**SYLLABUS**

**GE8291 (C215) ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C 3 0 0 3**

**OBJECTIVES:**

The student should be made to:

* To the study of nature and the facts about environment.
* To find and implement scientific, technological, economic and political solutions to environmental problems.
* To study the interrelationship between living organism and environment.
* To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
* To study the dynamic processes and understand the features of the earth‘s interior and surface.
* To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

**UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14**

Definition, Scope and Importance of Environment – Need for Public Awareness - Concept of an Ecosystem – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy Flow in the Ecosystem – Ecological Succession – Food Chains, Food Webs and Ecological Pyramids – Introduction, Types, Characteristic Features, Structure and Function of the (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity Definition: Genetic, Species and Ecosystem Diversity – Bio geographical Classification of India – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – Endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ Conservation of Biodiversity.

* Field Study of Common Plants, Insects, Birds
* Field Study of Simple Ecosystems – Pond, River, Hill Slopes, etc

**UNIT II ENVIRONMENTAL POLLUTION 8**

Definition – Causes, Effects and Control Measures of: (A) Air Pollution (B) Water Pollution (C)Soil Pollution (D) Marine Pollution (E) Noise Pollution (F) Thermal Pollution (G) Nuclear Hazards – Soil Waste Management: Causes, Effects and Control Measures of Municipal Solid Wastes – Role of an Individual in Prevention of Pollution – Pollution Case Studies – Disaster Management: Floods, Earthquake, Cyclone and Landslides.

Field Study of Local Polluted Site – Urban / Rural / Industrial / Agricultural.

**UNIT III NATURAL RESOURCES 10**

Forest Resources: Use and Over-Exploitation, Deforestation, Case Studies - Timber Extraction, Mining, Dams and Their Effects on Forests and Tribal People – Water Resources: Use and Over-Utilization of Surface and Ground Water, Floods, Drought, Conflicts Over Water, Dams-Benefits and Problems – Mineral Resources: Use and Exploitation, Environmental Effects of Extracting and Using Mineral Resources, Case Studies – Food Resources: World Food Problems, Changes Caused by Agriculture and Overgrazing, Effects of Modern Agriculture, Fertilizer-Pesticide Problems, Water Logging, Salinity, Case Studies – Energy Resources: Growing Energy Needs, Renewable and Non Renewable Energy Sources, Use of Alternate Energy Sources. Case Studies – Land Resources: Land as a Resource, Land Degradation, Man Induced Landslides, Soil Erosion and Desertification – Role of an Individual in Conservation of Natural Resources – Equitable Use of Resources for Sustainable Lifestyles.

* Field Study of Local Area to Document Environmental Assets – River / Forest / Grassland / Hill / Mountain.

**UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7**

From Unsustainable to Sustainable Development – Urban Problems Related to Energy – Water Conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People; its Problems and Concerns, Case Studies – Role of Non-Governmental Organization- Environmental Ethics: Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents a nd Holocaust, Case Studies. – Wasteland Reclamation – Consumerism and Waste Products – Environment Production Act– Air (Prevention And Control Of Pollution) Act – Water (Prevention And Control Of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Enforcement Machinery Involved in Environmental Legislation- Central and State Pollution Control Boards- Public Awareness.

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6**

Population Growth, Variation Among Nations – Population Explosion – Family Welfare Programme – Environment and Human Health – Human Rights – Value Education – HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Upon successful completion of the course, students will be able to:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

C215.1: Understanding the functionalities of ecosystem.

C215.2: Awareness of environmental pollution.

C215.3: Public awareness of environment at infant stage.

C215.4: Ignorance and incomplete knowledge has lead to misconceptions.

C215.5: Development and improvement in standard of living has lead to serious environmental disasters.

**TEXT BOOKS:**

1. Gilbert M. Masters, ―Introduction to Environmental Engineering and Science‖, Second Edition, Pearson Education 2004.
2. Benny Joseph, ―Environmental Science and Engineering‖, Tata McGraw-Hill, 2006.

**REFERENCES:**

1. R.K. Trivedi, Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards‖, Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, ‗Environmental Encyclopedia‘, Jaico Publishing, 2001.
3. Dharmendra S. Sengar, ―Environmental law‖, Prentice Hall, 2007. Rajagopalan.R, ―Environmental Studies-From Crisis to Cure‖, Oxford University Press 2005.

**MAPPING WITH CO AND PO OF THE COURSE**

**PROGRAM OUTCOMES (POs)** *(Defined by Anna University)*

**ENGINEERING GRADUATES WILL BE ABLE TO:**

**PO 1 Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO 2 Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO 3 Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO 4 Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO 5 Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO 6 The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO 7 Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO 8 Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO 9 Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO 10 Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO 11 Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO 12 Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**PROGRAM SPECIFIC OBJECTIVES (PSOs)** *(Defined by Anna University)*

**PSO 1:** To create, select, and apply appropriate techniques, resources, modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

**PSO 2:** To manage complex IT projects with consideration of the human, financial, ethical and environmental factors and an understanding of risk management processes, and operational and policy implications.

**CO/PO/PSO MAPPING OF THE COURSE**

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| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| C313.1 | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| C313.2 | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| C313.3 | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| C313.4 | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| C313.5 | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |

1: Low 2: Moderate 3: Substantial ‘-‘ : No Relevance

**Faculty in charge HOD**