HIRALAL MAZUMDAR MEMORIAL COLLEGE FOR WOMEN

DEPARTMENT OF ENVIRONMENTAL SCIENCE

ACADEMIC CALENDAR OF SESSION 2018- 2022

UNDER CHOICE BASED CREDIT SYSTEM SYLLABUS OF WEST BENGAL STATE UNIVERSITY

Academic Calendar 2018-2019

Department of Environmental Science, HMMCW

June/July, 2018 – December/January 2018/2019

A. WBSU-CBCS Syllabus for Odd Semester

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
1st	CORE COURSE 1: ECOLOGY AND ECOSYSTEMS EVSHGEC01T Or EVSGCOR01T Unit 1: Introduction: Basic concepts and definitions: ecology, landscape, habitat, ecozones, biosphere, ecosystems, ecosystem stability, resistance and resilience; autecology; synecology; major terrestrial biomes	5	RA	July- August

	Unit 2: Ecology of individuals : Ecological amplitude; Liebig's Law of the Minimum; Shelford's Law of Tolerance; phenotypic plasticity; ecotypes; ecoclines; acclimation; ecological niche; types of niche: Eltonian niche, Hutchinsonian niche, fundamental niche, realized niche; niche breadth; niche partitioning; niche differentiation; thermoregulation; strategies of adaptation in plants and animals.	10	RA	July- August
	Unit 3: Ecology of populations: Concept of population and meta-population; r- and k-selection; characteristics of population: density, dispersion, natality, mortality, life tables, survivorship curves, age	10	RA	September-October

	structure; population growth: geometric, exponential, logistic, density-dependent; limits to population growth; deterministic and stochastic models of population dynamics; rudreal, competitive and stress-tolerance strategies. Unit 4: Ecology of communities : Discrete versus continuum community view; community structure and organization: physiognomy, sociability, species associations, periodicity, biomass, stability, keystone species, ecotone and edge effect; species interactions: mutualism, symbiotic relationships, commensalism, amensalism, protocooperation, predation, competition, parasitism, mimicry, herbivory; ecological succession: primary and secondary	10	SC	September-October

	successions, models and types of successions, climax community concepts, examples of succession. Unit 5: Ecosystem ecology Types of ecosystem: forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands; ecosystem structure and function; abiotic and biotic components of ecosystem; ecosystem boundary; ecosystem function; ecosystem metabolism; primary production and models of energy flow; secondary production and trophic 4 efficiency; ecosystem connections: food chain, food web; detritus pathway of energy flow and decomposition processes; ecological efficiencies; ecological pyramids: pyramids of number, biomass, and energy.	10	SC	November-December

	Unit 6: Biogeochemical cycles and nutrient cycling: Carbon cycle; nitrogen cycle; phosphorus cycle; sulphur cycle; hydrological cycle; nutrient cycle models; ecosystem input of nutrients; biotic accumulation; ecosystem losses; nutrient supply and uptake; role of mycorrhizae; decomposition and nutrient release; nutrient use efficiency; nutrient budget; nutrient conservation strategies.	8	SC	November-December
	Unit 7: Biological invasions: Concept of exotics and invasives; natural spread versus man-induced invasions; characteristics of invaders; stages of invasion; mechanisms of invasions; invasive pathways; impacts of invasion on ecosystem and communities; invasive ecogenomics – role of polyploidy and genome size in determining invasiveness;	7	RA	January

	economic costs of biological invasions. **Practicals**: EVSHGEC01P Or EVSGCOR01P			
	1. Qualitative and quantitative analysis of planktons of aquatic systems.	5	RA	September-October
	2. Determination of species, dominance and frequency using quadrate/ plot method.	5	RA	November-December
	3. Determination of dissolved oxygen, free carbon dioxide and primary productivity of water samples collected from aquatic ecosystems.	5	SC	January

SC- Saranya Chakraborty

RA- Ritwik Acharya

Academic Calendar

Department of Environmental Science, HMMCW

January, 2019 – May/June, 2019

A. WBSU-CBCS Syllabus for Even Semester

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
2nd	CORE COURSE 2: ENVIRONMENTAL BIOTECHNOLOGY EVSHGEC02T Or EVSGCOR02T			
	1. Unit 1: The Structure and Function of DNA, RNA and Protein.	15	SC	January-February
	2. Recombinant DNA Technology.	15	RA	January-February
	3. Ecological restoration and bioremediation	20	RA	March- April
	4. Ecologically safe products and processes	10	SC	April- May

	Practical: EVSHGEC02P Or EVSGCOR02P			
	a) Cytological preparation of Mitotic stages from onion root tips (*Allium cepa*)	8	RA	January-February
	b) Cytological preparation of Meiotic stages from grasshopper testis	6	RA	March- April
	c) Gram staining of bacterial sample.	2	SC	March- April
	d) Estimation of carbohydrate, protein and DNA.	2	SC	March- April

SC- Saranya Chakraborty

RA- Mr. Ritwik Acharya

Academic Calendar

Department of Environmental Science, HMMCW

June/July, 2019 – December/January 2019/2020

A. WBSU-CBCS Syllabus for Odd Semesters

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
1st	CORE COURSE 1: ECOLOGY AND ECOSYSTEMS EVSHGEC01T Or EVSGCOR01T Unit 1: Introduction: Basic concepts and definitions: ecology, landscape, habitat, ecozones, biosphere, ecosystems, ecosystem stability, resistance and resilience; autecology; synecology; major terrestrial biomes	5	RA	July- August

	Unit 2: Ecology of individuals : Ecological amplitude; Liebig's Law of the Minimum; Shelford's Law of Tolerance; phenotypic plasticity; ecotypes; ecoclines; acclimation; ecological niche; types of niche: Eltonian niche, Hutchinsonian niche, fundamental niche, realized niche; niche breadth; niche partitioning; niche differentiation; thermoregulation; strategies of adaptation in plants and animals.	10	RA	July- August
	Unit 3: Ecology of populations: Concept of population and meta-population; r- and k-selection; characteristics of population: density, dispersion, natality, mortality, life tables, survivorship curves, age	10	RA	September-October

	structure; population growth: geometric, exponential, logistic, density-dependent; limits to population growth; deterministic and stochastic models of population dynamics; rudreal, competitive and stress-tolerance strategies. Unit 4: Ecology of communities : Discrete versus continuum community view; community structure and organization: physiognomy, sociability, species associations, periodicity, biomass, stability, keystone species, ecotone and edge effect; species interactions: mutualism, symbiotic relationships, commensalism, amensalism, protocooperation, predation, competition, parasitism, mimicry, herbivory; ecological succession: primary and secondary	10	DM	September-October

	successions, models and types of successions, climax community concepts, examples of succession. Unit 5: Ecosystem ecology Types of ecosystem: forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands; ecosystem structure and function; abiotic and biotic components of ecosystem; ecosystem boundary; ecosystem function; ecosystem metabolism; primary production and models of energy flow; secondary production and trophic 4 efficiency; ecosystem connections: food chain, food web; detritus pathway of energy flow and decomposition processes; ecological efficiencies; ecological pyramids: pyramids of number, biomass, and energy.	10	DM	November-December

	Unit 6: Biogeochemical cycles and nutrient cycling: Carbon cycle; nitrogen cycle; phosphorus cycle; sulphur cycle; hydrological cycle; nutrient cycle models; ecosystem input of nutrients; biotic accumulation; ecosystem losses; nutrient supply and uptake; role of mycorrhizae; decomposition and nutrient release; nutrient use efficiency; nutrient budget; nutrient conservation strategies.	8	DM	November-December
	Unit 7: Biological invasions: Concept of exotics and invasives; natural spread versus man-induced invasions; characteristics of invaders; stages of invasion; mechanisms of invasions; invasive pathways; impacts of invasion on ecosystem and communities; invasive ecogenomics – role of polyploidy and genome size in determining invasiveness;	7	RA	January

	economic costs of biological invasions. **Practicals**: EVSHGEC01P Or EVSGCOR01P			
	1. Qualitative and quantitative analysis of planktons of aquatic systems.	5	RA	September-October
	2. Determination of species, dominance and frequency using quadrate/ plot method.	5	RA	November-December
	3. Determination of dissolved oxygen, free carbon dioxide and primary productivity of water samples collected from aquatic ecosystems.	5	DM	January

3rd Semester

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
1st	CORE COURSE 3: URBAN ECOSYSTEMS AND ENVIRONMENTAL POLLUTION EVSHGEC03T Or EVSGCOR03T			
	Unit 1: Urbanization : Introduction to urbanization; urban sprawl and associated environmental issues.	4	RA	July- August
	Unit 2: Environment in an urban setting : Man as the driver of urban ecosystem; commodification of nature; metros, cities and towns as sources and sinks of resources; urban transformation; increasing challenges posed by modernity for the environment; urban pollution (air, water, soil).	6	RA	July- August

	Unit 3: Urban environmental management : Benefits of environmental management; introduction to green buildings; urban governance; political complexity of applying ecological science to urban policy and planning, smart cities.	8	RA	September-October
	Unit 4: Environmental Pollution : Definition of pollution; pollutants; classification of pollutants.	2	RA	September-October
	Unit 5: Air pollution: Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants (primary and secondary); smog (case study); effects of different pollutants on human health 8 (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs)	8	DM	November-December

	and control measures; indoor air pollution: sources and effects on human health.			
	Unit 6: Water pollution: Sources of surface and ground water pollution; water quality parameters and standards; organic waste and water pollution; eutrophication; COD, BOD, DO; effect of water contaminants on human health (nitrate, fluoride, arsenic, chlorine, cadmium, mercury, pesticides).	7	RA	November-December
	Unit 7: Soil pollution : Causes of soil pollution and degradation; effect of soil pollution on environment, vegetation and other life forms.	4	DM	November-December
	Unit 8: Noise pollution: Noise pollution – sources; frequency, intensity and	5	DM	November-December

	permissible ambient noise levels; effect on communication, impacts on life forms and humans - working efficiency, physical and mental health; control measures.			
	Unit9: Radioactive pollution: Radioactive material and sources of radioactive pollution; effect of radiation on human health (somatic and genetic effects).	3	RA	November-December
	Unit 10: Marine pollution: Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management.	3	RA	January
	Unit 11: Pollution control: Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidized bed reactors, membrane bioreactor neutralization,	10	DM	January

	ETP sludge management; digesters, up flow anaerobic sludge blanket reactor, fixed film reactors, sequencing batch reactors, hybrid reactors, bioscrubbers, biotrickling filters; regulatory framework for pollution monitoring and control; case study: Ganga Action Plan; Yamuna Action Plan; implementation of CNG in NCT of Delhi. Practical: EVSHGEC03P Or EVSGCOR03P 1. Estimation of soil parameters: pH & Temperature; Soil porosity, Bulk density, Organic carbon. 2. Estimation of Ground & surface water quality parameters (COD, BOD, DO, nitrate, chlorine, cadmium, mercury).	5 7	DM RA	September-October November-December

	Estimation of air quality parameters (NOx, SOx, SPM).			

Academic Calendar

Department of Environmental Science, HMMCW

January, 2020 – May/June, 2020

A.WBSU-CBCS Syllabus for Even Semesters

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
2nd	CORE COURSE 2: ENVIRONMENTAL BIOTECHNOLOGY EVSHGEC02T Or EVSGCOR02T 1. Unit 1: The Structure and Function of DNA, RNA and Protein.	15	DM	January- February

	2. Recombinant DNA Technology.	15	RA	January- February
	3. Ecological restoration and bioremediation	20	RA	March- April
	4. Ecologically safe products and processes	10	DM	April- May
	Practical: EVSHGEC02P Or EVSGCOR02P			
	a) Cytological preparation of Mitotic stages from onion root tips (*Allium cepa*)	8	RA	January- February
	b) Cytological preparation of Meiotic stages from grasshopper testis	6	RA	March- April
	c) Gram staining of bacterial sample.	2	SC	March- April
	d) Estimation of carbohydrate, protein and DNA.	2	SC	March- April

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
4th	CORE COURSE 4: BIODIVERSITY AND CONSERVATION EVSHGEC04T Or EVSGCOR04T			
	1. Levels of organization in the living world	8	DM	January-February
	2. Biodiversity patterns	10	RA	January-
	3. Biodiversity estimation	8	DM	February
	4. Importance of biodiversity	10 10	RA DM	March- April
	5. Threats to biodiversity	10	RA	March- April
	6. Conservation of biodiversity			
	7. Biodiversity in India		DM	March- April
	Practical: EVSHGEC04P Or EVSGCOR04P			
	1. Data Base: NCBI, UniProt, PDB	5	RA	March- April
	2. Sequence Collection: mRNA, Protein Sequences from NCBI and UNIPROT. Sequence alignment: Pair wise and multiple sequence	15	RA	March- April

	alignment, using MUSCLE, CLUSTALW, Alignment representation using Weblogo.			

Academic Calendar

Department of Environmental Science, HMMCW

June/July, 2020 – December/January 2020/2021

A. WBSU-CBCS Syllabus for Odd Semesters

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
1st	CORE COURSE 1: ECOLOGY AND ECOSYSTEMS EVSHGEC01T Or EVSGCOR01T Unit 1: Introduction: Basic concepts and definitions: ecology, landscape, habitat, ecozones, biosphere, ecosystems, ecosystem stability, resistance and resilience; autecology; synecology; major terrestrial biomes	5	RA	July- August

	Unit 2: Ecology of individuals : Ecological amplitude; Liebig's Law of the Minimum; Shelford's Law of Tolerance; phenotypic plasticity; ecotypes; ecoclines; acclimation; ecological niche; types of niche: Eltonian niche, Hutchinsonian niche, fundamental niche, realized niche; niche breadth; niche partitioning; niche differentiation; thermoregulation; strategies of adaptation in plants and animals.	10	RA	July- August
	Unit 3: Ecology of populations: Concept of population and meta-population; r- and k-selection; characteristics of population: density, dispersion, natality, mortality, life tables, survivorship curves, age	10	RA	September-October

	structure; population growth: geometric, exponential, logistic, density-dependent; limits to population growth; deterministic and stochastic models of population dynamics; rudreal, competitive and stress-tolerance strategies. Unit 4: Ecology of communities : Discrete versus continuum community view; community structure and organization: physiognomy, sociability, species associations, periodicity, biomass, stability, keystone species, ecotone and edge effect; species interactions: mutualism, symbiotic relationships, commensalism, amensalism, protocooperation, predation, competition, parasitism, mimicry, herbivory; ecological succession: primary and secondary	10	DM	September-October

	successions, models and types of successions, climax community concepts, examples of succession. Unit 5: Ecosystem ecology Types of ecosystem: forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands; ecosystem structure and function; abiotic and biotic components of ecosystem; ecosystem boundary; ecosystem function; ecosystem metabolism; primary production and models of energy flow; secondary production and trophic 4 efficiency; ecosystem connections: food chain, food web; detritus pathway of energy flow and decomposition processes; ecological efficiencies; ecological pyramids: pyramids of number, biomass, and energy.	10	DM	November-December

	Unit 6: Biogeochemical cycles and nutrient cycling: Carbon cycle; nitrogen cycle; phosphorus cycle; sulphur cycle; hydrological cycle; nutrient cycle models; ecosystem input of nutrients; biotic accumulation; ecosystem losses; nutrient supply and uptake; role of mycorrhizae; decomposition and nutrient release; nutrient use efficiency; nutrient budget; nutrient conservation strategies.	8	DM	November-December
	Unit 7: Biological invasions: Concept of exotics and invasives; natural spread versus man-induced invasions; characteristics of invaders; stages of invasion; mechanisms of invasions; invasive pathways; impacts of invasion on ecosystem and communities; invasive ecogenomics – role of polyploidy and genome size in determining invasiveness;	7	RA	January

	economic costs of biological invasions. **Practicals**: EVSHGEC01P Or EVSGCOR01P			
	1. Qualitative and quantitative analysis of planktons of aquatic systems.	5	RA	September-October
	2. Determination of species, dominance and frequency using quadrate/ plot method.	5	RA	November-December
	3. Determination of dissolved oxygen, free carbon dioxide and primary productivity of water samples collected from aquatic ecosystems.	5	DM	January

3rd Semester

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
1st	CORE COURSE 3: URBAN ECOSYSTEMS AND ENVIRONMENTAL POLLUTION EVSHGEC03T Or EVSGCOR03T			
	Unit 1: Urbanization : Introduction to urbanization; urban sprawl and associated environmental issues.	4	RA	July- August
	Unit 2: Environment in an urban setting : Man as the driver of urban ecosystem; commodification of nature; metros, cities and towns as sources and sinks of resources; urban transformation; increasing challenges posed by modernity for the environment; urban pollution (air, water, soil).	6	RA	July- August

	Unit 3: Urban environmental management : Benefits of environmental management; introduction to green buildings; urban governance; political complexity of applying ecological science to urban policy and planning, smart cities.	8	RA	September-October
	Unit 4: Environmental Pollution : Definition of pollution; pollutants; classification of pollutants.	2	RA	September-October
	Unit 5: Air pollution: Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants (primary and secondary); smog (case study); effects of different pollutants on human health 8 (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs)	8	DM	November-December

	and control measures; indoor air pollution: sources and effects on human health.			
	Unit 6: Water pollution: Sources of surface and ground water pollution; water quality parameters and standards; organic waste and water pollution; eutrophication; COD, BOD, DO; effect of water contaminants on human health (nitrate, fluoride, arsenic, chlorine, cadmium, mercury, pesticides).	7	RA	November-December
	Unit 7: Soil pollution : Causes of soil pollution and degradation; effect of soil pollution on environment, vegetation and other life forms.	4	DM	November-December
	Unit 8: Noise pollution: Noise pollution – sources; frequency, intensity and	5	DM	November-December

	permissible ambient noise levels; effect on communication, impacts on life forms and humans - working efficiency, physical and mental health; control measures.			
	Unit9: Radioactive pollution: Radioactive material and sources of radioactive pollution; effect of radiation on human health (somatic and genetic effects).	3	RA	November-December
	Unit 10: Marine pollution: Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management.	3	RA	January
	Unit 11: Pollution control: Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidized bed reactors, membrane bioreactor neutralization,	10	DM	January

	ETP sludge management; digesters, up flow anaerobic sludge blanket reactor, fixed film reactors, sequencing batch reactors, hybrid reactors, bioscrubbers, biotrickling filters; regulatory framework for pollution monitoring and control; case study: Ganga Action Plan; Yamuna Action Plan; implementation of CNG in NCT of Delhi. Practical: EVSHGEC03P Or EVSGCOR03P 1. Estimation of soil parameters: pH & Temperature; Soil porosity, Bulk density, Organic carbon. 2. Estimation of Ground & surface water quality parameters (COD, BOD, DO, nitrate, chlorine, cadmium, mercury).	5 7	DM RA	September-October November-December

	Estimation of air quality parameters (NOx, SOx, SPM).			

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
5th Sem	DISCIPLINE SPECIFIC ELECTIVE 1: ENERGY AND ENVIRONMENT Credits: (Theory-5, Tutorials-1) (EVSGDSE01T) Unit 1: Introduction Defining energy; forms and importance; energy use from a historical perspective: discovery of fire, discovery of locomotive engine and fossil fuels, electrification of cities, oil wars in the Middle East, advent of nuclear energy; sources and sinks of energy; energy over-consumption in urban setting Unit 2: Energy resources Global energy resources; renewable and non-renewable resources: distribution and availability; past, present, and	8 12	RA DM	July- August July- August

	future technologies for capturing and integrating these resources into our energy infrastructure; energy-use scenarios in rural and urban setups; energy conservation.			
	Unit 3: Energy demand Global energy demand: historical and current perspective; energy demand and use in domestic, industrial, agriculture and transportation sector; generation and 13 utilization in rural and urban environments; changes in demand in major world economies; energy subsidies and environmental costs.	12	RA	September-October
	Unit 4: Energy, environment and society Nature, scope and analysis of local and global impacts of energy use on the environment; fossil fuel burning and related issues of air pollution, greenhouse effect, global warming and, urban heat island effect; nuclear energy and related issues such as radioactive waste, spent fuel; social inequalities related to energy production, distribution, and use.	12	DM	September-October
	Unit 5: Energy, ecology and the environment Energy production as driver of environmental change; energy	9	RA	November-December

	production, transformation and utilization associated environmental impacts (Chernobyl and Fukushima nuclear accidents, construction of dams, environmental pollution); energy over-consumption and its impact on the environment, economy, and global change.			
	Unit 6: Politics of energy policy (10 lectures) Political choices in energy policy globally and in the Indian context (historical and contemporary case studies); domestic and international energy policy; energy diplomacy and bilateral ties of India with her neighbours.	10	DM	November-December
	Unit 7: Our energy future Current and future energy use patterns in the world and in India; evolution of energy use over time; alternative sources as green energy (biofuels, wind energy, solar energy, geothermal energy; ocean energy; nuclear energy); need for energy efficiency; energy conservation and sustainability; action strategies for sustainable energy mix and management from a future perspective.	12	RA	January

Academic Calendar

Department of Environmental Science, HMMCW

January, 2021 – May/June, 2021

A.WBSU-CBCS Syllabus for Even Semesters

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
2nd	CORE COURSE 2: ENVIRONMENTAL BIOTECHNOLOGY EVSHGEC02T Or EVSGCOR02T 1. Unit 1: The Structure and Function of DNA, RNA and Protein.	15	DM	January- February

	2. Recombinant DNA Technology.	15	RA	January- February
	3. Ecological restoration and bioremediation	20	RA	March- April
	4. Ecologically safe products and processes	10	DM	April- May
	Practical: EVSHGEC02P Or EVSGCOR02P			
	a) Cytological preparation of Mitotic stages from onion root tips (*Allium cepa*)	8	RA	January- February
	b) Cytological preparation of Meiotic stages from grasshopper testis	6	RA	March- April
	c) Gram staining of bacterial sample.	2	SC	March- April
	d) Estimation of carbohydrate, protein and DNA.	2	SC	March- April

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
4th	CORE COURSE 4: BIODIVERSITY AND CONSERVATION EVSHGEC04T Or EVSGCOR04T			
	1. Levels of organization in the living world	8	DM	January-February
	2. Biodiversity patterns	10	RA	January-
	3. Biodiversity estimation	8	DM	February
	4. Importance of biodiversity	10 10	RA DM	March- April
	5. Threats to biodiversity	10	RA	March- April
	6. Conservation of biodiversity			
	7. Biodiversity in India		DM	March- April
	Practical: EVSHGEC04P Or EVSGCOR04P			
	1. Data Base: NCBI, UniProt, PDB	5	RA	March- April
	2. Sequence Collection: mRNA, Protein Sequences from NCBI and UNIPROT. Sequence alignment: Pair wise and multiple sequence	15	RA	March- April

	alignment, using MUSCLE, CLUSTALW, Alignment representation using Weblogo.			

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
6th	DISCIPLINE SPECIFIC ELECTIVE 3: SOLID WASTE MANAGEMENT Credits: (Theory-4) (EVSGDSE03T)			
	Unit 1: Introduction Sources and generation of solid waste, their classification and chemical composition; characterization of municipal solid waste; hazardous waste and biomedical waste.	3	DM	January-February
	Unit 2: Effect of solid waste disposal on environment Impact of solid waste on environment, human and plant health; effect of solid waste and industrial effluent discharge on water quality and aquatic life; mining waste and land degradation; effect of landfill leachate on soil characteristics and ground water pollution.	8	RA	January-February

	Unit 3: Solid waste Management Different techniques used in collection, storage, transportation and disposal of solid waste (municipal, hazardous and biomedical waste); landfill (traditional and sanitary landfill design); thermal treatment (pyrolysis and incineration) of waste material; drawbacks in waste management techniques.	14	DM	January-February
	Unit 4: Industrial waste management Types of industrial waste: hazardous and non-hazardous; effect of industrial waste on air, water and soil; industrial waste management and its importance; stack 17 emission control and emission monitoring; effluent treatment plant and sewage treatment plant.	6	RA	January-February
	Unit 5: Resource Recovery 4R- reduce, reuse, recycle and recover; biological processing - composting, anaerobic digestion, aerobic treatment; reductive dehalogenation; mechanical biological treatment; green techniques for waste treatment.	8	RA	January-February
	Unit 6: Waste- to- energy	4	DM	

	(WTE) Concept of energy recovery from waste; refuse derived fuel (RDF); different WTE processes: combustion, pyrolysis, landfill gas (LFG) recovery; anaerobic digestion; gasification. Unit 7: Integrated waste management Concept of Integrated waste management; waste management hierarchy; methods and importance of Integrated waste management. Unit 8: Life cycle assessment (LCA) Cradle to grave approach; lifecycle inventory of solid waste; role of LCA in waste management; advantage and limitation of LCA; case study on LCA of a product. Unit 9: Policies for solid waste management Municipal Solid Wastes (Management and Handling) Rules 2000; Hazardous Wastes Management and Handling Rules 1989; Bio-Medical Waste (Management and Handling) Rules 1998; Ecofriendly or green products.	4 5 8	DM DM/RA RA	March- April March- April May May

Academic Calendar

Department of Environmental Science, HMMCW

June/July, 2021 – December/January 2021/2022

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1st	CORE COURSE 1: ECOLOGY AND ECOSYSTEMS EVSHGEC01T Or EVSGCOR01T Unit 1: Introduction: Basic concepts and definitions: ecology, landscape, habitat, ecozones, biosphere, ecosystems, ecosystem stability, resistance and resilience; autecology; synecology; major terrestrial biomes	5	RA	July- August

	Unit 2: Ecology of individuals : Ecological amplitude; Liebig's Law of the Minimum; Shelford's Law of Tolerance; phenotypic plasticity; ecotypes; ecoclines; acclimation; ecological niche; types of niche: Eltonian niche, Hutchinsonian niche, fundamental niche, realized niche; niche breadth; niche partitioning; niche differentiation; thermoregulation; strategies of adaptation in plants and animals.	10	RA	July- August
	Unit 3: Ecology of populations: Concept of population and meta-population; r- and k-selection; characteristics of population: density, dispersion, natality, mortality, life tables, survivorship curves, age	10	RA	September-October

	structure; population growth: geometric, exponential, logistic, density-dependent; limits to population growth; deterministic and stochastic models of population dynamics; rudreal, competitive and stress-tolerance strategies. Unit 4: Ecology of communities : Discrete versus continuum community view; community structure and organization: physiognomy, sociability, species associations, periodicity, biomass, stability, keystone species, ecotone and edge effect; species interactions: mutualism, symbiotic relationships, commensalism, amensalism, protocooperation, predation, competition, parasitism, mimicry, herbivory; ecological succession: primary and secondary	10	DM	September-October

	successions, models and types of successions, climax community concepts, examples of succession. Unit 5: Ecosystem ecology Types of ecosystem: forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands; ecosystem structure and function; abiotic and biotic components of ecosystem; ecosystem boundary; ecosystem function; ecosystem metabolism; primary production and models of energy flow; secondary production and trophic 4 efficiency; ecosystem connections: food chain, food web; detritus pathway of energy flow and decomposition processes; ecological efficiencies; ecological pyramids: pyramids of number, biomass, and energy.	10	DM	November-December

	Unit 6: Biogeochemical cycles and nutrient cycling: Carbon cycle; nitrogen cycle; phosphorus cycle; sulphur cycle; hydrological cycle; nutrient cycle models; ecosystem input of nutrients; biotic accumulation; ecosystem losses; nutrient supply and uptake; role of mycorrhizae; decomposition and nutrient release; nutrient use efficiency; nutrient budget; nutrient conservation strategies.	8	DM	November-December
	Unit 7: Biological invasions: Concept of exotics and invasives; natural spread versus man-induced invasions; characteristics of invaders; stages of invasion; mechanisms of invasions; invasive pathways; impacts of invasion on ecosystem and communities; invasive ecogenomics – role of polyploidy and genome size in determining invasiveness;	7	RA	January

	economic costs of biological invasions. **Practicals**: EVSHGEC01P Or EVSGCOR01P			
	1. Qualitative and quantitative analysis of planktons of aquatic systems.	5	RA	September-October
	2. Determination of species, dominance and frequency using quadrate/ plot method.	5	RA	November-December
	3. Determination of dissolved oxygen, free carbon dioxide and primary productivity of water samples collected from aquatic ecosystems.	5	DM	January

3rd Semester

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
1st	CORE COURSE 3: URBAN ECOSYSTEMS AND ENVIRONMENTAL POLLUTION EVSHGEC03T Or EVSGCOR03T			
	Unit 1: Urbanization : Introduction to urbanization; urban sprawl and associated environmental issues.	4	RA	July- August
	Unit 2: Environment in an urban setting : Man as the driver of urban ecosystem; commodification of nature; metros, cities and towns as sources and sinks of resources; urban transformation; increasing challenges posed by modernity for the environment; urban pollution (air, water, soil).	6	RA	July- August

	Unit 3: Urban environmental management : Benefits of environmental management; introduction to green buildings; urban governance; political complexity of applying ecological science to urban policy and planning, smart cities.	8	RA	September-October
	Unit 4: Environmental Pollution : Definition of pollution; pollutants; classification of pollutants.	2	RA	September-October
	Unit 5: Air pollution: Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants (primary and secondary); smog (case study); effects of different pollutants on human health 8 (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs)	8	DM	November-December

	and control measures; indoor air pollution: sources and effects on human health.			
	Unit 6: Water pollution: Sources of surface and ground water pollution; water quality parameters and standards; organic waste and water pollution; eutrophication; COD, BOD, DO; effect of water contaminants on human health (nitrate, fluoride, arsenic, chlorine, cadmium, mercury, pesticides).	7	RA	November-December
	Unit 7: Soil pollution : Causes of soil pollution and degradation; effect of soil pollution on environment, vegetation and other life forms.	4	DM	November-December
	Unit 8: Noise pollution: Noise pollution – sources; frequency, intensity and	5	DM	November-December

	permissible ambient noise levels; effect on communication, impacts on life forms and humans - working efficiency, physical and mental health; control measures.			
	Unit9: Radioactive pollution: Radioactive material and sources of radioactive pollution; effect of radiation on human health (somatic and genetic effects).	3	RA	November-December
	Unit 10: Marine pollution: Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management.	3	RA	January
	Unit 11: Pollution control: Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidized bed reactors, membrane bioreactor neutralization,	10	DM	January

	ETP sludge management; digesters, up flow anaerobic sludge blanket reactor, fixed film reactors, sequencing batch reactors, hybrid reactors, bioscrubbers, biotrickling filters; regulatory framework for pollution monitoring and control; case study: Ganga Action Plan; Yamuna Action Plan; implementation of CNG in NCT of Delhi. Practical: EVSHGEC03P Or EVSGCOR03P 1. Estimation of soil parameters: pH & Temperature; Soil porosity, Bulk density, Organic carbon. 2. Estimation of Ground & surface water quality parameters (COD, BOD, DO, nitrate, chlorine, cadmium, mercury).	5 7	DM RA	September-October November-December

	Estimation of air quality parameters (NOx, SOx, SPM).			

Semester	Syllabus Module	No of Lectures	Teacher's Name	Tentative Distribution
5th Sem	DISCIPLINE SPECIFIC ELECTIVE 1: ENERGY AND ENVIRONMENT Credits: (Theory-5, Tutorials-1) (EVSGDSE01T) Unit 1: Introduction Defining energy; forms and importance; energy use from a historical perspective: discovery of fire, discovery of locomotive engine and fossil fuels, electrification of cities, oil wars in the Middle East, advent of nuclear energy; sources and sinks of energy; energy over-consumption in urban setting Unit 2: Energy resources Global energy resources; renewable and non-renewable resources: distribution and availability; past, present, and	8 12	RA DM	July- August July- August

	future technologies for capturing and integrating these resources into our energy infrastructure; energy-use scenarios in rural and urban setups; energy conservation.			
	Unit 3: Energy demand Global energy demand: historical and current perspective; energy demand and use in domestic, industrial, agriculture and transportation sector; generation and 13 utilization in rural and urban environments; changes in demand in major world economies; energy subsidies and environmental costs.	12	RA	September-October
	Unit 4: Energy, environment and society Nature, scope and analysis of local and global impacts of energy use on the environment; fossil fuel burning and related issues of air pollution, greenhouse effect, global warming and, urban heat island effect; nuclear energy and related issues such as radioactive waste, spent fuel; social inequalities related to energy production, distribution, and use.	12	DM	September-October
	Unit 5: Energy, ecology and the environment Energy production as driver of environmental change; energy	9	RA	November-December

	production, transformation and utilization associated environmental impacts (Chernobyl and Fukushima nuclear accidents, construction of dams, environmental pollution); energy over-consumption and its impact on the environment, economy, and global change.			
	Unit 6: Politics of energy policy (10 lectures) Political choices in energy policy globally and in the Indian context (historical and contemporary case studies); domestic and international energy policy; energy diplomacy and bilateral ties of India with her neighbours.	10	DM	November-December
	Unit 7: Our energy future Current and future energy use patterns in the world and in India; evolution of energy use over time; alternative sources as green energy (biofuels, wind energy, solar energy, geothermal energy; ocean energy; nuclear energy); need for energy efficiency; energy conservation and sustainability; action strategies for sustainable energy mix and management from a future perspective.	12	RA	January

Academic Calendar

Department of Environmental Science, HMMCW

January, 2022 – May/June, 2022

A.WBSU-CBCS Syllabus for Even Semesters

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
2nd	CORE COURSE 2: ENVIRONMENTAL BIOTECHNOLOGY EVSHGEC02T Or EVSGCOR02T 1. Unit 1: The Structure and Function of DNA, RNA and Protein.	15	DM	January- February

	2. Recombinant DNA Technology.	15	RA	January- February
	3. Ecological restoration and bioremediation	20	RA	March- April
	4. Ecologically safe products and processes	10	DM	April- May
	Practical: EVSHGEC02P Or EVSGCOR02P			
	a) Cytological preparation of Mitotic stages from onion root tips (*Allium cepa*)	8	RA	January- February
	b) Cytological preparation of Meiotic stages from grasshopper testis	6	RA	March- April
	c) Gram staining of bacterial sample.	2	SC	March- April
	d) Estimation of carbohydrate, protein and DNA.	2	SC	March- April

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
4th	CORE COURSE 4: BIODIVERSITY AND CONSERVATION EVSHGEC04T Or EVSGCOR04T			
	1. Levels of organization in the living world	8	DM	January-February
	2. Biodiversity patterns	10	RA	January-
	3. Biodiversity estimation	8	DM	February
	4. Importance of biodiversity	10 10	RA DM	March- April
	5. Threats to biodiversity	10	RA	March- April
	6. Conservation of biodiversity			
	7. Biodiversity in India		DM	March- April
	Practical: EVSHGEC04P Or EVSGCOR04P			
	1. Data Base: NCBI, UniProt, PDB	5	RA	March- April
	2. Sequence Collection: mRNA, Protein Sequences from NCBI and UNIPROT. Sequence alignment: Pair wise and multiple sequence	15	RA	March- April

	alignment, using MUSCLE, CLUSTALW, Alignment representation using Weblogo.			

Semester	Syllabus Module & Topic	No of Lectures	Teacher's Name	Tentative Distribution
6th	DISCIPLINE SPECIFIC ELECTIVE 3: SOLID WASTE MANAGEMENT Credits: (Theory-4) (EVSGDSE03T)			
	Unit 1: Introduction Sources and generation of solid waste, their classification and chemical composition; characterization of municipal solid waste; hazardous waste and biomedical waste.	3	DM	January-February
	Unit 2: Effect of solid waste disposal on environment Impact of solid waste on environment, human and plant health; effect of solid waste and industrial effluent discharge on water quality and aquatic life; mining waste and land degradation; effect of landfill leachate on soil characteristics and ground water pollution.	8	RA	January-February

	Unit 3: Solid waste Management Different techniques used in collection, storage, transportation and disposal of solid waste (municipal, hazardous and biomedical waste); landfill (traditional and sanitary landfill design); thermal treatment (pyrolysis and incineration) of waste material; drawbacks in waste management techniques.	14	DM	January-February
	Unit 4: Industrial waste management Types of industrial waste: hazardous and non-hazardous; effect of industrial waste on air, water and soil; industrial waste management and its importance; stack 17 emission control and emission monitoring; effluent treatment plant and sewage treatment plant.	6	RA	January-February
	Unit 5: Resource Recovery 4R- reduce, reuse, recycle and recover; biological processing - composting, anaerobic digestion, aerobic treatment; reductive dehalogenation; mechanical biological treatment; green techniques for waste treatment.	8	RA	January-February
	Unit 6: Waste- to- energy	4	DM	

	(WTE) Concept of energy recovery from waste; refuse derived fuel (RDF); different WTE processes: combustion, pyrolysis, landfill gas (LFG) recovery; anaerobic digestion; gasification. Unit 7: Integrated waste management Concept of Integrated waste management; waste management hierarchy; methods and importance of Integrated waste management. Unit 8: Life cycle assessment (LCA) Cradle to grave approach; lifecycle inventory of solid waste; role of LCA in waste management; advantage and limitation of LCA; case study on LCA of a product. Unit 9: Policies for solid waste management Municipal Solid Wastes (Management and Handling) Rules 2000; Hazardous Wastes Management and Handling Rules 1989; Bio-Medical Waste (Management and Handling) Rules 1998; Ecofriendly or green products.	4 5 8	DM DM/RA RA	March- April March- April May May

DM- Dr. Debashis Majumder
RA- Mr. Ritwik Acharya