

**P.G. 4<sup>th</sup> SEMESTER SYLLABUS**  
**DEPARTMENT OF ENVIRONMENTAL BIOLOGY & WILDLIFE SCIENCES**  
**COTTON UNIVERSITY**

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**PAPER: EWS1001C**

**ECOLOGY AND SOCIETY**

**CREDITS: 4 (3+0+1)**

**Unit 1: Ecological History (12 lectures)**

Ecological history of India: A critical reading of Gadgil and Guha, *The Fissured Land (1989)* and Rangarajan and Sivaramakrishna, *India's Environmental History (2013)*. Ecological history of northeast India: paleoecology and pre-historic ecology; agriculture expansion, domestication of rice and other crops; geography and geology of the region: flood, fire, climate and monsoon pattern, formation of alluvial flood plain; society: hunting, shifting cultivation, forest villages; grazing; economy: nature, commerce and mobility, tea environmental history; state and environment: the Ahom rulers and the colonial state.

**Unit 2: Ecology and Economics of Human Societies (10 lectures)**

Human ecology and its importance in understanding conservation issues; different modes of resource use and differences with respect to technology, economy, social organization, ideology, and nature of ecological impact; population and scarcity; markets and commodities; ecological economics; institutions and “The Commons”

**Unit 3: Political Ecology (12 lectures)**

Introduction to political ecology; political versus apolitical ecologies; conceptual and methodological challenges, challenges in ecology, social construction and explanation, dominant narratives of political ecology - degradation and marginalisation, conservation and control, environmental conflict and exclusion, environmental subjects and identities and political objects and actors with examples from India and northeastern India; gender and environment (case study of Narmada Dam project in India); environmental identity and social movements in India and across the world—chipko, silent valley, navdanya, national park movement, Aldo Leopold's land ethics, Rachel Carson and Silent Spring; role of civil society, non-governmental organisation, media, individuals, literary figures in environmental awareness and actions.

**Unit 4: Urban Ecology (14 lectures)**

Introduction to urban ecology; urban environment; population-and species-level responses to urbanisation; community-level response to urbanisation; ecosystem-level responses to urbanisation; ecosystem services in urban areas; evolution of life in urban environments; human-wildlife interactions in urban areas; urban ecology and human health; multifunctional green infrastructure planning to promote ecological services in the city; building for biodiversity: accommodating people and wildlife in cities.

**Practicals**

Participant observation; qualitative interviews and focus groups; questionnaires; documenting local environmental knowledge and change; community workshops and the PRA toolbox; participatory mapping.

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**Suggested Readings**

1. Robbins P (2012). *Political Ecology: A critical Introduction (2nd Edition)*. Wiley-Blackwell
2. Robbins P, Hintz J and Moore SA (2014). *Environment and Society (2nd Edition)*. Wiley-Blackwell
3. Gadgil M and Guha R (1992). *This Fissured Land, An Ecological History of India*, Oxford University Press
4. Saikia AJ (2013). *Forests and ecological history of Assam, 1826-2000*. Oxford University Press
5. Saikia AJ (2005). *Jungles, Reserves, Wildlife: A History of Forests in Assam*. Wildlife Area Development Trust, Guwahati
6. Rangarajan M and Sivaramakrishna K (2013). *India's Environmental History: A Reader*. Orient Blackswan Private Limited
7. Newing H (2011). *Conducting Research in Conservation: Social Science Methods and Practice*. Routledge
8. Parris KM (2016). *Ecology of Urban Environments*. Wiley Blackwell
9. Niemelä J (2011) (ed). *Urban Ecology: Patterns, Processes, and Applications*. Oxford University Press

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**SPECIAL PAPER**

**PAPER: EWS 1002SP1**

**ADVANCED COMMUNITY ECOLOGY**

**CREDITS: 5 (4+1+0)**

**Unit 1: Community Ecology's Roots (3 lectures)**

What is a community? the ecological niche; whither competition theory; the theory of community ecology.

**Unit 2: Patterns, Causes, and Consequences of Biodiversity (10 lectures)**

Patterns of biological diversity: assessing species diversity in space; explaining the latitudinal diversity gradient; patterns of biological diversity at different spatial scales; biodiversity and ecosystem functioning: diversity and productivity, nutrient cycling and nutrient retention, diversity and stability; diversity and invasibility.

**Unit 3: Species Interaction in Simple Modules (10 lectures)**

Population growth and density dependence; the fundamental of predator-prey interactions; selective predators and responsive prey; interspecific competition: simple theory; competition in nature: empirical patterns and tests of theory; beneficial interactions in communities: mutualism and facilitation.

**Unit 4: Food Webs and Ecological Network (10 lectures)**

Species interactions in ecological networks: food webs, keystone species, body size, foraging models and food web structure, indirect effects, other types of ecological network, complexity and stability; food chains and food webs: controlling factors and cascading effects: why is the world green? what determines abundance at different trophic levels.

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**Unit 5: Spatial Ecology: Metapopulations and Metacommunities (10 lectures)**

Patchy environments, metapopulations, and fugitive species: metapopulations, fugitive species: competition and coexistence in a patchy environment; metacommunities and the neutral theory: metacommunities in heterogeneous environments, the neutral perspective.

**Unit 6: Species in Changing Environment: Ecology and Evolution (11 lectures)**

Species coexistence in variable environment: properties of species coexistence mechanisms; fluctuation-dependent mechanisms of species coexistence; niche-based and neutral processes in communities, regime shifts and alternative stable states; evolutionary community ecology: rapid evolution and eco-evolutionary dynamics; community phylogenetics, adaptive radiation, niche filling and community assembly.

**Unit 7: Functional and Phylogenetics Community Ecology (10 lectures)**

Trade-offs and life history theories; the common currency of functional traits to enable comparison; how traits are measured and how well they capture the key dimensions of functional variation; functional traits and community ecology.

**Suggested Readings**

1. Swenson NG (2014). *Functional and Phylogenetic Ecology* in R. Springer
2. Mittelback G (2012). *Community Ecology (1st Edition)*. Sinauer Associates, Inc
3. Vellend M (2016). *The Theory of Ecological Communities*. Princeton University Press

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**SPECIAL PAPER**

**PAPER: EWS 1002SP2**

**EARTH PROCESSES, ENERGY AND ENVIRONMENTAL IMPACT ASSESSMENT**

**CREDITS: 5 (4+1+0)**

**Unit 1: Earth Processes and Environmental Geology (15 lectures)**

Origin and formation of the earth; formation of core, mantle and crust; thermal, magnetic and gravitational fields of the earth; concept of minerals and rocks; rock formation, types and rock cycle; plate tectonics; biogeochemical cycles; concept of major, trace and rare earth elements.

**Unit 2: Energy and Environment (18 lectures)**

Exchange of mass and energy between organisms and the environment; conduction, convection and radiation; laws of thermodynamics; properties of liquids and gases; properties of electromagnetic radiation; energy resource and reserves – an overview; fossil fuels; nuclear energy; solar energy; wind energy; tidal energy; ocean thermal energy; geothermal energy; hydroelectric power; bioenergy; energy conservation strategies.

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**Unit 3: Natural Hazards and Disaster Management (18 lectures)**

Introduction to hazards; hazard classification-types of hazards; natural hazards: landslides: causes, prevention and correction methods; earthquake: concept of seismic waves, magnitude and intensity, causes, distribution of earthquake zones, effects, protection from earthquake; volcanic activity; flood and tropical cyclone: nature and frequency; cause, impacts and management; forest fires; disaster management cycle.

**Unit 4: Environmental Impact Assessment (13 lectures)**

Origin and development of EIA (Environmental Impact Assessment); linkage between development and environment; relationship of EIA to sustainable development; EIA process; EIA notifications and guidelines; some case studies.

**Suggested Readings**

1. Smith K (1992). *Environmental Hazards*. Routledge, London
2. Bell FG (1999). *Geological Hazards*. Routledge, London
3. Bill McJuire, Mason I and Killburn C (2002). *Natural hazards and Environmental change*, Oxford University Press, New York
4. Gupta HK (2003). *Disaster Management*, Universities Press (India) Pvt. Ltd
5. Coppola DP (2006). *Introduction to International Disaster Management*, Butterworth-Heinemann
6. Jha MK (2010). *Natural and Anthropogenic Disasters: Vulnerability, Preparedness and Mitigation*, Springer
7. Canter LW (1996). *Environmental Impact Assessment (2<sup>nd</sup> Edition)*. McGraw-Hill, New York

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**OPEN ELECTIVE**

**PAPER: EWS 1003OP1**

**GLOBAL AND REGIONAL ENVIRONMENTAL ISSUES**

**CREDITS: 4 (4+0+0)**

**Unit 1: Global Environmental Issues (24 lectures)**

Global warming and climate change; environmental pollution; natural resource depletion; waste disposal; deforestation; biodiversity loss; ozone layer depletion; ocean warming and acidification; genetically modified organisms; nuclear hazards; migration; agriculture and environment; environmental management strategies.

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**Unit 2: Social Issues and the Environment (20 lectures)**

Growth and distribution of world's population; impact of growing population- global and Indian issues; urbanisation and environmental challenges; epidemiological issues; environmental education and awareness; resettlement and rehabilitation issues.

**Unit 3: Environmental Issues of North East India (20 lectures)**

Changes in forest cover, issues and concerns related to sacred forests and sacred groves; issues and problems associated with shifting agriculture; industrialization; coal and lime stone mining, quarrying of sand from hills and rivers; environmental and socio-economic implications of mega hydroelectric projects; floods, landslides and earthquakes.

**Suggested Readings**

1. Singh OP (2006). *Environment and Natural Resources*, Regency Publications, New Delhi
2. Singh OP (2005). *Mining Environment*. Regency Publications, New Delhi
3. Saxena KG, Liang L and Rerkasem K (2007). *Shifting Agriculture in Asia*, BS MPS Dehradun
4. Ramakrishnan PS (2000). *Mountain Biodiversity, Land Use Dynamics and Traditional Ecological Knowledge*, Oxford and IBH, New Delhi

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**PAPER: EWS 1004DPW**

**DISSERTATION / PROJECT WORK**

**CREDITS: 6**

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