Rabindra Bharati University

Department of Environmental Studies

Kolkata 50

Syllabus for MA in Environmental Studies
Session 2017-18 onwards

The Department of Environmental Studies, RabindraBharatiUniversity, in view of the changing needs of time and situation has decided to modify and update the Examination Structure and Syllabus at Post-Graduate level. The required modification aims to satisfy the needs of the students intending to appear NET Examination and also those preparing jobs in both academic and corporate fields in a competitive world. The salient features of the proposed changes are as follows:

- Incorporation of Semester system of Studies
- There shall be four semesters of 25credits each, totaling to 100credits
- In all there shall be 16 core coursesincluding one special course of dissertation work and one practical course,4 compulsory elective courseand two open elective course
- The structure of the course will be as follows

First Semester: 5 Core Units of total 25 credits.
Second Semester: 5 Core Units of total 25 credits.
Third Semester: 3 Core Units and 2 compulsory electives of total 25 credits.
Fourth Semester: 1Core Unit,2 compulsory electives and 2 open electives of total 25 credits

For each unit in each semester, 40 marks arefor examinations and 10 marks are for internal assessment.

The syllabus of the core papers, compulsory elective papers and open elective papers are in lines with the UGC model curriculum with minor changes to suit present circumstances and keeping in mind that Environmental Studies is a multidisciplinary subject and students join in this course have different honours subjects.

The schedule of the semesters can be as follows:

Semester	Duration	Effective numbers of weeks	Total Credit Hour per weeks
I	July - December	16 weeks	25
II	January - June	15 weeks	25
III	July - December	16 weeks	25
IV	January - June	15 weeks	25

Synopsis of
Syllabus for MA in Environmental Studies
Session 2017-18 onwards

	Code	Course		Credits	Marks*
Semester I (July to December)	ENVCC101	1.1	Society, Development and Ecology	6	50
	ENVCC102	1.2	Environmental Pollutions I	6	50
	ENVCC103	1.3	Natural Resources and Environment	5	50
	ENVCC104	1.4	Environmental Politics	4	50
	ENVCC105	1.5	Environmental policies,laws and regulations	4	50
Semester II (January to June)	ENVCC201	2.1	Wetland , marine,hill ecology and environmental forestry	5	50
	ENVCC202	2.2	Environmental Pollutions II	6	50
	ENVCC203	2.3	Environmental Geology and Remote Sensing	5	50
	ENVCC204	2.4	Practical in Environmental Studies	5	50
	ENVCC205	2.5	Environmental Economics and Statistics	4	50
Semester III (July to December)	ENVCC301	3.1	Sustainable Development	5	50
	ENVCC302	3.2	Hydrology and water resources	5	50
	ENVCC303	3.3	Atmosphere and Global climate scenario	5	50
	ENVCEC304	3.4, 3.4A	Environmental Management I/Man and Environment I	5	50
	ENVCEC305	3.5 3.5A	Environmental Management II/ Man and Environment II	5	50
Semester IV (January to June)	ENVCC401	4.1	Project (Dissertation)	7	50
	ENVCEC402	4.2 4.2A	Environmental Management III/ Man and Environment III	4	50
	ENVCEC403	4.3 4.3A	Environmental Management IV/ Man and Environment IV	4	50
	ENVOEC404	4.4 4.4A	Disaster Management I /Museum and Environment I	5	50
	ENVOEC405	4.5 4.5A	Disaster Management II / Museum and Environment II	5	50
	Total			100	5000

Semester I

Code and Course	*Detail Syllabus*	*Lectures required*	*Marks*	*Credits per week*
ENVCC 101 Course 1.1	**Society, Development and Ecology** • Human beings, society and Development – views of Rabindranath Tagore and other Indian thinker on environment • Need for development – Antidevelopment – maldevelopment – Development and displacement of population in India • Concept of ecology and ecosystem – Structure and function of ecosystem • Biotic factor – relationship among organism, positive and negative interactions • Concept of population and community ecology, characteristics, dynamics –composition, structure, origin and development of a community, nich and habitat concept, succession Ecological dimensions in development in India with environmental priorities in India • Environmental communication	96	50 *[40(exam)+10(internal assessment)]*	5+1=6
ENVCC 102 Unit 1.2	**Environmental Pollutions I** • Air pollution: classification, vehicular and industrial pollution, Green-house effect, ozone layer depletion, acid rain, particles,ions and radicals in the atmosphere, chemical processes for formation of inorganic and organic particulate matter, thermochemical and photochemical reactions in atmosphere, chemistry of air pollutants, photochemical smog. • Ground water issues, aquifers, hydrological cycle, surface and subsurface water, rain water harvesting and ground water recharge, pollutants in surface and ground water and their treatment, water treatment plant and treatment processes, bacteriological sampling	96	50 *[40(exam)+10(internal assessment)]*	5+1=6

	and analysis for quality. • Chemistry of water , concepts of BOD, COD, DO • Metal, Non- metal, Heavy metal & Bacteriological contamination in water • Sewage and waste water treatment			
ENVCC 103 Course 1.3	**Natural Resources and Environment** • Natural resources and associate problems • Forest resource use and overexploitation, forest degradation and conservation. • Water resources and national status . • Mineral resources and national status • Food resources and national status • Energy resources and national status • Land resources and national status, land use planning.	80	50 *[40(exam)+10(internal assessment)]*	4+1=5

ENVCC305 Course 1.4	**Environmental Politics** • Environment, culture and politics • The Wastephalian system, rethinking the ecology – sovereignty debate • North vs South – international co-operation and conflict • Biosphere Conference – from Stockholm to Rio and beyond : globalization of the environmental agenda – UNCED and post UNCED • Civil society and marginal voices – indigenous people – women – eco-feminism • Environmental politics in India – major issues – environmental politics among neighboring countries • Major environmental movements in India and abroad • Politics of environment-International protocols and treaties Environment in Indian economy with diversities and Environment in India under 5 Yr plans and constitution.	64	50	3+1=4
ENVCC105 Course 1.5	**Environmental laws and regulations** • Environmental ethics and major environmental laws,Growth of environmental laws and procedure in India Quasi administrative environmental laws • Environmental laws at the international level, National policy on environment and practice Environment in India • Prohibition and restriction on the location of the	64	50 *[40(exam)+10(internal assessment)]*	3+1=4

	industries. EPA (Environmental Protection Act, 1986) Administrative adjudication and agencies implementing Courts, People, NGOs and environmental laws • Environmental monitoring and role of West Bengal Pollution Control Board • Human rights and environment			

Semester II

ENVCC201 Course 2.1	**Wetland ,hill, marine ecology and environmental forestry** • Energy and environment in India Urbanization and urban environment in India • Energy flows, food chain, food web, ecological pyramids, community ecology, parasitism, prey and predator relationship Wetland and Coral Reef ecology: Wetlands – definition and classification, threats, conservation. Identification of Ramsar site, Ramsar conservation. Coral reef formation, importance, threats, coral reefs and climate change • Marine ecology: Ecological importance of mangrove vegetation, distribution of mangrove areas in India, salinity ingress in coastal areas. Marine Environment: Biota in different types of zone s, its diversity-plankton, nekton, benthos, their adaptations and productivity, Indian marine territory, Exclusive Economic Zones (EEZ). • Definition of forest and forestry; Classification of forest and their distribution with special reference to mangrove forest. Composition of forest – fundamentals of forest population, community, succession, climax; components of a forest ecosystem. Interrelationship among different components in forest ecosystem endemic Ecological values of forest, forest types of the world and India Conservation of forest – definition, National and international conservation strategies. Indian Forest Conservation Act 1980, 1988). Importance of indigenous knowledge and peoples participation in forest conservation. Knowledge about – World Forestry day, World Environment Day, Vanamahotsav, Aranya Saptaha. Forest Biotechnology – Forest resources & bioprocess	75	50 [40(exam)+10(internal assessment)]	4+1=5
ENVCC202 **Course 2.2**	**Environmental Pollutions II** • Industrial wastes and treatment processes • Arsenic and heavy metal pollution and mitigatiion • Marine and river pollution • Radioactive pollution and thermal pollution • Noise pollution and measurement technique. • Pollution due to population explosion and habitat degradation • Soil pollution, soil chemistry inorganic and organic components of soil,nitrogen pathways , pH, NPK and organic carbon in soils • solid and bio medical waste pollution and management • Odour pollution, vision pollution and e waste .	90	50 *[40(exam)+10(internal assessment)]*	5+1=6
ENVCC 203 **Course 2.3**	**Environmental Geology and Remote Sensing** • Origin and evolution of earth, plate tectonics and sea	75	50 *[40(exam)+10(internal assessment)]*	4+1=5

	floor spreading, continental drift and mountain building • Glaciers: Physical and chemical aspects, Mass balance, Recession of Himalayan glaciers, Glaciers as index of climate change. • Rock types – igneous, metamorphic and sedimentary; Soil formation, composition, and classification; Soil profile, Mineral deposits – formation and classification • Weather Elements and their variations; Heat balance of the earth atmosphere system, Earth as a heat engine • Major climatic zones of the world, Climates of India, Climate and vegetation, Climatic extremes - environmental implications, Global climate change and its impact on environment • Remote sensing application in GIS interface of GIS & RS. • Maps & spatial information, the components of geographical information system. • Data structure in GIS. Raster & vector data structures. • Using of GPS in Environmental management.		*Saheli- 50*	
ENVCC 204 **Course 2.4**	**Practical in Environmental Studies** • Chemical Kinetics : Normality, Molarity , ,Principles of titrimetry, , Spectrophotometry, • Microbiological analysis – Isolation and characterisation of bacteria, fungi, from soil & water. Coliform detection of drinking water, Antifungal and antibacterial activity of toxic compounds • Quadratic study of soil. Physiochemical analysis of soil- pH, conductivity, organic carbon, hardness • Water Pollution : Common Pollutants : Colour, Odour, TDS and TSS, Particle size analysis, pH value, Temperature, Oil and Grease, Nitrate –Nitrogen, Total residual Chlorine, Iron, Fluoride, Chloride, Hardness, Arsenic, Lead, Hexavalent Cromium, Sulphate, • Effluent Water : Colour, Total Dissolved Solids, pH, Oil & Grease, Chemical Oxygen Demand, Biochemical Oxygen Demand (for 3 days at 27 C) • Soil Pollution : pH, Calcium carbonate, Available Phosphate, Available Potassium, Nitrate – Nitrogen, Ammonical Nitrogen, Percent of organic Carbon • Air Pollution : SOX, NOX, Ozone, CO_2, Suspended Particulate Matter • Noise Pollution : Measurement of Noise Pollution by Decibel meter	75	50	5
ENVCC 205 **Course 2.5**	**Environmental Economics and Statistics** • Environment-economy circular relationship, Environmental Kuznets Curve (EKC): Concepts and Genesis. Explanations of inverted-U shaped EKC- empirical evidence- N-shaped EKC. • Environmental Pollution as a Negative Externality (Pigou), The issue of Property Rights (Coase	60	50 *[40(exam)+10(internal assessment)]*	3+1=4

	theorame), Tax vs Standard • Basic issues of environmental valuation I –concept of willingness to pay and willingness to accept, Revealed Preference Approach- household production function, travel cost, hedonic price, statistical value of life, Approach-contingent valuation method • Environmental problems due to underdevelopment and economic growth and over population with Environment under economic reforms: official policies and future trends – Indian example • Descriptive statistics- collecting of data, tabular representation, sample survey, concept of frequency, relative frequency, class limit, class boundaries, diagrammatic representation (bar chart, pie chart, frequency polygon, histogram and ogive) • Cost Benefit analysis • Basic issues of environmental valuation			

SEMESTER III

ENVCC301 Course 3.1	**Sustainable Development** • Theories and concept of sustainable development – models of sustainable development • Agenda 21: Reference guide for sustainable development • Sustainable land management and wasteland reclamation • Sustainable use of biodiversity and wild life and its conservation • Agriculture sustainability- food security. • Sustainable Water management and conservation • Sustainable forest policies and conservation • Sustainable tourism development, coastal and hill ecology management	80	50 *[40(exam)+10(internal assessment)]*	4+1=5
ENVCC302 Course 3.2	**Hydrology and water resurces** • The hydrologic cycle and various characteristics of surface and groundwater resources including different techniques of water management. • Analytical methods to quantify water quality and determine hydrological parameters. • Structure and properties of water, Inventory of Earth's water, quality and quantity. Limits of cations and anions in portable water including	80	50	4+1=5

	fluoride and arsenic, phosphate, nitrate and heavy metals. • Application of isotopes in hydrology. Hydrogeology of India. • Surface water resources: precipitation, infiltration, water balance, Evapo-transpiration and runoff, Drainage basin. • Groundwater resources: rock properties affecting ground water, vertical distribution of ground water, zone of saturation. • Darcy's law: permeability, transmissivity and storage coefficient. Viscous character of groundwater flow. Geologic formations as aquifers, type of aquifers. • Distribution of water - local, regional and global. • Ground water exploration. Environmental Influences on water resources: surface and groundwater resources of arid and semiarid regions, • Snowmelt hydrology from glaciers, fluctuations due to urbanization, Evapo-transpiration and tides. • Recent development in surface and groundwater resources monitoring and assessing processes. • Salinity ingress in ground water. Water logging and soil salinity-conjunctive use of surface water and ground water. • Water resource management: Flood and flood plain management; Water-shed management, water harvesting and artificial recharge to ground water; water pollution and water treatment. • Wetland and riparian management; forest management on water resources. Environmental issues: River linking debate			
ENVCC303 Course 3.3	**Atmosphere and global climate change** • Earth's atmosphere, its dynamic nature and variability in turns of the global energy balance. • Elements of the climate, climate change and human impacts on climate initiative policies. • Earth Systems: Atmosphere, Hydrosphere, Lithosphere, Biosphere and their linkage. Earth's geological history and development	80	50	4+1=5

	and evolution of the atmosphere; Gaia Hypothesis. • Atmosphere and climate. Basic atmospheric properties, climatic controls. Climatic classifications and variability. Movement in the atmosphere: global scale, regional scale, local scale. • Oceans: General circulation patterns. Air- Sea interaction. • Global Energy balance: Source, transfer, distribution. Energy balance of the atmosphere. • Wind, stability and turbulence; Monsoons; El Nino, Southern Oscillations, cyclones. Natural climate changes: Records of climate change (glacial cycles, ocean sediments, corals, tree rings). • Human Impacts on climate, Causes and consequences of Global warming: Greenhouse effect; Global and regional trends in greenhouse gas emissions; Sea level rise; role of oceans and forests as carbon sinks • Ozone depletion- stratospheric ozone shield; Ozone hole.Impacts of Climate change: Effects on organisms including humans; effects on ecosystems and productivity; species distribution ranges; spread of diseases; Extinction risk for temperature-sensitive species; UV effects • Climate change and Policy: Montreal Protocol; Kyoto Protocol; Carbon trading; clean development mechanisms.			
ENVCEC304 Course 3.4	**Environmental Management I** • Environment, ecology and management, positive and negative effects • Human impact on natural environment • Population and ecological crisis • Management of natural resources – forest and mineral resource • Conventional energy: Sources and categories, current status of exploitation viz. coal, petroleum, natural gas, nuclear fuel with reference to India and their consequences on environment. • Non-Conventional energy: Sources and categories, current status of exploitation viz. solar, wind, biofuel, tidal, geothermal, hydal energy e t c . with respect to India and their	80	50	4+1=5

	consequences on environment. • Energy production and its consequence on environment. Conventional and non-conventional energy use. • Energy Audit: Concept, purpose and methodology			
ENVCEC305 Course 3.5	**Environmental Management II** • Concept & scope of EIA, principle and salient features, EIA processes, methodologies, MOEF guidelines; • Basic steps of overall appraisal of development projects - base line date collection & generation from the field; • Identification & prediction of impacts of development project; • Evaluation of impacts - different methods (checklist, adhoc, overlays, matrix, network and Bettle Environmental Evaluation Systems) - • Preparation Environmental Management plan (EMP) for mitigation; • Environmental impact statement; post project monitoring – • Environmental. Audit System; some case studies of EIA/EMP and environmental auditing system. • Instrumentation technique & micro-meteorological study • DPR for core and buffer zone	80	50	4+1=5
ENVCEC304 Course 3.4A	**Man and Environment I** • Methods of communication to the masses and consumers for environmental issues. It also provides an overview of the scenario of environmental education and communication at the national and international levels. • Environmental education and environmental literacy: Need for public awareness. • Fundamentals of Mass communication: What is communication? Defining Communication; Types of Communication; Mass Communication: an introduction; Role of Mass media. • Basics of Science & Technology (S&T) Communication: Role of Communication in Modern Science; 'Public' nature of science; Science and Public: Historical overview; Why communicate S&T; When public meets science • Channels of S&T Communication: What are	80	50 *[40(exam)+10(internal assessment)]*	4+1=5

	channels; Broadcast media and S&T; Print media and S&T; Telecast Media and S&T; Science through little media; Use of group media for S&T communication. • Pragmatic aspect and contexts of science & environmental communication: Strategies for Communication; Use of analogies; Metaphor and Simile; Human and With Examples and illustrations; Anecdotes and personalizing; Context for science and environmental communication; Human interest; Cultural needs; Survival needs; Sources of information; ethics in reporting & fundamentals of media laws. • Educating Consumers: Consumer Behavior and Environment: Role of Information, Eco- Labeling Environmental communication Today: Introduction; Over view of the scenario in the country; International scenario; Canonical texts (Critical reading of Books on Environmental communications such as Silent spring); case studies of media reports that had impact; Analysis of mass media coverage of complex environmental issues and the media's effects on public opinion and government environmental policies.			
ENVCEC305 Course 3.5A	. **Man and Environment II** • Economics & ecology in decision making & law making processes • Environmental and resource economics makes use of ideas and tools developed in other branches of economics to make significant contribution to valuation techniques, design of policy instruments for pollution control and management of commons. • Overview of Central Issues; Refresher on Supply and Demand Basics of Welfare Economics: Producer and Consumer Surplus, Market failure, Externalities, Public Goods, Pareto Optimality • Cost-Benefit Analysis and Valuation: Discounting, Principles of Cost-Benefit Analysis, Estimation of Costs and Benefits,	80	50 *[40(exam)+10(internal assessment)]*	4+1=5

	Techniques of Valuation • Non-Renewable Resources: Economics of Fuels and Minerals, Hotelling's rule and Extensions, Taxation, Recycling, • Waste Management Renewable Resources: Economics of water use, Management of Fisheries and Forests • Pollution Control: Policies for Controlling Air and Water pollution, Disposal of Toxic and Hazardous Waste-Standards vs. Emissions Charges Regional and Global Concerns: Acid rain, Ozone depletion, Greenhouse Effect, WTO and environment, Natural Disaster Management. • Growth, Resources and the Environment: Resource Scarcity, Poverty, Sustainable Development, Foreign Aid			

Semester IV

Code and Course	*Detail Syllabus*	*Lectures required*	*Marks*	*Credits per week*
ENVCC 401 Course 4.1	**Project/ Dissertation** (Report + Viva)	105	50	7
ENVCEC402 Course 4.2	**Environmental Management III** • Pollution and Global environmental issues • Management of environment: approaches, components and objectives • Management of environment: ISO 14001 Standards for designing and implementation of Environment Management System (EMS),assessment issues, strategy-environmental audit • Environmental problems, planning and management in India • Total Quality management (TQM)	75	50	4+1=5
ENVCEC403 Course 4.3	**Environmental Management IV** • Toxicology: Principles of toxicology, Types of toxic	75	50	4+1=5

	substances - degradable and non-degradable; Influence of ecological factors on the effects of toxicity; Toxic substances in the environment, their sources and entry roots, Eco-system influence on the fate and transport of toxicants; Transport of toxicants by air and water; Transport through food chain - bio-transformation and bio-magnification. Routes of toxicants to human body – entry through inhalation, skill absorption, indigestion and injection; Response to toxin exposures – Dose response, Lethal and sub-lethal doses; Dose-Response relationships between chemical and biological reactions. Analysis of LD 50, LC 50; Detoxification in human body - detoxification mechanisms. • Environmental biotechnology: concept and broad outlines of various application areas – waste treatment, biodegradation of xenobiotic compounds, hydrocarbon degradation, biofuel production, biofertilizer, biopesticides production, and bioleaching. • Bioremediation: Concept, role of bioremediation in controlling various pollution problems – solid water, sewage water, industrial effluents, heavy metals, radioactive substances, oil spillage. • Phytoremediation: Abatement of different types of pollution using plants, types of phytoremediation, mechanism involved with case studies. • Alternate fuels: source and mechanism of various biofuel production. • Integrated pest management: concept, technology involved in agriculture & forestry, Biopesticides application potential. • Biocomposting: – Microbial process involvement, Waste management, vermin- composting. • Biomining: Extraction of Cu, Au, etc from Ore by microbes • Biomethanation: Agro industrial wastes • Recombinant DNA technology & its application in strain improvement • GM Crops and GMO: Environmental Implications			
ENVCEC402 Course 4.2A	**Man and Environment III** • The relationship between 'development', 'progress', science, capitalism and industrialism. • Green critiques of industrialism • Post-colonial and post-structuralist critiques of development and the discourse of participation • The impact of development on marginal peoples	75	50	4+1=5

	• Re-evaluation of development in light of sustainability and social equity; contemporary critiques and models.			
ENVCEC403 Course 4.3 A	**Man and Environment IV** • Broad theories and parameters of environmental philosophy, including issues of animal rights, human rights and wilderness ideas. The effort will be to look at the philosophical basis of current conservation theories and competing views of environmentalism. • An Introduction to Environmental Ethics and Philosophy: Ethics in society; Environmental Consequences; Responsibility for Environmental Degradation • Theories of Environmental Ethics and Philosophy: Different types of schools of thought vis-à-vis nature and environmental management. Values in modernity, anti-modernity, eastern and western cultures, nature and religion etc. • Eco Centric Theories of Nature: Deep ecology and animal rights theories, environmental rights, environmental racism. • Cross-cultural views on Nature: The relationship between humans, nature and adaptation. Theoretical frameworks of cultural and social ecology; debates on culture/nature divide. • Environment and Business Ethics: Foundations of Environmental Ethics for Business, Corporate Environmental Ethics, Environmental Disclosure, Social and Ethical Issues for Sustainable Development, Business Ethics and Corporate Environmental Performance. • Environmental Ethics and Issues of National and International Governance: changing nature of environmental ethics in relation to international and national paradigms of environmental governance. • Resource consumption patterns and the need for equitable utilization; Equity disparity in the northern and southern countries; Urban – rural	75	50	4+1=5

	equity issues; Need for gender equities; Preserving resources for future generations; The ethical basis of Environmental education and awareness; The conservation ethics and traditional value system of India. .			
ENVOEC404 Course 4.4	**Disaster Management I** • Disaster: definition, classification and threat • Disaster management cycle, Mapping of disaster prone areas, counter disaster plans • Disaster prevention, mitigation and National disaster management policy with disaster legislation • Major factors prior to disaster impact. Response to disaster impact, disaster induced displacement • Study of Cyclone and Fire • Safety measures for natural disasters •	75	50	5
ENVOEC405 Course 4.5	**Disaster Management II** • Flood and land slide management • Earthquake and Tsunami management • Man made disaster • Industrial and chemical disaster and safety measures and HAZOP study. • Disaster due to volcano • Drought – causes and effect • Avalanche and Global warming • Radioactive and nuclear disaster	75	50	4+1=5
ENVOEC404 Course 4.4 A	**Museum and Environment I** • Humidity measurement and control • Temperature Measurement and control • Light intensity measurement and control • Pesticide Fumigation • Air Pollution Monitoring • Moisture control and monitoring	75	50	4+1=5
ENVOEC405 Course 4.5 A	**Museum and Environment II** • Different forms of Environmental degradation • **C**orrosion , its effects and remedial action • Salt action and moisture attack and remedial action • Termite attack and remedies	75	50	4+1=5

	• Effect of gaseous pollutants and remedies			