement compulsory courses (AECC-4)	XXX-431	Communication skills in English-IV	45(5/week)	3	50	10	40	20
	XXX-432	Marathi/Hindi/Urdu/Sanskrit A student can opt for any one of these languages (SL-IV)	45(4/week)	3	50	10	40	20
Additional credits		Environmental Studies	45(3/week)	2*	50	10	40	20
			315	15	350	70	280	140

Total Credits for Semester IV : 15 (Theory : 12 ; Laboratory : 3)

Semester V

	Course Code	Course Title	Total periods (Teaching periods/week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 A) Discipline Specific Elective	EVS- 511		45(3/week)	2	50	10	40	20
	EVS- 512		45(3/week)	2	50	10	40	20
	EVS-521	Lab course 6 (based on EVS-511)	45(3/week)	1.5	50	10	40	20
	EVS-522	Lab course 7 (based on EVS-512)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course(SEC-3)	XXX-513	SEC-3Any one skill to be chosen out oftwo SEC-3(E) , SEC-3 (F)	45(3/week)	2	50	10	40	20
			225	9	250	50	200	100

Total Credits for Semester V : 9 (Theory : 06 ; Laboratory : 03)

Semester VI								
	Course Code	Course Title	Total periods (Teaching periods/week)	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 B) Discipline Specific Elective	EVS-611		45(3/week)	2	50	10	40	20
	EVS-612		45(3/week)	2	50	10	40	20
	EVS-621	Lab course 8 (based on EVS-611)	45(3/week)	1.5	50	10	40	20
	EVS-622	Lab course 9 (based on EVS-612)	45(3/week)	1.5	50	10	40	20
Skill Enhancement course (SEC-4)	XXX-613	SEC-4 Any one skill to be chosen out of two SEC-4(G) , SEC-4 (H)	45(3/week)	2	50	10	40	20
			225	9	250	50	200	100
Total Credits for Semester V : 09 (Theory : 06 ; Laboratory : 03)								
Total Credits for three years : Sem I (11.5) + Sem II (11.5) + Sem III (15) + Sem IV (15) + Sem V (09) + Sem VI (09) = 71 Credits								

3. Vision
4. Mission
5. Program Educational Objectives:
6. Programme Outcomes (POs) and Programme Specific Outcomes:
7. Eligibility:
8. Duration
9. Medium of Instructions
10. Choice Based Credit System (CBCS) and Credit-to-contact hour Mapping:
11. Attendance:
12. Evaluation Methods/ Scheme of Examination, Earning Credits, Grading System
13. Curriculum for Semester I
14. Curriculum for Semester II
15. Curriculum for Semester III
16. Curriculum for Semester IV
17. Curriculum for Semester V
18. Curriculum for Semester VI

Template for the designing curriculum of various courses/ papers

Course Code and Course Title

Total Credits: 02

Contact Hours: 30 (Clock Hours)

Marks: 50

Periods: 45 (50 minutes each)

Learning Objectives of the Course

Learning Outcomes of the Course

Unit I : 10 Periods

Unit II: 10 Periods

Unit III: 10 Periods

Unit IV : 10 Periods

Unit V: Tutorials, seminars and Assignments (05 Periods)

References:

Important Notes:

- i) **Nomenclature:** DSC- Discipline Specific Core course, SEC – Skill Enhancement Course, AECC- Ability Enhancement compulsory course, DSE- Discipline Specific Elective, UA- University Assessment (Semester End), CIA-Continuous Internal Assessment
- ii) **There shall be one skill enhancement course (SEC) IIIrd to VIth Semester (any one SEC course to be chosen (any one from three optional subjects) from the basket of SEC courses for the respective semester.**
- iii) **Code description:** EVS code has to be decided by BOS of the respective subject while designing their respective curriculum (e.g. for Environmental Science it will be EVS)

- The codes for first semester courses will start from EVS-111, Second-semester courses will start from EVS-211 and so on
 - EVS111 : The first digit indicate the Semester Number, the second two digits indicate paper numbers for the first-semester courses and the same analogy is for the remaining semesters
 - The codes for theory courses will start from EVS -111 (for the first semester and the same analogy is for the remaining semesters)
 - The codes for practical courses will start from EVS -121 (for the first semester and the same analogy is for the remaining semesters)
 - The codes for Ability Enhancement compulsory courses will start from EVS -131 (for the first semester and the same analogy is for the remaining semesters)
- iv) **Assessment:** 80% for University Assessment (Semester End Examination) and 20 % for Continuous Internal Assessment (CIA)
- v) **Continuous Internal Assessment (CIA): Theory** (10 Marks): Internal Test 05 Marks (Two Internal Tests of 05 marks each and average of the two test will be considered) and 05 Marks for Assignment/tutorials.
- vi) **Continuous Internal Assessment (CIA): Practical** (10 Marks): 07 Marks for Internal Practical Examination and 03 Marks for record book/submission of collection and field survey report and excursion report
- vii) **Practical examination** : Annual examination

B. Sc. I Year Semester I
Core Course (Theory Paper-I)
EVS- 111: Foundation of Environment

Course Objectives

Students will be able to know

1. Dynamics of ecosystems, energy flow in ecological system, nature of a biotic and biotic components and stability concept of ecosystem.
2. Various types of degraded ecosystems, ecological succession, concept of climax and role of pioneer's species in restoration of ecosystems.
3. Population dynamics, prey predator relationship, concept of community, community competition and ecological sustainability.
4. Nature and status of renewable and non-renewable resources, mineral resources, fishery resources, energy resources and recycle, reuse and recovery of these resources.

Unit-I: - Ecosystem Dynamics: (10)

Concept of ecosystem, A biotic and biotic components, Energy in ecological system, Concept of productivity, Energy flow in ecosystem, Food chain, Food web, Ecological pyramids, Biogeochemical cycles of nitrogen, oxygen and carbon.

Unit –II: Ecological succession (10)

Types of ecological succession, Mechanism of succession, Concept of climax, Concept of Gaia hypothesis. Concept of habitat, Ecological niche, Guild, concept of ecotone, Edge effect. Significance of ecological adaptation, Ecological adaptation in plant- Hydrophytes, Xerophytes, Mesophytes and Halophytes.

Unit-III:-Restoration of Degraded Ecosystems: (10)

Degraded ecosystems such as, Forest, grassland, Desert ecosystem, Lentic and Lotic ecosystems, Coastal ecosystems, etc., Role of pioneer species in restoration, Major biomes of world.

Unit-IV: - Population and Community Ecology: (10)

Concept of population ecology, Population dynamics, Characteristics of population: Natality, Mortality, Fecundity, Density, Age distribution, Prey predator Relationship, Population explosion: Concept of community, Interspecific and intraspecific competition, Concept of carrying capacity.

Unit-V: Tutorials, seminars and Assignments (05)

Course Outcome

Students should be able to:

1. Define ecological systems and its functionality along with stability concept of ecosystem
2. Describe various types of pioneer species and their role in restoration of ecosystems.
3. Recognize ecological succession, concept of climax and degraded ecosystem.
4. Examine nature and status of renewable and non renewable energy resources, mineral resources and energy resources.

References

1. Fundamentals of Ecology – E.P. Odum, Revised Edition 1995-96
2. Principles of Ecology – P.S. Verma, V.K. Agarwal, S. Chand and Co. Delhi.
3. Principles of Environmental Science – Wart K.E.F. (1973) McGraw Hill Book Company.
4. Basic Ecology – E.P. Odum
5. Concept of Ecology – E.J. Koromondy, 1996, concept of modern biology series, prentice Hall.
6. Modern Concepts of Ecology – H.D. Kumar
7. Principles of Environmental Biology – P.K.G. Nair, Himalaya pub. House, Delhi
8. Environmental Biology – P.D. Sharma, Rastogi Publication, Meerut.
9. Ecology and Environment - P.D. Sharma, Rastogi Publication, Meerut.
10. Basic concepts of soil science – A.K. Kolay, Willey estern ltd., New Delhi.
11. Environmental Science – Enger, Smith, Smith, W.M.C. Brown company publishing
12. Practical Method in Ecology – R.K. Trivedi, P.K. Goel and Trisal.,Enviro Publication, Karad.
13. Chemical methods for Environmental Analysis Water and sediments – R.Ramesh, M. Anbu. Macmillan India Ltd. New Delhi.
14. Fundamental of Ecology – Dash M.C. Tata McGraw Hill Pub. Co. Ltd. NewDelhi.
15. Concepts of Ecology (Fourth Edition)- Edward J. Kormondy, Prentice Hall of India Pvt. Ltd. New Delhi.
16. Environment forest, ecology and man – Dixit R.K. Rastogi Publication, NewDelhi.
17. Environment, energy, health planning for conservation – V. Vidyanath, Gyan Publishing House, New Delhi
18. Air pollution-M.N. Rao
19. Air pollution- A.C. Stern, Academic press Vol. I-X.
20. Air pollution-V.P. Kudesia.
21. Air pollution control-NEERI
22. Air pollution-Magill Holder and Ackely
23. Water pollution-A.K. Tripathi and S.N. Pande
24. Waste water engineering, treatment, disposal and reuse-Metcalf and Eddy.
25. water supply and sanitary engineering-R.C. Rangwala

B. Sc. I Year Semester I
Core Course (Theory Paper-II)
EVS-112: Chemical Aspect of Environment
Course Objectives

Students will be able to know

1. Understand the basics concepts of Chemistry
2. Acquire the knowledge of composition of Air, Water & Soil
3. Identify the chemical aspects of Environment.
4. To analyze processes for Air, Water & Soil

Unit-I: -Basic Concepts of Environmental Chemistry: (10)

Energy-definition, types (kinetic and potential), Forms of energy: Laws of thermodynamics (First & Second), Stoichiometry, Gibbs energy, Chemical potential, chemical equilibrium, Acid-base reactions. Solubility product, Solubility of gases in water.

Unit-II: - Chemical Agents in Environment: (10)

Introduction, definition, Scope, Importance , Role of chemical agents in environment, Basic water chemistry, Impurities, Basic principles and sources, Gases solubility in water, Heat influencing chemical reactions, Solubility of impurities, Characteristics of sanitary spent water, Concentration, Normality, Molarity, concept of dilution , Serial dilution, Single step and multiple step dilution, Sample collection guidelines, Sample preservation , Sample order.

Unit-III: Chemistry of Air : (10)

Classification of elements, Composition of air, Chemical speciation, particles, Ions and radicals in the atmosphere, Chemical processes for formation of inorganic and organic particulate matter, Toxic chemicals in environment, Pesticides, Insecticides, Arsenic, Cadmium, Lead, Mercury, Carbon monoxide and Ozone, MIC and other carcinogens in air and water. Chemistry of Ozone layer, Ozone layer depletion, Causes and effects. Greenhouse effect: Major greenhouse gases, Causes and effects. Global Warming, Causes and effects.

Unit -IV: - Chemistry of Water and Soil: (10)

Chemistry of water, Structure of water molecule, Solubility of compounds in water, Dissociating constant, Water quality parameters and standards, Chemistry of soil, Composition of soil, Biogeochemical cycles (nitrogen, oxygen, carbon, Sulphur, phosphorus etc.), Micronutrients of soil, Factors effecting the soil quality, Adsorption of contaminant in soil, Toxic chemicals present in soil.

Unit V: Tutorials, seminars and Assignments (05)

Course Outcome

Students should be able to:

- Define basic aspects of environment
- Explain chemical contamination in the environment
- Apply the knowledge of chemistry to analyze air, water and soil quality
- Evaluate the level of pollution in environment

References

1. Environmental Chemistry- G.S. Sodhi.
2. Environmental Science –S.C.Santra
3. Environmental Chemistry- S. E.Mannhan
4. Environmental Chemistry – A.K. De
5. Environmental Chemistry-A global perspective; G.W. Vantoon and S.J. Duffy, Oxford Uni. Press, London.
6. Environmental chemistry – B.K. Sharma
7. Environmental chemistry – B.K. Sharma and H. Kaur
8. Environmental pollution analysis – S.M. Khopkar
9. Environmental chemical analysis – Lanin L. Marr, Malcom S.
10. Environmental Chemistry – Kanan Krishnan.
11. Environmental Chemistry – S.K. Banerjee.
12. Environmental Chemistry – J.W. Moore and E.A. Moore.
13. Destruction of hazardous chemicals in the laboratory: G. Lunn and E.B. Sansone.
14. A text book of Environmental Chemistry and pollution control – S.S. Dara.
15. Environmental Chemistry – M. Satake, Do. S. Sethi, S.A. Eqbal.
16. Environmental and Man: The chemical environment: J. Lenihan and W.W. Fletcher.
17. Environmental Chemistry – S.S.Dara

B. Sc. I Year Semester I
EVS-121: Lab Course- 1
(Practical paper based on paper EVS-111 and EVS-112)

1. To study the 'Laboratory Safety Rules'.
2. To study the cleaning methods of glass wears.
3. To study the First-Aid and emergency treatment in laboratory.
4. Collection and Preservation of phytoplankton and zooplankton samples from different Water bodies (river, pond, Lake etc)
5. The qualitative study the phytoplankton's (any 10 specimens).
6. The qualitative study the zooplanktons (any 10 specimens).
8. Collection of hydrophytes, xerophytes, mesophytic and halophytic plants / animals Specimens.
9. Study of xeric adaptation in plants, morphometrically and histologically.
10. Study of xeric adaptations in animal (at least 5 specimen's morphometrically)
11. Study of mesophytic specimens (at least 5 specimens).
12. To study the laboratory equipments and instruments (Oven, Microscope, Incubator, Inoculation chamber, Autoclave, Electronic balance, pH meter, Colorimeter, Turbidity meter, etc).
13. To study the preparation of regents of different Normality and Molarities (i.e. 1 N, 0.1N, 1M, etc).
14. Study of various equipments used in air pollution.
15. Detection of SO₂ gas and its effect on plants.
16. Detection of NH₃ gas and its effect on plants.

Note:

- i) Duration for each practical is of 04 periods.
- ii) Study tour /field visits are compulsory.

B. Sc. I Year Semester II
Core Course (Theory Paper-III)
EVS- 211: Natural Resources Management

Unit I: Natural Resources:

(10)

Definition; Classification; Concept of renewable and nonrenewable resources; their conservation and importance, Role of Individuals and NGOs in Resource Conservation: Environmental movements such as 'Chipko', Western Ghats, and Silent valley, Narmada, Project agitation etc.; Role of individuals and NGO's in natural resource conservation.

Unit II: Energy Resources:

(10)

Renewable and non-conventional energy resources like solar, wind, geothermal, tidal and wave energy, biomass, biogas and biodiesel, hydroelectric energy; Atomic energy, on-renewable and conventional energy resources like coal, petroleum, fuel gases; Environmental impacts of energy exploitation, Energy conservation.

Unit IV: Forest and Wildlife Resources:

(12)

Importance of forests and wildlife; Types of forest resources; Overexploitation of forests; Deforestation; Forest management and conservation; Wildlife conservation; National parks and sanctuaries; Biosphere reserves.

Unit IV: a) Water Resources and conservation:

(10)

Water resources on the earth; Consumption and uses of water; Management and conservation of water resources; Rain water harvesting, drip irrigation.

b) Mineral and Soil Resources:

Types and Importance of minerals and soil; Important minerals of India; Mineral extraction and environmental problems; Conservation of mineral resources; Reclamation of mining areas. Soil erosion, conservation of soil.

Unit V: Tutorials, seminars and Assignments

(05)

References:

1. Environmental Chemistry – B.K.Sharma
2. Ecology and Environment – P.D Sharma
3. Geography of India – Majid Hussain
4. Environmental Studies- Arun K.Tripathi
5. Environmental Geography- Savindra Singh
6. Oceanography- Savindra Singh
7. Environmental studies -Erach Bharucha
8. Environmental studies –Irani Dipti
9. Craig, J.R., Vaughan. D.J. & Skinner. B.J. 1996. Resources of the Earth: Origin, Use, and Environmental Impacts (2nd edition). Prentice Hall, New Jersey.
10. Freeman, A.M. 2001. Measures of value and Resources: Resources for the Future. Washington DC.
11. Freeman, A.M. 2003. Millennium Ecosystem Assessment: Conceptual Framework. Island Press.
12. Ginley, D.S. & Cahen, D. 2011. Fundamentals of Materials for Energy and
13. Environmental Sustainability. Cambridge University Press.
14. Klee, G.A. 1991. Conservation of Natural Resources. Prentice Hall Publication.
15. Miller, T.G. 2012. Environmental Science. Wadsworth Publishing Co.
16. Ramade, F. 1984. Ecology of Natural Resources. John Wiley & Sons Ltd.
17. Tiwari, G.N. & Ghosal. M. K. 2005. Renewable Energy Resources: Basic Principles and Application. Narosa Publishing House.

B. Sc. I Year Semester II
Core Course (Theory Paper-IV)
EVS- 212: Solid and Hazardous waste management

Unit I- Introduction (10)

Introduction to MSW, Composition and Waste characteristics of MSW, Collection, Segregation and Transfer Operation, Waste system, current scenario, MSW generation in India, Model for appropriate waste collection and segregation, reference model, mode of collection, micro-route planning and maps, transfer stations, Management and Handling Rules of MSW.

Unit II- Treatment Method for MSW (10)

1. Anaerobic Digestion, 2. Aerobic Digestion, 3. Vermicomposting, 4. Incineration, 4) Mass Burn and Refuse-Derived Fuel, 5. Waste To Energy (WTE), Dioxin and furans, heavy metals, 6. Landfill (Basic Landfill Constructions and operations, Decomposition and phases in Landfill) Types landfills (Secured Landfill, Sanitary Landfill).

Unit III- Integrated Solid Waste Management (10)

Source Reduction, Green, Material Selection, Product System Life Extension, Material Life Extension, Reduced Material Intensity, Process Management, Efficient Distribution, Eco-labels, Lifecycle Assessment, The 5 R's-Reduce, Recycle (Paper & Paperboard, Plastics, Glass Containers, Aluminum), Reuse, Remanufacture, Recover (Energy Recovery & Material Recovery)

Unit- IV- Hazardous waste Sources and Management (10)

Hazardous Waste Management: Definition and identification of hazardous wastes-sources and characteristics – hazardous wastes in Municipal Waste – Hazardous waste regulations –minimization of Hazardous Waste-compatibility, handling and storage of hazardous waste-collection and transport, e- waste -sources, collection, treatment and reuse management. Hazardous waste treatment: Hazardous waste treatment technologies, Biomedical Waste management: Biomedical (Handling and Management) Rules 2008, sources and disposal.

Unit-V- Tutorials, seminars and Assignments (05)

References

1. George Tchobanoglous et al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993. 177
2. B. Bilitewski, G. HardHe, K. Marek, A. Weissbach, and H. Boeddicker, "Waste Management", Springer, 1994.
3. Municipal Solid Waste Management – N. N. Bandela, D.G. Tare, B.R. Publishing Corporation, 2009
4. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
5. R.E. Landreth and P.A. Rebers, "Municipal Solid Wastes – problems and Solutions", Lewis Publishers, 1997.
6. Bhide A.D. and Sundaresan, B.B., "Solid Waste Management in Developing Countries", INSDOC, 1993.
7. George Tchobanoglous et al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993. 177
8. B. Bilitewski, G. HardHe, K. Marek, A. Weissbach, and H. Boeddicker, "Waste Management", Springer, 1994.
9. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
10. R.E. Landreth and P.A. Rebers, "Municipal Solid Wastes – problems and Solutions", Lewis Publishers, 1997.
11. Bhide A.D. and Sundaresan, B.B., "Solid Waste Management in Developing Countries", INSDOC, 1993.
12. Gilbert Masters, "An Introduction of Environmental Engineering", McGraw-Hill Publishers.
13. Dr. P.K. Behra, Dr. S.K. Sahu and M.S. Shivarama, "Encyclopedia of Hazardous Waste Management", Dominate Publishers and Distributors.

B. Sc. I Year Semester II

EVS-221: Lab Course- 2

(Practical paper based on paper EVS-211 and EVS-212)

1. Measurement of Electrical Conductivity.
2. Determination of Total Hardness.
3. Determination of Dissolved Oxygen.
4. Determination of Alkalinity
5. Determination of Free CO₂
6. Determination of Turbidity.
7. Determination of soil Temperature.
8. Determination of Soil Moisture
9. Determination of soil pH.
10. Determination of organic matter in soil .
11. Monitoring wind speed and direction.
12. To study the Vermicomposting bed.
13. Determination pH & Electrical conductance of Municipal solid waste.
14. Determination of Moisture content of municipal solid waste.
15. Determination of potassium of Municipal solid waste.
16. Percent composition study of solid waste for organic and inorganic matter.

