LESSON PLAN

First Semester

ACADEMIC YEAR (2020 – 2021)

Course	M.Sc. Environmental Science
Semester	First Semester
Subject	ES 1C 01– Fundamentals of Ecology and Environment
Teacher-in-charge	Rekha V.B
Total number of modules	5
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	**CO.1. Enable to understand fundamentals, Scope, Importance of Environmental Science and structure and function of different compartments of the Environment.** **CO.2. Gain knowledge on multidisciplinary nature of environmental Science and need of Environmental awareness.** **CO.3. Develop an understanding on different Environmental factors and various ecological processes.** **CO.4. Gain insight into various processes involved in ecosystems.**
Resources materials needed	Black board, projector and a laptop
Assessment methods	1. Asking questions to them after taking each unit 2. Class test will be conducted after the completion of each module 3. Internal examinations will be conducted after the completion of the 3/4th of the portions 4. Model examination will be conducted after completion of the syllabus 5. Field visit to familiarize the systems 6. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	10 hours	Fundamentals of Environmental Science	Definition, Need of Environmental awareness;	June 2020	I
			Scope and Importance of Environmental Science;	June 2020	I
			Multidisciplinary nature of environmental Science;	June 2020	II
			Ecology, Interrelationship of ecology with other disciplines.	June 2020	II
2	15 hours	Components of the Environment: .	a). The atmosphere or the air: Layers of Atmosphere, Composition of air; importance of atmosphere, meteorological conditions and air circulation	June 2020	III
			b). The hydrosphere or water: Importance of water, distribution of water at global, national and state level. Hydrological cycle.	June 2020	IV
			c). Lithosphere or the rock and the soil: Elementary composition of rocks in the earth crust.	July 2020	I
			Types of rocks; Process of soil formation:	July 2020	II
			Physical weathering, Chemical and biological weathering of rocks; Role of soil in shaping the biosphere.	July 2020	III
5	25 hours		(a) Climatic Factors - Light, Temperature of Air (atmospheric temperature), Rainfall (precipitation), Humidity of air, atmosphere (gases and wind), fire.	August 2020	I
			(b) Topographic Factors: height of mountains, direction of mountains and valleys, steepness of slope and exposure of slope	August 2020	II

			(c) Edaphic factors: Soil-soil formation, soil profile, soil erosion, soil	August 2020	III
			Environmental Factors conservation (d) Biotic factors: Intraspecific interactions;	August 2020	III
			Interspecific interactions: Neutralism, Commensalism, Mutualism, Proto co-operation, Parasitism, Predation.	September 2020	I
4	10	Ecosystem.	Definition; Components of ecosystem; Abiotic components: Light, Temperature, Pressure, Water, Wind, Soil; Biotic components;	September 2020	II
			Energy flow in an ecosystem: Primary production, Secondary production; Food chain: Grazing food chain, Detritus food chain;	September 2020	III
			Ecological pyramids: Pyramid of number, Pyramid of biomass, Pyramid of energy; Food web;	September 2020	I
			Ecological indicators	October 2020	1I
			Biogeochemical cycles: a) Gaseous cycles: Oxygen cycle, Carbon cycle and Nitrogen cycle.		
			Sedimentary cycles: Phosphorus cycle, Sulphur cycle.	October 2020	1I
5	15	Population Ecology	Population characteristics - Population growth and its dynamics; natality, mortality, growth patterns; Age distribution, Malthus theory	October 2020	III
			Community Ecology:Community	October 2020	III

			structure, Species diversity,		
			Ecological dominance, Ecotone, Edge effect, Ecological equivalence, Succession and Climax; Ecological adaptations.	October 2020	III

LESSON PLAN

First Semester

ACADEMIC YEAR (2020 – 2021)

Course	M.Sc. Environmental Science
Semester	First Semester
Subject	ES 1C 02– Physical processes in the Environment
Teacher-in-charge	Subin K Jose, Manju N.J, Rekha V.B
Total number of modules	5
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	**CO.1.** Lay foundation on Structure and Composition of atmosphere and General atmospheric circulation. **CO.2.** Develop an insight in to thermodynamics of atmosphere and associated processes. **CO.3.** Gain knowledge on various processes involved in ecosystem. **CO.4.** Develop an understanding on diurnal variations in temperature and their significance in pollutant dispersion.
Resources materials needed	Black board, projector and a laptop
Assessment methods	7. Asking questions to them after taking each unit 8. Class test will be conducted after the completion of each module 9. Internal examinations will be conducted after the completion of the 3/4th of the portions 10. Model examination will be conducted after completion of the syllabus 11. Field visit to familiarize the systems 12. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	10 hours	Sun-Earth System: planetary motion and seasons	Solar radiation - global distribution	June 2020	I
			Structure of atmosphere and atmospheric circulation	June 2020	I
			General circulation of the atmosphere and Indian monsoons	June 2020	II
			General circulation of Oceans	June 2020	II
			Deep-sea circulation	June 2020	III
2	15 hours	Thermodynamics, Atmospheric stability	Composition of dry air and atmospheric water vapor content	June 2020	IV
			Potential temperature, virtual temperature	June 2020	V
			isothermal and adiabatic processes; Stable, unstable and neutral equilibriums	July 2020	I
			Inversions	July 2020	II
			Atmospheric boundary layer	July 2020	III
			diurnal variations and their significance in pollutant dispersion	June 2020	I
3	10	Clouds and precipitation:	Cloud formation and classification, aerosols, condensation and ice nuclei, droplet growth - curvature and solute effects, precipitation mechanisms;	June 2020	II
			Weather and climate - Climatic zones, continental & maritime climates;	July 2020	I
			Climate change and variability, Natural and anthropogenic causes of climate change,	August 2020	I
			El Nino and ENSO events.	August 2020	II
4	15	Earth Systems:; types of ecosystems.	Earth's geological history and development and evolution of the earth systems	September 2020	I
			Gaia Hypothesis; Introductions to various systems -	September 2020	I
			Atmosphere, Hydrosphere, Lithosphere, Biosphere and their linkages,	September 2020	II
			Properties and Structure of the Earth: crust, mantle, core, earth's magnetic field;	September 2020	II
			Recycling of the lithosphere - the rock cycle, weathering (physical, chemical and biological)	September 2020	III

			Erosion, sedimentation, metamorphism;	September 2020	III
			Rock types - igneous, metamorphic and sedimentary rocks;	October 2020	I
			Concept of plate tectonics and continental drift; Geological time-scales.	October 2020	II
5	25 hours	Global water balance	Global water balance	October 2020	II
			Hydrological cycle	October 2020	II
			Relationship of surface, groundwater and stream-flow	October 2020	II
			Stream hydrograph	October 2020	II
			Groundwater - aquifers	October 2020	III
			Groundwater exploitation and management.	October 2020	III

LESSON PLAN
First Semester

ACADEMIC YEAR (2020 – 2021)

Course	M.Sc. Environmental Science
Semester	First Semester
Subject	ES 1C 03– Energy and Environment
Teacher-in-charge	Subin K Jose
Total number of modules	5
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	**CO.1.** Develop distinction between Renewable and Non Renewable energy resources. **CO.2.** make awareness on world's and India's energy reserves and consumption. **CO.3.** Develop knowledge on modern techniques for energy resource recovery. **CO.4.** prioritize into some key concepts such as Energy production and impacts on environment, Important multipurpose power projects and environmental issues in India, Sustainable energy management, problems and solutions and Energy crisis and challenges of energy transformation.
Resources materials needed	Black board, projector and a laptop

Assessment methods	1. Asking questions to them after taking each unit 2. Class test will be conducted after the completion of each module 3. Internal examinations will be conducted after the completion of the 3/4th of the portions 4. Model examination will be conducted after the completion of the syllabus 5. Field visit to familiarize the systems 6. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	10 hours	Energy basics	Laws of thermodynamics	June 2020	I
			Forms and types of energy	June 2020	I
			Energy resources classification	June 2020	II
			sun as source of energy	June 2020	II
			ecologically important radiations, energy flow in Ecosystems	June 2020	III
2	20 hours	Non-renewable energy resources	Coal, oil, natural gas, heavy radioactive elements	June 2020	IV
			formation of fossil fuels in the geological time scale	June 2020	V
			India's non- renewable energy reserves and usage pattern	July 2020	I
			Non-renewable energy usage and limitations	July 2020	II
			role of fossil fuels in modern economy	July 2020	III
			Environmental impacts of fossil fuels exploitation and utilization.	August 2021	I

3	20 hours	Renewable energy resources	Biomass, wind, hydroelectric, ocean, geothermal	August 2021	II
			Secondary energy resources	August 2021	III
			Alternate energy resources	August 2021	IV
			Renewable energy usage, limitations and scope	August 2021	IV
			modern techniques for energy resource recovery using microbes	September 2021	I
			solar collectors	September 2021	II
			Hydrodynamic Power (MHD) and biomass gasification	September 2021	II
4	10hours	Nuclear energy generation and environmental safety	radioactivity from nuclear reactors, fuel processing and radioactive waste	September 2021	III
			hazards related to power plants	September 2021	IV
			pathways analysis and dose assessment	October 2021	I
			radioactivity risk assessment, criterion for safe exposure.	October 2021	I
5	15 hours	Energy production and impacts on environment	degradation of air, water and land	October 2021	II
			Important multipurpose power projects and environmental issues in India	October 2021	II
			Energy use pattern in different parts of the world and its impact on the environment	October 2021	III
			Sustainable energy management	October 2021	III
			Energy crisis and challenges of energy transformation	October 2021	IV

LESSON PLAN
First Semester

ACADEMIC YEAR (2021 – 2022)

Course	M.Sc. Environmental Science
Semester	First Semester
Subject	ES 1C 04– Environmental Pollution and Waste Management
Teacher-in-charge	Dr Manju N J
Total number of modules	6
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	**CO.1.** Develop an insight in to the fundamental Concepts of Environmental pollution. **CO.2.** Develop perspective on Air pollution, Water Pollution and Soil Pollution by and looking into concerned pollutants and their effects. **CO.3.** Analyze the impacts of wastes on environment. **CO.4.** Design innovative Waste management approaches.
Resources materials needed	Black board, projector and a laptop
Assessment methods	1. Asking questions to them after taking each unit 2. Class test will be conducted after the completion of each module 3. Internal examinations will be conducted after completion of 3/4th of the portions 4. Model examination will be conducted after completion of the syllabus 5. Field visit to familiarize the systems 6. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	5 hours	Fundamental Concepts	Chemical equations and Stoichiometry, Chemical Kinetics - Control of reaction - First, second and zero order reactions, Thermodynamics - Energy, enthalpy, entropy - Gibbs energy and chemical potential	June 2021	I
			Chemical equilibria, Acid-base equilibria, Redox reactions and redox potential, Radio nuclides, unsaturated and saturated hydrocarbons.	June 2021	II
2	10 hours	Environmental pollution	Pollution - physical, chemical and biological; radio nuclides, Electromagnetic radiations, Electro-smog, noise and light pollution; sources - industrial, commercial, domestic etc.	June 2021	III

			Industrial process and their pollution potentials - mining, smelting, cement production, petroleum refining	June 2021	IV
			Industrial process and their pollution potentials - thermal power plants, pulp and paper, tannery, dairy, textile dyeing and bleaching.	June 2021	V
3	18 hours	Chemistry of Air	Ozone layer - Chemistry of the ozone layer - ozone depletion and the chemicals that cause ozone depletion, Photochemical smog - origin and occurrence, Oxidizing and reducing smog - ecological effects, Acid rain and its ecological effects, trans-boundary air pollution	July 2021	I
			Ozone layer - Chemistry of the ozone layer - ozone depletion and the chemicals that cause ozone depletion, Photochemical smog - origin and occurrence, Oxidizing and reducing smog - ecological effects, Acid rain and its ecological effects, trans-boundary air pollution	July 2021	II
			Ozone layer - Chemistry of the ozone layer - ozone depletion and the chemicals that cause ozone depletion, Photochemical smog - origin and occurrence, Oxidizing and reducing smog - ecological effects, Acid rain and its ecological effects, trans-boundary air pollution	July 2021	III
			Meteorological factors affecting air pollutants, diffusion, turbulence and transportation, plume rise and stability conditions, Wind roses; Effects of pollutants on human beings, plants, animals, materials and climate	July 2021	IV
			Ambient air quality standards. Pollution monitoring methods and pollution abatement: Air quality monitoring techniques - high volume air samplers, stack samplers, measurement of PM, gaseous pollutants.	July 2021	V
4	20hours	Chemistry of water	Composition and structure of pure water, Physical properties of water and aqueous solutions, Solubility of solids, liquids and gases in water , Chemical reactions and equilibria in water – carbonate equilibria, metal ion equilibria, redox equilibria	August 2021	I
			Water pollution: Physical and chemical properties of water; pollution of water resources, types and sources, solids and turbidity, alkalinity, acidity, salinity, hardness, nutrients, fluoride, heavy metals	August 2021	II
			Organic pollutants, oxygen demanding wastes, (COD, BOD, DO), persistent organic pollutants (DDT, PCBs, PAHs, Dioxin) etc.	August 2021	III
			Pollution monitoring methods and pollution abatement: Water, soil and biological sample analysis for parameters such as dissolved and suspended solids, BOD, COD, turbidity, hardness, chloride, phosphate, sulphate, nitrogen compounds, heavy metals, pesticides, oil and grease etc.	August 2021	V

			Wastewater and its treatment: water as a scarce natural resource, sources of water pollution; Introduction to wastewater treatment and waste management.	September 2021	I
5	10 hours	Chemistry of soil	Introduction, weathering and pedogenesis, factors of soil formation, development of soil profile, structure of soil, gross composition - texture and structure, organic and inorganic components of soil	September 2021	II
			Physico -chemical characteristics of soil, ion-exchange and adsorption processes in the soil, classification of types of soil (Reference to India and Kerala), soil quality parameters and assessment, method of analysis of texture (International pipette method).	September 2021	III
			Soil pollution: macro and micro pollutants in soil, heavy metals, radio nuclides, agrochemical pollutants (fertilizers, pesticides, animal wastes), industrial wastes (oil drilling, coal fired power plants, mining), municipal solid wastes, biomedical wastes.	September 2021	IV
6	12 hours	Solid wastes	Definition, types, source, categories, generation rates; Indian and International scenario; Waste management approaches (collection, segregation and transport of solid wastes); handling wastes at source, domestic, municipal solid wastes; Hazardous wastes; Biomedical wastes; Nuclear wastes	September 2021	V
			Environmental impacts of wastes; recycling of wastes and waste minimization techniques; solid waste processing technologies, mechanical and thermal volume reduction; biological and chemical techniques for energy and other resource recovery	October 2021	I
			Introduction to the concepts of waste biomass resources, utilization of organic manure; waste and earthworms, vermicomposting - the concept, advantages and phases; case studies / success stories in India for management of different types of solid wastes	October 2021	II

LESSON PLAN

Third Semester

ACADEMIC YEAR (2020 – 2020)

Course	M.Sc. Environmental Science
Semester	Third Semester
Subject	ES 3C 13– Environmental Assessment Tools and Monitoring methods
Teacher-in-charge	Manju N.J, Rekha V.B
Total number of modules	5
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	CO.1. Develop an understanding on Fundamental principles on Environment Impact Assessment (EIA), Risk Assessment (RA) and Environmental Management Plan (EMP). CO.2. Gain an insight in to concept of Environmental Impact Statements and EIA in sustainable development. CO.3. Empower with Statistical analysis for problem solving in various fields. CO.4. Develop an insight in to fundamental principles of probability. CO.5. Develop perspectives on Eco informatics and its applications in Environmental Science.
Resources materials needed	Black board, projector and a laptop
Assessment methods	13. Asking questions to them after taking each unit 14. Class test will be conducted after the completion of each module 15. Internal examinations will be conducted after the completion of the $3/4^{th}$ of the portions 16. Model examination will be conducted after completion of the syllabus 17. Field visit to familiarize the systems 18. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	8	Environmental resources	Quantitative and qualitative depletion of environmental resources	June 20	I
			Qualitative depletion of environmental resources	June 20	I
			Methods of resource analysis	June 20	I
			Monitoring of Environmental resources.	June 20	II
2	12	Basics of Environmental Impact Assessment and Risk Assessment	Concept of EIA, Evolution of EIA, EIA practice in India	June 20	II
			EIA Notifications 1994, 1997 2009; Other related notifications	June 20	II
			Project Screening in EIA, defining and examining scope	June 20	III
			Objectives and alternatives in EIA Projects, project planning and processes	Aug 20	I
			Baseline information, Impact prediction, decision making	Aug 20	II
			Cumulative impact assessments, strategic impact assessments.	Aug 20	III
3	10	Types of EIA:	Rapid EIA, comprehensive EIA, strategic EIA,	June 20	I
			Data collection, ecological impacts, environmental impacts (Air, water, land and noise).	June 20	I
			Socioeconomic and cultural impacts, health impacts.	June 20	II
			Prediction of impacts; methodologies,	June 20	II
			Cost benefit analysis,	June 20	III
			Environmental Management Plan (EMP).	June 20	III
4	15	Environmental Impact Statements	Preparation and contents of Environmental Impact Statements (EIS);	July 20	I
			Use of EIA in public participation and decision making	July 20	II
			EIA in sustainable development.	July 20	III
			EIA - case studies: mining projects, hydroelectric projects,	August 20	I

			nuclear power projects, thermal power projects, refineries etc.		
5	13	Fundamentals of Statistics	Introduction - Importance and limitation; Classification and tabulation of data; Graphical representation;	August 20	II
			Measures of central tendencies - mean median and mode; Measures of dispersion - range, standard deviation and co-efficient of variation; Moments,	August 20	III
			Skewness and Kurtosis;	August 20	III
			Limit theorems: Central limit theorem, Strong Law of large number, Weak Law of large number.	August 20	III
			Correlation and regression - Scatter diagrams - Karl Pearsons coefficient of correlation - Rank correlation - Linear and Curvilinear regressions;	September 20	I
			Probability - Basic probability and statistics, probability fundamentals, computation and laws of probability, fundamentals of inference;	September 20	II
			Binomial, Poisson and normal distribution, Probit analysis (Graphic Method only);	September 20	III
			Testing of Hypothesis**:** Null and alternative hypothesis - Two types of error -Level of significance	September 20	III
			- test based on t, z, Chi-square	October 20	I

			analysis of Variance – one - way, two - way, three - way analysis		
			(Computational only using softwares for data analysis like Excel, SPSS, Minitab and R Module)	October 20	
6	17	Application of Computers in Statistics	Data analysis using packages - SPSS, Introduction to Database Management System (DBMS)	September 20	I
			Data structures in eco-informatics, Databases for eco-informatics	September 20	II
			Web applications development in eco-informatics, Introduction to Internet, protocols	September 20	III
			WWW, URL, Web Site, Web Browser, Web Server	October 20	I
			Eco-informatics applications in Natural Resources Management, wildlife conservation and management	October 20	II
			Habitat suitability studies, habitat modeling in study of anthropogenic pressures on environment such as industrialization, urbanization and other threats.	October 20	III

LESSON PLAN

Third Semester

ACADEMIC YEAR (2020 – 2020)

Course	M.Sc. Environmental Science
Semester	Third Semester
Subject	ES 3C 14– Environmental Toxicology and Occupational Health and Safety
Teacher-in-charge	Subin K Jose, Manju N.J, Rekha V.B
Total number of modules	5
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	CO.1. Gain knowledge on global transport of pollutants and fate of pollutants in ecosystems. CO.2. Develop an insight in to Biochemical effects of environmental contaminants.

	CO.3. Develop perspectives on Environmental health and safety. CO.4. Enable to apply Occupational health & safety management system in different field of industry. CO.5. Develop an understanding on fundamentals of Ergonomics. CO.6. To make aware of Environmental risk assessment and management.
Resources materials needed	Black board, projector and a laptop
Assessment methods	1. Asking questions to them after taking each unit 2. Class test will be conducted after the completion of each module 3. Internal examinations will be conducted after the completion of the 3/4th of the portions 4. Model examination will be conducted after completion of the syllabus 5. Field visit to familiarize the systems 6. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	10 hours	Ecotoxicology as a synthetic science	major classes of environmental pollutants	June 2020	I
			routes of entry into ecosystems	June 2020	I
			long-range movement and global transport of pollutants	June 2020	II
			Fate of pollutants in ecosystems	June 2020	II
			biotransformation, bioaccumulation and biomagnification.	June 2020	III
2	15 hours	Toxicity testing	Test organisms used in bioassays	June 2020	IV
			Definition of toxicity	June 2020	V
			Concept of dosimetry	July 2020	I
			dose response curves	July 2020	II
			toxicant effects	July 2020	III
			LC50, MATC-NOEC	August 2020	I
3	8 hours	Biochemical effects of Environmental Contaminants	Environmental carcinogens, mutagens, asbestos, hormone mimics	June 2020	I
			Biomarkers and bio-indicators; metabolic impacts	June 2020	II
			Biochemical parameters - enzymes, metabolites, structural changes	June 2020	III
			Biosynthesis and catabolism of proteins, lipids, carbohydrates and nucleic acids	June 2020	IV
			Toxic response of different tissues and organelles, tissue specificity	July 2020	I
4	17 hours	Environmental health and safety	Concept of environment, health and safety; Diseases through pollution (Environmental	July 2020	II

			contamination related diseases-Gastroenteritis)		
			Hepatitis, allergies, respiratory diseases, food - borne diseases, vector borne diseases, management to control diseases	July 2020	II
			Occupational health, health and safety considerations; Environmental health and human society, Health problems in different types of industries: Construction industry	August 2020	I
			Health problems in textile, steel, food processing, tanneries	August 2020	II
			Health problems in cement, thermal and nuclear power plants, pharmaceuticals	August 2020	III
			Occupational health and safety considerations in waste treatment plants.	October	I
5	10	Environmental health and occupational hygiene	Environmental health and occupational hygiene:	June 2020	I
			: Basis of environment and occupational health, biological monitoring (e.g. BEI),	June 2020	II
			Occupational hygiene, preventive measures;	June 2020	III
			Occupational health & safety management system, OHSAS – 18000.	July 2020	I
6	10	Safety and health management: Importance of industrial safety, role of safety department, Safety committee and function.	Occupational health hazards, Promoting safety, Safety and health training, Stress and safety;	July 2020	II
			Ergonomics, Introduction, Definition, Objectives, Advantages; Ergonomics hazards,	July 2020	III
			Musculoskeletal disorders and cumulative trauma disorders;	August 2020	1
			Musculoskeletal disorders and cumulative trauma disorders;	August 2020	II
7	5	Environmental risk assessment and management:	Environmental risk assessment and management:	August 2020	III
			Perceived risks, real risks,	September 20	I
			hazard identification, hazard characterization, health risk assessment, risk management.	September 20	II

LESSON PLAN

Third Semester

ACADEMIC YEAR (2020 – 2020)

Course	M.Sc. Environmental Science
Semester	Third Semester
Subject	ES 3C 15– Biodiversity and Conservation
Teacher-in-charge	Manju N.J, Rekha V.B
Total number of modules	5
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	CO.1. Demonstrate importance of diversity at different levels of biological organization. CO.2. Examine the processes that ensures long term stability of ecosystems CO.3. Identify the threats to biodiversity CO.4. Analyze the values of biodiversity CO.5. Develop measures for scientific management of biodiversity
Resources materials needed	Black board, projector and a laptop
Assessment methods	1. Asking questions to them after taking each unit 2. Class test will be conducted after the completion of each module 3. Internal examinations will be conducted after the completion of the 3/4th of the portions 4. Model examination will be conducted after completion of the syllabus 5. Field visit to familiarize the systems 6. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	17	Natural resources	Ecological concepts related to natural resources, matter, energy; renewable and non-renewable resources; soil, water, plants, animals etc.	June 2020	I
			Wetlands, water bodies, Forests; ecosystems services etc.	June 2020	I
			Biodiversity concepts and patterns: organic evolution through geological time scale	June 2020	II
			Microbial diversity, Plant diversity, Soil biodiversity; Levels of biodiversity	June 2020	III
			Community diversity (alpha, beta and gamma biodiversity)	June 2020	IV
			Gradients of biodiversity (latitudinal, insular)	June 2020	IV
2	12	Biodiversity - scales	Ecosystems diversity - biomes, mangroves, coral reefs	July 2020	I
			Wetlands and terrestrial diversity	July 2020	I
			Species diversity - richness and evenness; Genetic diversity: sub species, breeds, race, varieties and forms	July 2020	II
			Benefits from biodiversity - direct and indirect benefits	July 2020	III
			Ecosystems services, Bio-prospecting	July 2020	IV
			Biodiversity hotspots and their characteristics	August 2020	I
3	8	Threats to Biodiversity	Habitat loss and fragmentation	August 2020	I
			Disturbance to habitats and pollution	August 2020	II
			Introduction of exotic species; extinction of species	August 2020	III
			Human intervention and biodiversity loss	August 2020	III
4		Biodiversity conservation: constraints);	Conservation movements - International and National;	August 2020	III
			ecologically relevant parameters (viable population, minimum	September2020	I

			dynamic area, effective population size, metapopulations);		
			reproductive parameters in conservation (breeding habitats, mating systems, inbreeding depression, genetic bottlenecks, genetic constrains	September2020	I
			IUCN categories - endangered, threatened, vulnerable species;	September2020	II
			Red Data Book and related documentation; threatened plants and animals of India,	September2020	III
			ecosystems,people and traditional conservation mechanisms.	September2020	IV
5		Ex-situ / in-situ conservation:	Ex-situ / in-situ conservation:	October2020	I
			Botanical gardens, Zoos, Aquaria, Homestead garden; Herbarium; In-vitro conservation – Germplasm and Gene bank; Tissue culture - Pollen and spore bank, DNA bank;	October2020	II
			Wildlife values and eco-tourism, wildlife distribution in India, problems in wildlife protection,	October2020	III
			organizations involved in conservation (WWF, WCU,CITES, TRAFFIC etc.),	October2020	IV
			In-situ conservation: sanctuaries, biospheres reserves, national parks, sanctuaries and nature reserves, preservation plots.	October2020	V

LESSON PLAN
Third Semester

ACADEMIC YEAR (2020 – 2020)

Course	M.Sc. Environmental Science
Semester	Third Semester
Subject	ES 3C 16– Environmental Disaster management
Teacher-in-charge	Subin K Jose
Total number of modules	5
Credit	4
Total allotted hours	75 Hrs (Four Hrs in a week)
Course outcome	CO.1. Develop perspective on Disaster management system with special reference to Prediction and forecasting. CO.2: Distinguish to understand weather and climate and Treaties and conventions - IPCC. CO.3. Develop an insight into Forest protection and management. CO.4. Develop awareness on concept of Emergency Disaster management, Tools of Disaster management, Emergency Management Information Systems (EIMS), Phases of disaster management. CO.5. Prioritize to analyze Environmental problems faced by India and the world and Sustainable development - problems and perspectives.
Resources materials needed	Black board, projector and a laptop
Assessment methods	1. Asking questions to them after taking each unit 2. Class test will be conducted after the completion of each module 3. Internal examinations will be conducted after the completion of the 3/4th of the portions 4. Model examination will be conducted after the completion of the syllabus 5. Field visit to familiarize the systems 6. Assignments and Seminars

MONTHLY TEACHING PLAN

MODULE	DURATION	NAME OF THE MODULE	UNIT	MONTH	WEEK
1	10 hours	Disaster management system	Flood damage assessment	June 2020	I
			Environmental Impact Analysis	June 2020	I
			Trans-boundary air pollution	June 2020	II
			Pollution monitoring and management	June 2020	II
			Vehicular pollution assessment	June 2020	III
2	20 hours	Weather and climate	climate science, thermal inversion, heat island	June 2020	IV
			natural hazards	June 2020	V
			Coastal erosion,	July 2020	I
			global warming, acid rain	July 2020	II
			EL NINO, LA NINA	July 2020	III
			Climate change	August 2020	I
3	20 hours	Forest protection and management	Introduction to silviculture and silvicultural systems	August 2020	II
			forest protection from fire	August 2020	III
			injuries by exotic and noxious plants,	August 2020	IV
			shifting cultivation	August 2020	IV
			forest cover monitoring	September 2020	I
			Forest protection and management: objectives and principles	September 2020	II
			Aforestation	September 2020	II
4	10hours	Hydrologic hazards	earthquake, acid rain, eutrophication	September 2020	III
			flood, landslides	September 2020	IV
			avalanches, drought, desertification	October 2020	I
			Urbanization stress and health	October 2020	I
5	15 hours	Disaster Management	Concept and scope of disaster management	October 2020	II
			Professional activities	October 2020	II
				October 2020	III

			Tools of disaster management	October 2020	III
			Environmental problems faced by India and the world. Sustainable development - problems and perspectives.	October 2020	IV