ESS II Syllabus

June/2011

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| **Assessment Statements** | **Pearson** | **W&B** | **Lab/Activity/Experience**  ***POSSIBILITIES TO CHOOSE FROM*** |
| ***Chapter 1*** |  |  |  |
| 1.1 **Concepts and Characteristics of Systems** | 1-13 |  |  |
| * + 1. Outline the concepts and characteristics of systems.     2. Apply the systems concept on a range of scales.     3. Define the terms *open system*, *closed system* and *isolated system.*     4. Describe how the first and second laws of thermodynamics are relevant to environmental systems.     5. Explain the nature of equilibria.     6. Define and explain the principles of positive feedback and negative feedback.     7. Describe the transfer and transformation processes.     8. Distinguish between flows (inputs and outputs) and storages (stock) in relation to systems.     9. Construct and analyse quantitative models involving flows and storages in a system.     10. Evaluate the strengths and limitations of models. |  |  | Trip to Water Treatment Plant |
| ***Chapter 2*** |  |  |  |
| **2.1 Structure** | 14-28 |  |  |
| 2.1.1 Distinguish between biotic and abiotic (physical) components of an ecosystem  2.1.2 Define the term *trophic level*.  2.1.3 Identify and explain trophic levels in food chains and food webs selected from the local environment  2.1.4 Explain the principles of pyramids of numbers, pyramids of biomass, and pyramids of productivity, and construct such pyramids from given data.  2.1.5 Discuss how the pyramid structure affects the functioning of an ecosystem  2.1.6 Define the terms *species, population, habitat, niche, community*, and *ecosystem* with reference to local examples  2.1.7 Describe and explain population interactions using examples of named species |  |  | Zoo Trip  Howell Wetlands  Wesselman Woods  Molar’s Grass Lab |
| **2.3 Measuring biotic components of the system** | 29-35 |  |  |
| 2.3.1 Construct simple keys and use published keys for the identification of organism.  2.3.2 Describe and evaluate methods for estimating abundance or organisms.  2.3.3 Describe and evaluate methods for estimating the biomass of trophic levels in a community.  2.3.4 Define the term *diversity.*  2.3.5 Apply Simpson’s diversity index and outline its significance. |  |  | Biodiversity of Leaf Litter  Ant Lab from Friedland  EIS/15-1/Biodiversity in Ecosystems  Mark and Recapture |
| **2.4 Biomes** | 35-43 |  |  |
| 2.4.1 Define the term *biome*.  2.4.2 Explain the distribution, structure and relative productivity of tropical rainforests, deserts, tundra, and any other biome. |  |  | EIS/1-1/Seasons and Angle of Isolation  EIS/2-1/A Local Weather Study |
| **2.5 Function** | 43-73 |  |  |
| 2.5.1 Explain the role or producers, consumers and decomposers in the ecosystem.  2.5.2 Describe photosynthesis and respiration in terms of inputs, outputs and energy transformations  2.5.3 Describe and explain the transfer and transformation of energy as it flows through an ecosystem  2.5.4 Describe and explain the transfer and transformation of energy as it flows through an ecosystem  2.5.5 Define the terms *gross productivity, net productivity, primary productivity* and *secondary productivity*  2.5.6 Define the terms and calculate the values of both gross primary productivity (GPP) and net primary productivity (NPP) from given data  2.5.7 Define the terms and calculate the values of both *gross secondary productivity* (GSP) and *net secondary productivity* (NSP) from given data |  |  | Molnar’s Grass Lab  EIS/14-1/Cell Respiration  EIS/23-1/Primary Productivity |
| **2.6 Changes** |  |  |  |
| 2.6.1 Explain the concepts of limiting factors and carrying capacity n the context of population growth.  2.6.2 Describe and explain the role of density-dependent and density-independent factors, and internal and external factors, in the regulation of populations.  2.6.4 Describe the principles associated with survivorship curves including, K- and r-strategists.  2.6.5 Describe the concept and processes of succession in a named habitat.  2.6.6 Explain the changes in energy flow, grow and net productivity, diversity and mineral cycling in different stages of succession.  2.6.7 Describe the factors affecting the nature of climax communities. |  |  |  |
| **2.7 Measuring Changes in the System** | 73-83 |  |  |
| 2.7.1 Describe and evaluate methods for measuring changes in abiotic and biotic components of an ecosystem along an environmental gradient  2.7.2 Describe and evaluate methods for measuring changes in abiotic and biotic components of an ecosystem due to a specific human activity  2.7.3 Describe and evaluate the use of Environmental Impact Assessments (EIAs) |  |  | EIS/3-1/Investigating Dissolved Oxygen  EIS/16-1/Biochemical Oxygen Demand  Comparison of local waterways |
| ***Chapter 3*** |  |  |  |
| **3.1 Population Dynamics** | 83-96 |  |  |
| 3.1.1 Describe the nature and explain the implications of exponential growth in human populations  3.1.2 Calculate and explain, from given data, the values of crude birth rate, crude death rate, fertility, doubling time and natural increase rate  3.1.3 Analyse age/sex pyramids and diagrams showing demographic transition models  3.1.4 Discuss the use of models in predicting the growth of human populations |  |  | Molnar’s Cemetery Lab |
| **3.2 Resources—Natural Capital** | 96-107 |  |  |
| 3.2.1 Explain the concept of resources in terms of natural income  3.2.2 Define the terms renewable, replenishable and non-renewable natural capital  3.2.3 Explain the dynamic nature of the concept of a resource  3.2.4 Discuss the view that the environment can have it s own intrinsic value  3.2.5 Explain the concept of sustainability in terms of natural capital and natural income  3.2.6 Discuss the concept of sustainable development  3.2 7 Calculate and explain sustainable yield from given data |  |  |  |
| **3.3 Energy resources** | 108-122 |  |  |
| 3.3.1 Outline the range of energy resources available to society  3.3.2 Evaluate the advantages and disadvantages of two contrasting energy sources  3.3.3 Discuss the factors that affect the choice of energy sources adopted by different societies |  |  | Trip to Coal Mine  Vectren Speaker  Claire/Sam’s Dad’s  EIS/26-1/Insulation Study  EIS/27-1/Fossil Fuel Energy  EIS/28-1/Energy Conversion  EIS/29-1/Wind Energy  EIS/30-1/Solar Energy Photovoltaic Cells  EIS/31-1/An Investigation of Passive Solar Heating |
| **3.4 The Soil System** | 122-146 |  |  |
| 3.4.1 Outline how soil systems integrate aspects of living systems  3.4.2 Compare and contrast the structure and properties of sand, clay and loam soils including their effect on primary productivity  3.4.3 Outline the processes and consequences of soil degradation  3.4.4 Outline soil conservation measures  3.4.5 Evaluate soil management strategies in a name commercial farming system and in a named subsistence farming system |  |  | Rob Brown guest speaker  Flinn Soil lab  EIS/8-1/Soil Temperature  EIS/9-1/Soil Salinity  EIS/10-1/Soil pH  EIS/11-1/Soil Moisture  EIS/12-1/Soil and Acid Precipiation  EIS/13-1/Managing Garden Soil Moisture  EIS/18-1/Decomposition Column Investigations |
| **3.6 Water Resources** | 146-160 |  |  |
| 3.6.1 Describe the Earth’s water budget  3.6.2 Describe and evaluate the sustainability of freshwater resource usage with reference to a case study |  |  | Water Treatment Plant  EIS/4-1/Water Quality  EIS/5-1/Long Term Water Monitoring  WIS/6-1/Water Treatment  WIS/7-1/Investigating Salinity  WIS/17-1/Water Cycle Column Investigations |
| **3.8 Environmental Demands of Human Population** | 160-174 |  |  |
| 3.8.1 Explain the concept of an ecological footprint as a model for assessing the demands that human populations make on their environment  3.8.2 Calculate from appropriate data the ecological footprint of a given population stating the approximations and assumption involved  3.8.3 Describe and explain the differences between the ecological footprints of two human populations, one from an LECD and one from an MEDC.  3.8.4 Discuss how national and international development policies and cultural influences can affect human population dynamics and growth  3.8.5 Describe and explain the relationship between population, resource consumption and the technological development, and their influence on carrying capacity and material economic growth |  |  | EIS/25-1/Modeling Population Growth |
| ***Chapter 4*** |  |  |  |
| **4.1 Biodiversity in Ecosystems** | 175-187 |  |  |
| 4.1.1 Define the terms biodiversity, genetic diversity, species diversity and habitat diversity  4.1.2 Outline the mechanism of natural selection as a possible driving force for speciation  4.1.3 State that isolation can lead to different species being produced that are unable to interbreed to yield fertile offspring  4.1.4 Explain how plate activity has influenced evolution and biodiversity  4.1.5 Explain the relationships among ecosystems, stability, diversity succession and habitat |  |  |  |
| **4.2 Evaluating Biodiversity and Vulnerability** | 187-202 |  |  |
| 4.2.1 Identify factors that lead to loss of diversity  4.2.2 Discuss the perceived vulnerability of tropical rainforests and their relative value in contributing to global biodiversity  4.2.3 Discuss current estimates of numbers of species and past and present rates of species extinction  4.2.4 Describe and explain the factors that may make species more or less prone to extinction  4.2.5 Outline the factors used to determine a species’ Red List Conservation status  4.2.6 Describe the case histories of the three different species: one that has become extinct, another that is critically endangered, and a third species whose conservation status has been improved by intervention  4.2.7 Describe the case history of a natural area of biological significance that is threatened by human activities |  |  |  |
| **4.3 Conservation of Biodiversity** | 202-216 |  |  |
| 4.3.1 State the argument for preserving species and habitats  4.3.2 Compare and contrast the role and activities of intergovernmental and non-governmental organizations in preserving and restoring ecosystems and biodiversity  4.3.3 State and explain the criteria used to design protected areas  4.3.4 Evaluate the success of a named protected area  4.3.5 Discuss and evaluate the strengths and weaknesses of the species-based approach to conservation |  |  |  |
| ***Chapter 5*** |  |  |  |
| 5.1 **Nature of Pollution** | 217-218 |  |  |
| 5.1.1 Define the term pollution  5.1.2 Distinguish between their terms *point source pollution* and *non-point-source pollution*, and outline the challenges they present for management  5.1.3 State the major sources of pollutants |  |  |  |
| **5.2 Detection and Monitoring of Pollution** | 219-230 |  |  |
| 5.2.1 Describe two direct methods of monitoring pollution  5.2.2 Define the term *biochemical oxygen demand* (BOD) and explain how this indirect method is used to assess pollution levels in water  5.2.3 Describe and explain an indirect method of measuring pollution levels using a biotic index |  |  |  |
| **5.4 Eutrophication** | 230-242 |  |  |
| 5.4.1 Outline the processes of eutrophication  5.4.2 Evaluate the impacts of eutrophication  5.4.3 Describe and evaluate pollution management strategies with respect to eutrophication |  |  | EIS/17-1/Water Cycle Column Investigations |
| **5.6 Depletion of Stratospheric Ozone** | 242-248 |  |  |
| 5.6.1 Outline the overall structure and composition of the atmosphere  5.6.2 Describe the role of ozone in the absorption of ultraviolet radiation  5.6.3 Explain the interaction between ozone and halogenated organic gases  5.6.4 Sate the effects of ultraviolet radiation on living tissues and biological productivity  5.6.5 Describe three methods of reducing the manufacture and release of ozone-depleting substances  5.6.6 Describe and evaluate the role of national and international organizations in reducing the emissions of ozone-depleting substances |  |  | EIS/21-1/UV Investigations  EIS/22-1/Sunscreen Comparison |
| **5.7 Urban Air Pollution** | 249-253 |  |  |
| 5.7.1 State the source and outline the effect of tropospheric ozone  5.7.2 Outline the formation of photochemical smog  5.7.3 Describe and evaluate pollution management strategies for urban air pollution |  |  | EIS/33-1/Measuring Particulates  EIS/34-1/Investigation Indoor Carbon Dioxide Concentrations  EIS/35-1/A Pollution Study |
| **5.8 Acid Deposition** | 253-260 |  |  |
| 5.8.1 Outline the chemistry leading to the formation of acidified precipitations  5.8.2 Describe three possible effect of acid deposition on soil, water, and living organisms  5.8.3 Explain why the effect of acid deposition is regional rather than global  5.8.4 Describe and evaluate pollution management strategies for acid deposition |  |  | EIS/12-1/Soil and Acid Precipitation  EIS/32-1/The Effect of Acid Deposition on Aquatic Ecosystems |
| ***Chapter 6*** |  |  |  |
| **6.1 The Greenhouse Effect** | 261-282 |  |  |
| 6.1.1 Describe the role of greenhouse gases in maintaining mean global temperature  6.1.2 Describe how human activities add to greenhouse gases  6.1.3 Discuss qualitatively the potential effects of increased mean global temperature  6.1.4 Discuss the feedback mechanisms that would be associated with an increase in mean global temperatures  6.1.5 Describe and evaluate pollution management strategies to address the issue of global warming  6.1.6 Outline the arguments surrounding global warming  6.1.7 Evaluate contrasting human perceptions of the issue of global warming |  |  | Data Collection/CO2 McD  EIS/20-1/Global Warming |
| ***Chapter 7*** |  |  |  |
| **7.1 Environmental Value Systems and Philosophies** | 283-299 |  |  |
| 7.1.1 State what is meant by an environmental value system  7.1.2 Outline the range of environmental philosophies with reference to the evolution of environmentalist objectives and strategies in the seventies  7.1.3 Discuss how these philosophies influence the decision-making process with respect to environmental issues covered in this course  7.1.4 Outline key historical influences on the development of the modern environmental movement  7.1.5 Compare and contrast the environmental value systems of two named societies  7.1.6 Justify your personal viewpoint on environmental issues |  |  |  |