

ENVIRONMENTAL STUDIES

Classes VIII – XII

Rationale

The secondary and higher secondary stage is crucial and challenging stage of school education as it is a transition from general science to discipline-based curriculum. Environmental Studies is an integral part of learning. The protection of the environment today is the concern of the people all around the globe. Ecological challenges are growing in every part of the earth, whether regions are developed or developing in industrialization and modernization. In India deforestation, land degradation, pollution of rivers are the central features of environmental crisis. In such a scenario, it is extremely important to imbue in learners an environmental consciousness.

Only when today's youth is made aware and knowledgeable about the environmental disasters facing the earth, will they be motivated to conserve nature and to find solutions to the problems, both local and global that loom in our horizon. The goal to make Environmental Studies a compulsory subject is indeed commendable. However, formal education must be planned in a way that environmental concerns and values are inculcated in students throughout their school life.

The proposed syllabus for Environmental Studies (Environmental Education) at the Secondary & Higher Secondary Stage has been developed with a view that this stage of school education is crucial and challenging for the need of environmental education as an essential part of curriculum to instill the environmental ethic in the fabric of our society is now well recognized. The recommendations of National Curriculum Framework (2005) have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. Due care has been taken that the syllabus is not heavy at the same time it is comparable to the international standards. The syllabus provides logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding.

It is expected that the syllabus will help to develop an interest in the learners to study Environmental Education as a discipline and inculcate in learners the abilities, useful concepts of real-life situation for making learning of environment relevant, meaningful and interesting. The learner is expected to realize, appreciate and understand his nature and his relationship with it.

Salient features

- Emphasis on basic conceptual understanding of content.
- Emphasis on the balance for the learners from the Arts, Commerce and Science streams
- Promoting process-skills, solving abilities and applications of environmental concepts/ contents, useful in real-life situations for making Environmental Studies /Environmental Education more relevant, meaningful and interesting.
- Emphasis on the use of numerous illustrations to give the students the exact mental image of the subject discussed.
- Emphasis on environmental-related technological/ industrial aspects to cope up with the fast changing scenario.

- Providing logical sequencing of the subject matter and proper placement of concepts for better learning and matching the concepts/ content with comprehension level of the learners.
- Reducing curriculum load by eliminating overlapping of concepts/content within the discipline of Environmental Education, making room for contemporary core topics and emerging curricular areas.
- The syllabus is arranged in units spread over three terms for the Secondary level and over two years duration for the Higher secondary level. The time allocation for learning Environmental Education content per unit in terms of instructional periods have been mentioned for each unit to help teachers and learners to cover it within the time frame. There is an imperative need for evaluating the learners through continuous and comprehensive evaluation of various concepts covered in a unit.

With this background, the Environmental Studies curriculum attempts to:

- Strengthen the concepts developed and sensitize students towards the environment and to create in them a responsibility towards local, national and global concerns.
- Expose the learners to different aspects of environmental concerns
- Develop process-skills, observational, manipulative, decision-making and investigatory skills in learners
- Understand the relationship between man and his nature, develop positive scientific attitude and appreciate the concept that environment has taken a central part of human life and its existence.

AIMS & OBJECTIVES

- To develop an understanding of ecosystem and their interrelations.
- To develop an awareness about the utilization, over exploitation of natural resources.
- To recognize the need for keeping pollution under control in order to maintain the quality of life.
- To acquire skills to analyze and interpret information relating to environmental problems.
- To develop the ability to identify, analyze and reflect upon different environmental concerns.
- To develop skills for effectively tackling problems related to the local environment.
- To adopt practices that help in promoting balance in nature by making judicious utilization of resources and materials.
- To develop love, affection, sensitivity and sense of responsibility towards all living beings.
- To appreciate and respect legal provisions for protection of animals and plants.
- To imbibe the essence of environmental values and ethics in order to live in harmony with nature.

EVALUATION & MARKING

Evaluation on this subject is to be strictly followed. There will be one paper of 3 (three) hours duration carrying 80 (eighty) marks and for Internal Assessment in the Activities assign of 20 (twenty) marks at the Secondary Level. At the Higher Secondary Level there will be one paper of 3 (three) hours duration carrying 70(seventy) marks and for Internal Assessment in the Activities assign of 30(thirty) marks.

For effective evaluation and understanding with interest on the subject the Question pattern are to be of Objective Type Questions which includes the following:

- a) Multiple Choice questions of 1 (one) mark each.
- b) Fill in the blanks of 1 (one) mark each.
- c) True or False of 1(one) mark each.
- d) Short answer type questions of 2/ 3 (two / three) marks each.

With regards to Internal Assessment a credible system of evaluation should be re-assessed by an External Examiner through viva voce of each student.

ENVIRONMENTAL STUDIES

CLASS VIII

Unit I. BALANCE IN NATURE (Periods: 20) [10 marks]

- (a) Ecosystem: - Definition, structure, function and its importance.
- (b) Energy flow through ecosystem (food chain, food web); examples of terrestrial and aquatic food chains.

Unit II.HARNESSING RESOURCES (Periods: 44) [30 marks]

- (a) Sources of Energy:- Renewable and non renewable resources, availability and potential.
- (b) Renewable Resources:- solar, wind, hydro-energy, ocean (tidal), biomass including water wastes.
- (c) Non renewable resources:- Coal, petroleum and natural gas.
- (d) Utilization of resources for industry:- Processing and production of goods, need for efficient and environmental friendly technologies, industrial waste and waste management practices.
- (e) Environmental Concerns:- National and Regional (coal mining, uranium mining, limestone extraction)

Unit III. ENVIRONMENTAL FACTORS : Cause and effect (Periods: 80) [40 marks]

- (a) Emerging lifestyles in modern societies:- Over utilization of resources, increasing consumption of energy (electricity and fuels).
- (b) Synthetic materials:- Plastics, detergents, paints and refrigerants; advantages and disadvantages of using them.
- (c) Pollution:- Definition, types (soil, water, air and noise), sources , impact on physical environment and all forms of life (diseases), control and preventive measures (modern and traditional).

- (d) Disasters:- Natural and man-made, major types and their causes, impact on environment and human life.
- (e) Impact of environment degradation on: - Natural habitats, living forms (endangered and extinct species).
- (f) Population and Environment:- Definition of species, community, population; Population growth and its impact on:-
- i) Environment (Deforestation, extinction of species, land settlements)
 - ii) Common social and civic facilities.
- (g) Protecting the environment:- Role of individuals, community and government in; planning, decision-making, legislation and social action for prevention of pollution and improvement of environment.

Exemplar Activities (Internal Assessment)

[20 marks]

Students must undertake at least one activity in a year. Teachers may design their own set of activities keeping in view the overall objectives of teaching and learning of environmental education at this stage. They will have to make use of local flora and fauna and the available resources and facilities and take cognizance of local environmental problems. The learners should be encouraged to initiate action on their own. As illustrations activities may be of the following types:

- Helping learners to collect samples of water from different available sources like portable water, drain water, water stagnant in pits, industrial or factory discharge: guiding them to compare their physical characteristics and presence of suspended impurities and living organisms.
- Guiding learners to conduct surveys in nearby localities about number of trees, types of trees, the products and other benefits obtained from them.
- Helping learners to observe and find out advantages and disadvantages of growing crops by transplantation and by sowing seeds.
- Helping learners to identify commercial, social and cultural activities that may have a short term and / or long term impact on environment; organizing discussions to interpret the collected information to infer its impact on the environment. The possible sources of information could be news items, features, photographs, posters, cartoons appearing in newspapers, magazines, journals or through questionnaires and personal interviews about one or more of the following types:- air, water, land and noise pollution; per capita availability / consumption of water, electricity and land; sources of portable water, water treatment plants and wastage of water.

Topics to be covered at three different terms in the Academic year CLASS VIII

1st Term

Unit I. BALANCE IN NATURE

- (a) Ecosystem: - Definition, structure, function and its importance.
- (b) Energy flow through ecosystem (food chain, food web); examples of terrestrial and aquatic food chains.

Unit II. HARNESSING RESOURCES

- (a) Sources of Energy:- Renewable and non renewable resources, availability and potential.

- (b) Renewable Resources:- solar, wind, hydro-energy, ocean (tidal), biomass including water wastes.
- (c) Non renewable resources:- Coal, petroleum and natural gas.

2nd Term

- (d) Utilization of resources for industry:- Processing and production of goods, need for efficient and environmental friendly technologies, industrial waste and waste management practices.
- (e) Environmental Concerns:- National and Regional (coal mining, uranium mining, limestone extraction)

Unit III. ENVIRONMENTAL FACTORS : Cause and effect

- (a) Emerging lifestyles in modern societies:- Over utilization of resources, increasing consumption of energy (electricity and fuels).
- (b) Synthetic materials:- Plastics, detergents, paints and refrigerants; advantages and disadvantages of using them.
- (c) Pollution:- Definition, types (soil, water, air and noise), sources , impact on physical environment and all forms of life (diseases), control and preventive measures (modern and traditional).

3rd Term

- (d) Disasters:- Natural and man-made, major types and their causes, impact on environment and human life.
- (e) Impact of environment degradation on: - Natural habitats, living forms (endangered and extinct species).
- (f) Population and Environment:- Definition of species, community, population; Population growth and its impact on:-
 - i) Environment (Deforestation, extinction of species, land settlements)
 - ii) Common social and civic facilities.
- (g) Protecting the environment:- Role of individuals, community and government in; planning, decision-making, legislation and social action for prevention of pollution and improvement of environment.

ENVIRONMENTAL STUDIES

CLASS – IX

UNIT I

(Periods: 84)

[30 marks]

1. UNDERSTANDING ECO-SYSTEM

Structure of ecosystem: Trophic structure, producers, consumers, detritus feeders, and decomposers; Interaction between biotic and abiotic factors in an ecosystem; optimum zone of stress and limit of tolerance; Law of limiting factors; Energy flow and its importance; Trophic levels, food chain, Biomass Pyramid; Nutrient cycles in eco-system; Biogeochemical cycle- carbon cycle, nitrogen cycle.

2. TYPES OF ECOSYSTEM

Understanding the types of ecosystem (i) terrestrial (forest, grassland and desert) and (ii) aquatic (fresh water and salt water) with an example of each.

3. FACTORS RESPONSIBLE FOR DESTRUCTION OF THE ECOSYSTEM

Population growth, Migration, Industrialization, Urbanization, Transport, Encroachment on water bodies, Deforestation, Increase need for agricultural land, Shifting cultivation construction of dams, war and mining, facilities for tourism, pilgrimage and recreation.

4. CONSERVATION OF THE ECOSYSTEM

Man's responsibility to conserve the ecosystem; Forest protection, Fire management; Range management; Wildlife management (Parks and Nature Reserves); Conservation of soil:- mechanical practices, physical soil conservation structure; vegetative practices, Low input sustainable agriculture; Role of Environment Impact Assessment (EIA): key elements of EIA; Conservation of the ecosystem in India- Forest, Deserts and Wetlands.

UNIT II

(Periods: 30)

[20 marks]

5. DEPLETION OF RESOURCES

- (a) Natural Resources: Air, soil, water, forest, metals and minerals.
- (b) Cause of Depletion of Resources- Over consumption, non-equitable distribution of resources, technological and industrial development, population growth.
- (c) Impact of Resource depletion: imbalance in nature, shortage of materials, struggle for existence, slackening of economic growth
- (d) Practices for conservation of resources: search for alternatives, promotion of renewable resources.

UNIT III

(Periods: 20)

[20 marks]

6. WASTE

Generation, Management and its impact on the ecosystem.

- (a) Sources of waste - domestic, industrial, agricultural, commercial and other establishments.
- (b) Classification of waste – biodegradable, non-biodegradable, toxic, non-toxic, biomedical.
- (c) Impact of waste accumulation - spoilage of landscape, health hazards, effect on terrestrial and aquatic life.
- (d) Methods of safe disposal of waste - segregation, dumping, composting, drainage, treatment of effluents; incineration, use of scrubbers and electrostatic precipitators; reducing, reusing and recycling of waste; legal provisions for handling and management of waste.

UNIT IV

(Periods: 10)

[10 marks]

7. ENVIRONMENTAL VALUES

- (a) Human rights, fundamental duties and value education.
- (b) Women and child welfare.

Exemplar Activities (Internal Assessment)**[20 marks]**

Students must undertake at least one activity in a year. Teachers may design their own set of activities keeping in view the overall objectives of teaching and learning of environmental education at this stage. They will have to make use of local flora and fauna and the available resources and facilities and take cognizance of local environmental problems. The learners should be encouraged to initiate action on their own. As illustrations activities may be of the following types:

- Guiding learners in making plans for kitchen garden or school garden. Identifying suitable plants / trees, undertaking plantation and looking after them.
- Helping learners in preparing a list of local cottage industries and in collecting information about the types of raw materials, modes of procurement and disposal of waste. This may be followed by organizing discussions to infer the possible impact of these activities on the environment.
- Guiding learners to prepare charts depicting different types of food chains or food webs.
- Helping learners to identify commercial, social and cultural activities that may have a short term and / or long term impact on environment; organizing discussions to interpret the collected information to infer its impact on the environment. The possible sources of information could be news items, features, photographs, posters, cartoons appearing in newspapers, magazines, journals or through questionnaires and personal interviews about one or more of the following types:- quantity of solid, liquid, degradable, non-degradable waste of the village / city; methods of disposal of wastes like drainage systems, sewer treatment plant, industrial effluents; sources of electricity, losses during transmission and utilization of electricity; sources of pollution of water bodies including streams, rivers and oceans.

Topics to be covered at Three different terms in the Academic year**CLASS – IX****1st Term**
UNIT I**1. UNDERSTANDING ECO-SYSTEM**

Structure of ecosystem: Trophic structure, producers, consumers, detritus feeders, and decomposers; Interaction between biotic and abiotic factors in an ecosystem; optimum zone of stress and limit of tolerance; Law of limiting factors; Energy flow and its importance; Trophic levels, food chain, Biomass Pyramid; Nutrient cycles in eco-system; Biogeochemical cycle- carbon cycle, nitrogen cycle.

2. TYPES OF ECOSYSTEM

Understanding the types of ecosystem (i) terrestrial (forest, grassland and desert) and (ii) aquatic (fresh water and salt water) with an example of each.

3. FACTORS RESPONSIBLE FOR DESTRUCTION OF THE ECOSYSTEM

Population growth, Migration, Industrialization, Urbanization, Transport, Encroachment on water bodies, Deforestation, Increase need for agricultural land,

Shifting cultivation construction of dams, war and mining , facilities for tourism, pilgrimage and recreation.

2nd Term

4. CONSERVATION OF THE ECOSYSTEM

Man's responsibility to conserve the ecosystem; Forest protection, Fire management; Range management; Wildlife management (Parks and Nature Reserves); Conservation of soil:- mechanical practices, physical soil conservation structure; vegetative practices, Low input sustainable agriculture; Role of Environment Impact Assessment (EIA): key elements of EIA; Conservation of the ecosystem in India- Forest, Deserts and Wetlands.

UNIT II

5. DEPLETION OF RESOURCES

- (a) Natural Resources: Air, soil, water, forest, metals and minerals.
- (b) Cause of Depletion of Resources- Over consumption, non-equitable distribution of resources, technological and industrial development, population growth.
- (c) Impact of Resource depletion: imbalance in nature, shortage of materials, struggle for existence, slackening of economic growth
- (d) Practices for conservation of resources: search for alternatives, promotion of renewable resources.

3rd term

UNIT III

6. WASTE

Generation, Management and its impact on the ecosystem.

- (a) Sources of waste - domestic, industrial, agricultural, commercial and other establishments.
- (b) Classification of waste – biodegradable, non-biodegradable, toxic, non-toxic, biomedical.
- (c) Impact of waste accumulation - spoilage of landscape, health hazards, effect on terrestrial and aquatic life.
- (d) Methods of safe disposal of waste - segregation, dumping, composting, drainage, treatment of effluents; incineration, use of scrubbers and electrostatic precipitators; reducing, reusing and recycling of waste; legal provisions for handling and management of waste.

UNIT IV

7. ENVIRONMENTAL VALUES

- (a) Human rights, fundamental duties and value education.
- (b) Women and child welfare.

ENVIRONMENTAL STUDIES**CLASS – X****UNIT I (Periods: 36) [40 marks]****RESTORING BALANCE IN ECOSYSTEM**

- (a) Conservation and management of water - integrated watershed management, recharging of ground water including rain water harvesting, public awareness programme.
- (b) Conservation and management of forest, grasslands and semi-arid ecosystem, public awareness programme.
- (c) Conservation and management of soil - alternative dropping, judicious use of inputs like water, fertilizers, pesticides, use of manure, bio-fertilizers and bio-pesticides, plantation and conservation of grasslands to check soil erosion; public awareness programme.
- (d) Wild-life management - National parks, sanctuaries and bio-reserves, breeding programme for endangered species, preventing poaching, hunting and bio-piracy, enforcement of legal provision.
- (e) Relevance of indigenous practices - tribal culture and its linkages to conservation of forest resources (stress on local relevance).

UNIT II (Periods: 30) [25 marks]**POLLUTION**

- (a) Types of pollution- air, water (fresh and marine), soil, noise and radiation.
- (b) Sources of pollution and major pollutants.
- (c) Effects of pollution on environment, human health and other organism.
- (d) Abatement of pollution.

UNIT III (Periods: 54) [10 marks]**ISSUES OF THE ENVIRONMENT**

- (a) Decline in forest, agricultural & marine productivity and its effects on the economy.
- (b) Resettlement and rehabilitation of people.
- (c) Energy Crisis – urban and rural sectors.
- (d) Greenhouse effect and global warming.
- (e) Climatic changes.
- (f) Acid rain.
- (g) Ozone layer depletion

UNIT IV (Periods: 24) [5 marks]**STRIVING FOR A BETTER ENVIRONMENT**

- (a) Use of efficient and eco-friendly technologies.
- (b) Community participation for ecological restoration and conservation – Importance of community participation in organic agriculture and biodiversity conservation.

Exemplar Activities (Internal Assessment)**[20 marks]**

Students must undertake at least one activity in a year. Teachers may design their own set of activities keeping in view the overall objectives of teaching and learning of environmental education at this stage. They will have to make use of local flora and fauna and the available resources and facilities and take cognizance of local environmental problems. The learners should be encouraged to initiate action on their own. As illustrations activities may be of the following types:

- Organizing visits to some of the sites either in the school premises or around like agricultural fields, factories, fairs, ponds, tourist spots, garbage dumps and helping the learners to record the prevailing environmental conditions
- Helping learners to identify commercial, social and cultural activities that may have a short term and / or long term impact on environment; organizing discussions to interpret the collected information to infer its impact on the environment. The possible sources of information could be news items, features, photographs, posters, cartoons appearing in newspapers, magazines, journals or through questionnaires and personal interviews about one or more of the following types:- droughts, floods, cyclones and their impact on the environment; environmental problems caused due to development activities such as construction of roads, building, dams; poaching / hunting of wild animals, illegal trading of animals' skin, paws, horns, ivory, cruelty towards animals; damage to forests by fire and diseases; deforestation, extinction of species especially that of wildlife; impact of overgrazing in a given area /region; programme or activities related to protection and conservation of environment; success stories of these efforts; maintenance of wildlife parks, sanctuaries and forest reserves; rules, laws, legislation concerning environmental issues enacted by the government from time to time; and agencies engaged in tackling environmental problems.
- Providing opportunities to learners to participate in campaigns organized by different agencies to improve environmental conditions.
- Organizing co-scholastic activities like observance of the World Environment Day, debates and quiz competitions and encouraging learners to participate in them.

Topics to be covered at three different terms in the Academic year**CLASS – X****1st term****UNIT I****RESTORING BALANCE IN ECOSYSTEM**

- (a) Conservation and management of water - integrated watershed management, recharging of ground water including rain water harvesting, public awareness programme.
- (b) Conservation and management of forest, grasslands and semi-arid ecosystem, public awareness programme.
- (c) Conservation and management of soil - alternative dropping, judicious use of inputs like water, fertilizers, pesticides, use of manure, bio-fertilizers and bio-pesticides, plantation and conservation of grasslands to check soil erosion; public awareness programme.

- (d) Wild-life management - National parks, sanctuaries and bio-reserves, breeding programme for endangered species, preventing poaching, hunting and bio-piracy, enforcement of legal provision.

2nd Term

- (e) Relevance of indigenous practices - tribal culture and its linkages to conservation of forest resources.

UNIT II

POLLUTION

- (a) Types of pollution- air, water (fresh and marine) soil, noise and radiation.
- (b) Sources of pollution and major pollutants.
- (c) Effects of pollution on environment; human health and other organism.
- (d) Abatement of pollution.

UNIT III

ISSUES OF THE ENVIRONMENT

- (a) Decline in forest, agricultural & marine productivity and its effects on the economy.
- (b) Resettlement and rehabilitation of people.

3rd term

- (c) Energy Crisis – urban and rural sectors.
- (d) Greenhouse effect and global warming.
- (e) Climatic changes.
- (f) Acid rain.
- (g) Ozone layer depletion

UNIT IV

STRIVING FOR A BETTER ENVIRONMENT

- (a) Use of efficient and eco-friendly technologies.
- (b) Community participation for ecological restoration and conservation – Importance of community participation in organic agriculture and biodiversity conservation.

ENVIRONMENTAL STUDIES CLASS – XI

Unit I **(Periods: 28)** **[20 marks]**

MAN & ENVIRONMENT

- a) *Dimensions of Environment*: Physical, biological and social dimensions:- Environmental dimensions- Exchange of heat between the earth and its atmosphere; Physical realms of the earth-Atmosphere, Lithosphere, Hydrosphere; Biological environment; Social environment.
- b) *Population and environment*: Meaning and importance of population study; Population theories (Malthusian & Transition Theory); World population growth & its impact on human welfare and environment; Population and environmental issues.
- c) *Impact of human activities on the environment* : Environmental problems of urban and rural areas; Natural resources its classification & Depletion(Land, Soil, Water, Minerals & energy, Plants and Wildlife); Stress on civic amenities and supply of water; Waste disposal; Transport; Health services; Vehicular emission; Urbanization(Urban Land use, Housing Crisis); Migration (Livelihood, Educational, Floating population).

Unit – II **(Periods: 20)** **[10 marks]**

ENVIRONMENT & DEVELOPMENT

- a) *Agriculture and Industrialization*: Historical background of the role of agriculture and industry in development; Localization of industrial plants; Impact of industrialization on agriculture development.
- b) *Impact of Development on Environment*: Changing pattern of land use; Reclamation of land; Deforestation; Resource depletion; Pollution; Environmental degradation.
- c) *Role of Society in Development and Environment*: Importance of environment education for public awareness; Public awareness through education and eco-clubs; Population education program; Mass awareness campaigns; Public participation in decision making.

Unit – III **(Periods: 28)** **[30 marks]**

ENVIRONMENTAL POLLUTION AND GLOBAL ISSUES

- a) *Air, Water and Soil Pollution* : Air pollution; water pollution; Soil pollution
- b) *Noise and Radiation Pollution* : Noise pollution; Radiation pollution
- c) *Ozone Layer depletion and its Effects*: Ozone; Formation of ozone in the atmosphere; Depletion of ozone over the Antarctic region; Ozone depletion over the Arctic region; Effects of ozone layer depletion.
- d) *Green House Effect*: Green house effect; Effects of global warming and climatic changes on human society; Biological impacts of global warming.
- e) *Pollution Related Diseases*: Diseases caused by air and water pollution; Diseases of the modern age.

Unit – IV
ENERGY

(Periods: 24) [10 marks]

- a) *Conventional Sources of Energy*: Conventional energy sources:- Fossil fuels (Coal & Petroleum); Firewood; Energy situation in India.
- b) *Non Conventional Sources of Energy* : Biomass energy; Solar energy; Wind energy; Ocean power [Tidal Energy, Wave Energy, Ocean thermal energy conversion (OTEC)]; Nuclear energy; Hydel power; Geothermal energy.
- c) *Conservation of Energy Resources* : Efforts to conserve energy resources; Conserving energy resources in industries; Conserving energy resources in agriculture; Conserving energy resources in the transport sector.

Exemplar Activities (Internal Assessment)

[30 marks]

Students must undertake at least one activity in a year. Teachers may design their own set of activities keeping in view the overall objectives of teaching and learning of Environmental education at this stage. Activities may be planned and designed depending upon the local situations, available resources and environmental issues of concern. The learners should be encouraged to initiate action on their own. As illustrations activities may be of the following types:

- Visits to few neighboring establishments such as motor repair workshops, markets, etc. and find out the types of wastes and methods prevalent for their disposal.
- To identify economically and environmentally friendly alternatives in order to deal with the scarcity of resources such as fuels in the locality.
- To investigate the impact of an industry or a manufacturing unit or any other establishment on the local environment. Parameters could be land use, ratio of covered area and open space, raw materials used for production, inputs like electricity, water, etc, the waste generated or the type of pollutants emitted, etc.
- To study the impact of changes in agricultural practices or animal husbandry like poultry, piggery, fishery, apiculture, etc.
- Prepare a flow chart to show different steps involved in the supply of electricity from the source to houses in the locality. Plan and execute campaign to educate the society about the implications of wastage of electricity in terms of energy.

ENVIRONMENTAL STUDIES**CLASS – XII****Unit I****(Periods:50)****[18marks]****BIODIVERSITY**

- a) *Concepts and Values of Biodiversity*: Concepts of biodiversity; Species of various gene pools; Biodiversity in an ecosystem; Values of biodiversity; Why value biodiversity.
- b) *Types of Biodiversity (Ecosystem, Species and Genetic)*: Ecosystem diversity including Marine ecosystem and Estuarine ecosystem; Species diversity; Genetic diversity.
- c) *Interdependence between Species*: Interactions between plants and animals; Species Interaction-Mutualism, Symbiosis, Commensalisms, Protocooperation, Predation, Parasitism, Amensalism and Antibiosis, Competition, Aggregations, Allelochemistry.
- d) *Economic Potential of Biodiversity*: Introduction; Economic potential of plant diversity; Economic importance of animal diversity.
- e) *Loss of Biodiversity (Threatened, Endangered and Existing Species)*: Introduction; Causes leading to loss of biodiversity; Threatened, endangered and extinct species.
- f) *Strategies for Conservation of Biodiversity*: Introduction; Conservation Strategies and its Importance.

Unit – II**(Periods: 20)****[16marks]****ENVIRONMENTAL MANAGEMENT**

- a) *Need for Environmental Development Vis – A – Vis Development*: Introduction; Development levels and environmental impacts.
- b) *Legal Provisions and Environmental Management* : Introduction; Legislation for Environmental Protection
- c) *Approaches for Environmental Management* : Some environmental approaches

Unit – III**Periods: 20)****[16 marks]****SUSTAINABLE AGRICULTURE**

- a) *Need for Sustainable Agriculture*: Key components in the industrialization of modern agriculture.
- b) *Green Revolution*: Impact of green revolution on the environment; Ecological impacts; Sociological impacts.
- c) *Impact of Agrochemicals on Environment*
- d) *Management of Agriculture Produce*: Storage and preservation; Transportation.

Unit – IV**Periods: 30)****[20 marks]****SUSTAINABLE DEVELOPMENT**

- a) *Concept of Sustainable Development:* Introduction
- b) *Concept of Sustainable Consumption:* Lessons on Sustainable Consumption; Contemporary concept of sustainable consumption.
- c) *Challenges for Sustainable Development:* Economic considerations- Need for sound economic policies; Political considerations- Requirements for effective measures & approaches; Social considerations- Need for a transformation in social conditions.
- d) *Role of Individual and Community*

Exemplar Activities (Internal Assessment)**[30 marks]**

Students must undertake at least one activity in a year. Teachers may design their own set of activities keeping in view the overall objectives of teaching and learning of Environmental education at this stage. Activities may be planned and designed depending upon the local situations, available resources and environmental issues of concern. The learners should be encouraged to initiate action on their own. As illustrations activities may be of the following types:

- To study the changes that have taken place in a given land area during a specific time in respect of number of houses and families and determine the effects on civic amenities like availability of water, electricity and fuels, drainage system, disposal of wastes, etc.
- To study the practices followed in the region for storage, preservation, transportation and processing of perishable or nonperishable farm products and to assess the extent of wastage due to faulty practices.
- To study the status of an endangered species listed for the region by collecting information through different sources and observation, if possible and to assess the reasons for its diminishing number. Suggests ways and means to protect the species.
- Conduct a survey of plants and trees in the locality and collect information about their cultural, economic and medicinal values. Prepare action plans for the propagation of trees that are most valuable for use.
- Prepare plans for beautification of the school campus or a park in the locality. Identify suitable plants and trees for the same.
- Prepare a flow chart to show different steps involved in the supply of tap water from the source to houses in the locality. Plan and execute campaign to educate the society about the implications of wastage of water in terms of energy.

RECOMMENDED BOOKS :

- **FRANK ENVIRONMENTAL EDUCATION series (Class VIII to XII)** recommended by NCERT; Frank Bros. & Co.

BOOK FOR REFERENCES:

- **ECOLOGY & ENVIRONMENT** by P. D. Sharma; Rastogi Publications; Seventh Edition-1999.
- **ENVIRONMENTAL BIOLOGY** by P. D. Sharma; Rastogi Publications; Second Edition- 1999.
- **MAN & HIS ENVIRONMENT** by Dr. S. R. Joshi & N. Joshi; Gautam Bros. & Co; 1999 Edition.
- **FUNDAMENTALS OF ENVIRONMENTAL SCIENCE** by G. S. Dhaliwal, G. S. Sangha & T. K. Rahlan; Kalyani Publications; 2004 Edition
- **Relevant Journals and Periodicals of Local Environmental Concerns**

- **PRACTICALS / ACTIVITIES**

It is not possible to include practical but due to the lack of infrastructures in many schools especially in rural areas and in schools having hundreds of learners which include the Arts and the Commerce stream besides the Science streams in most institutions, with no teacher appointed specifically for this subject for being a newly introduced subject. However, in lieu of this, **Exemplar Activities** may be designed by teachers, keeping in view the overall objectives of teaching and learning of Environmental Education and Environmental Sciences. These **Activities** are to be assign to students so as to undertake at least one activity in a year.

- **EVALUATION**

It is strongly recommended that evaluation pattern on this subject should be strictly of **Objective Type** questions.

It is also recommended that the MBOSE should evolve a credible system of evaluation of “Exemplar Activities (Internal Assessment) “.

Marks already allotted by the Internal Examiner on the “Exemplar Activities” should be re-assessed by an External Examiner who would go through the Activity / Project Report of each student (maintained by the School / College).