INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE DESCRIPTOR

Course Title	**ENVIRONMENTAL STUDIES**				
Course Code	AHS009				
Programme	B.Tech				
Semester	II	AE | CSE | IT | ECE | EEE | ME | CE			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Ms. M Lakshmi Prasanna, Assistant Professor				
Course Faculty	Dr. C Mahendar, Professor Ms. V Anitha Rani, Associate Professor Mr. B Raju, Assistant Professor Ms. M Praveen, Assistant Professor Ms. M Malathi, Assistant Professor Mr. G Mahesh Kumar, Assistant Professor Ms. T Mallika, Assistant Professor Ms. M Swathi, Assistant Professor				

I. COURSE OVERVIEW:

Environmental study is interconnected interrelated and interdependent subject. Hence, it is multidisciplinary in nature. The present course is framed by expert committee of UGC under the direction of honorable supreme court to be as a core module syllabus for all branches of higher education and to be implemented in all universities over India. The course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. The course description is multidisciplinary nature of environmental studies, natural resources Renewable and non-renewable resources Ecosystems Biodiversity and its conservation Environmental pollution Social issues and the environment Human population and the environment Pollution control acts and field work. The course is divided into five chapters for convenience of academic teaching followed by field visits.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites
-	-	-	Basic Principles of Environmental Studies

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Environmental Studies	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	Chalk & Talk	✔	Quiz	✔	Assignments	✘	MOOCs
✔	LCD / PPT	✔	Seminars	✘	Mini Project	✔	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five modules and each module carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
50 %	To test the analytical skill of the concept OR to test the application skill of the concept.

Continuous Internal Assessment (CIA):
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for Continuous Internal Examination (CIE), 05 marks for Quiz and 05 marks for Alternative Assessment Tool (AAT).

Table 1: Assessment pattern for CIA

Component	Theory		Total Marks
Type of Assessment	CIE Exam	Quiz/AAT	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):
Two CIE exams shall be conducted at the end of the 8th and 16th week of the semester respectively. The CIE exam is conducted for 20 marks of 2 hours duration consisting of five descriptive type questions out of which four questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Quiz - Online Examination
Two Quiz exams shall be online examination consisting of 25 multiple choice questions and are to be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quiz examinations for every course.

Alternative Assessment Tool (AAT)
This AAT enables faculty to design own assessment patterns during the CIA. The AAT converts the classroom into an effective learning centre. The AAT may include tutorial hours/classes, seminars, assignments, term paper, open ended experiments, METE (Modeling and Experimental Tools in Engineering), five minutes video, MOOCs etc.

The AAT chosen for this course is given in section XI.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Seminar
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.	2	Seminar
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.	1	Real-time applications
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.	1	Real-time applications

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Problem Solving**: Exploit the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environment, for the research based team work.	1	Seminar
PSO 2	**Professional Skills:** Identify the scientific theories, ideas, methodologies and the new cutting edge technologies in renewable energy engineering, and use this erudition in their professional development and gain sufficient competence to solve the current and future energy problems universally.	-	-
PSO 3	**Modern Tools in Electrical Engineering:** Comprehend the technologies like PLC, PMC, process controllers, transducers and HMI and design, install, test, maintain power systems and industrial applications.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Analyze the interrelationship between living organism and environment
II	Understand the importance of environment by assessing its impact on the human world
III	Enrich the knowledge on themes of biodiversity, natural resources, pollution control and waste management
IV	Understand the constitutional protection given for environment

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHS009.01	CLO 1	Understand and realize the importance of multi-disciplinary nature of the environment in day to day life	PO 1, PO 3	2
AHS009.02	CLO 2	Describe various types of ecosystems its components and inter-relationship between man and environment	PO 1, PO 3	2
AHS009.03	CLO 3	Examine how pollutants move through various levels in an ecosystem in our daily life	PO 1, PO 3, PO 7	2
AHS009.04	CLO 4	Explain the pathways of relevant chemical elements through the components of the biosphere in real world applications	PO 1, PO 3, PO 7	2
AHS009.05	CLO 5	Understand the relevance and importance of the natural resources in the sustenance of life on earth and living standard.	PO 1, PO 3, PO 5, PO 7	2
AHS009.06	CLO 6	Develop an understanding of the natural resources problems and ethical issues facing humans and the environment	PO 1, PO 3, PO 7	2
AHS009.07	CLO 7	Correlate the exploitation and utilization of conventional and non-conventional resources.	PO 1, PO 3, PO 5,PO 7	2
AHS009.08	CLO 8	Demonstrate the level of chemical usage in agricultural development and its impact in our daily life	PO 1, PO 5, PO 7	2
AHS009.09	CLO 9	Understand the concept of growing energy needs in the world in terms of consumption of energy	PO 1, PO 7	2
AHS009.10	CLO 10	Establish knowledge and existence of endemic, extinct, endangered and threatened species, types and values of biodiversity	PO 1, PO 5, PO 7	2
AHS009.11	CLO 11	Describe our country as mega biodiversity nation in terms of hotspots	PO 1, PO 7	2
AHS009.12	CLO 12	Explain on threats and innovative methods for conservation of biodiversity.	PO 1, PO 3, PO 7	2
AHS009.13	CLO 13	Establish a foundation on different pollutants and pollutions in the environment.	PO 1, PO 3, PO 5, PO 7	2
AHS009.14	CLO 14	Ability to use methods, and strategies to investigate and interpret the pollution problems	PO 3, PO 5, PO 7	2
AHS009.15	CLO 15	Use innovative methods to control the level of water pollution in our day to day life.	PO 3, PO 5, PO 7	2
AHS009.16	CLO 16	Acquire Knowledge on global effects and how to interpret with global environmental problem in our daily life	PO 1, PO 7	2
AHS009.17	CLO 17	Acquire knowledge and skills about health and safety protocols when working with polluted environment in day to day life	PO 1, PO 7	2

AHS009.18	CLO 18	Describe the role of government and legal aspects in environmental protection.	PO 7	1
AHS009.19	CLO 19	Knowledge of proper decontamination techniques for solid waste management.	PO 3, PO 7	2
AHS009.20	CLO 20	Understand the importance of EIA for developmental activities to have minimum negative impacts on people	PO 1, PO 7	2
AHS009.21	CLO 21	Prepare entry level for future generations to meet sustainable development.	PO 7	1

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X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO 1	3		1													
CLO 2	3		1													
CLO 3	2		2				1									
CLO 4	2		2				1									
CLO 5	3		1		1		1									
CLO 6	2		2				1									
CLO 7	3		1		1		1									
CLO 8	2				1		1									
CLO 9	3						1									
CLO 10	3				1		1									
CLO 11	2						1									
CLO 12	2		2				1									
CLO 13	3		2		2		2									
CLO 14			2		1		1						1			
CLO 15			2		1		1						1			
CLO 16	2						1									
CLO 17	2						1									
CLO 18							1									
CLO 19			1				2									
CLO 20	1						1									
CLO 21							2									

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1,PO3 PO5,PO7	SEE Exams	PO1,PO3 PO5,PO7	Assignments	PO1	Seminars	PO1 PO3
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS:

Unit-I	ENVIRONMENT AND ECOSYSTEMS
Environment: Definition, scope and importance of environment, need for public awareness; Ecosystem: Definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food web and ecological pyramids, flow of energy; Biogeochemical cycles; Biomagnifications	
Unit-II	**NATURAL RESOURCES**
Natural resources: Classification of resources, living and nonliving resources; Water resources: Use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; Mineral resources: Use and exploitation; Land resources; Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.	
Unit-III	**BIODIVERSITY AND BIOTIC RESOURCES**
Biodiversity and biotic resources: Introduction, definition, genetic, species and ecosystem diversity; Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and optional values; India as a mega diversity nation; Hot spots of biodiversity Threats to biodiversity: Habitat loss, poaching of wildlife, human-wildlife conflicts; Conservation of biodiversity: In situ and ex situ conservation; National biodiversity act.	
Unit-IV	**ENVIRONMENTAL POLLUTION, POLLUTION CONTROL TECHNOLOGIES AND GLOBAL ENVIRONMENTAL PROBLEMS**
Environmental pollution: Definition, causes and effects of air pollution, water pollution, soil pollution, noise pollution; Solid waste: Municipal solid waste management, composition and characteristics of e-waste and its management; Pollution control technologies: Waste water treatment methods, primary, secondary and tertiary; Concepts of bioremediation; Global environmental problems and global efforts: Climate change, ozone depletion, ozone depleting substances, deforestation and desertification; International conventions / protocols: Earth summit, Kyoto protocol and Montreal protocol.	
Unit-V	**ENVIRONMENTAL LEGISLATIONS AND SUSTAINABLE DEVELOPMENT**
Environmental legislations: Environmental protection act, air act1981, water act, forest act, wild life act, municipal solid waste management and handling rules, biomedical waste management and handling rules2016, hazardous waste management and handling rules, Environmental impact assessment(EIA); Towards sustainable future: Concept of sustainable development, population and its explosion, crazy consumerism, environmental education, urban sprawl, concept of green building.	
Text Books:	
1. Benny Joseph (2005)., Environmental Studies, New Delhi, Tata McGraw Hill Publishing co. Ltd 2. Erach Bharucha (2005)., Textbook of Environmental Studies for Undergraduate Courses, Hyderabad, Universities Press.	
Reference Books:	
1. Anji Reddy .M (2007), Textbook of Environmental Sciences and Technology, Hyderabad, BS Publications.	

2. Anjaneyulu.(2004), Introduction to Environmental Sciences, BS Publications
3. Anubha Kaushik(2006).,Perspectives in Environmental Science, 3rd Edition, New Delhi, New age international.
4. Tyler Miller, Scott Spoolman, "Environmental Science", Cengage Learning, 14th Edition, 2012.

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
1	Summarize about environment and its importance.	CLO 1	T2: 1.1.1, 1.1.2,1.1.3, 1.2.1,1.2.2 R3:1.1-1.3
2	Discuss environment and importance of ecosystems	CLO 1	R1: 1.1,1.2 R3:1.1-1.3
3	Provides the information regarding ecosystem and applicability.	CLO 1	T2:3.2 R1:1.6.1,1.6.2 R3:1.6,1.7
4	Provides the information regarding ecosystem and applicability	CLO 1	T2:3.2 R1:1.6.1,1.6.2 R3:1.6,1.7
5	Acquire knowledge of how all the animals are competing with their food requirements and also understand the various trophic levels in the food chain.	CLO 2	T2:3.6.1-3.6.3 R1:1.7.1,1.7.2, 1.7.3 R3:1.7.1,1.7.2
6	Describe the flow of energy through the various components of ecosystem	CLO 2	T2:3.4 R1:1.8 R3:1.7.5
7	Examine the importance a of nutrients and flow of nutrients in ecosystem	CLO 3	T2:3.4.1-3.4.4 R1:1.9,1.10 R3:1.7.6
8	Examine the importance a of nutrients and flow of nutrients in ecosystem	CLO 3	T2:3.4.1-3.4.4 R2:1.9,1.10 R3:1.7.6
9	Summarize about the toxicity of heavy metals on the biotic and a biotic components.	CLO 4	R1:1.11 R3:1.7.3
10	Distinguish about different types of natural resources and their applicability and illustrate the utility of renewable resources efficiency	CLO 5	R1:2.1 R3:2.1
11	Describe the impact of over utilization of underground and surface water	CLO 5	R1:2.3,2.4.1, 2.4.2,2.4.3 R3:2.2
12	Discuss the disaster manage mental plans	CLO 6	R1:2.4.4 R3:2.2.4,2.2.5
13	Describe the benefits and property dams	CLO 6	R1:2.4.5 R3:2.3
14	Illustrate the uses of mineral resources	CLO 2 CLO 6	R1:2.5 R3:2.4
15	Enumerate the application of the solar energy in modern days	CLO 6	R1:3.1 R3:2.5
16	Enumerate the application of the wind energy in modern days	CLO 6	R1:3.3.1.5 R3:2.5
17	Illustrate the definition and importance of biodiversity	CLO 6	T2:4.1 R1:4.1 R3:3.1

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
18	Acquire the genetic diversity, species and ecosystem diversity	CLO 7	T2:4.1.1,4.1.2, 4.1.3 R1:4.2 R3:3.2
19	Describe the ecological values and consumptive use of ecosystem	CLO 7	T2:4.3 R1:4.3 R3:3.3
20	Recall India is mega diversity nation	CLO 7	T2:4.5 R3:3.4
21	Discuss the hot spot center in and around	CLO 7	T2:4.6 R1:4.6 R3:3.4
22	Analyze the information regarding different causes for loss of biodiversity	CLO 7	T2:4.7 R1:4.4 R3:3.5
23	Analyze various reasons for conflict of species	CLO 7	T2:4.7 R3:3.5.3
24	Illustrate different methods to protect the biodiversity	CLO 7	T2:4.9 R1:4.5 R3:3.7
25	Correlate national biodiversity act	CLO 8	T2:4.9 R1:4.5 R3:3.7
26	Explain the meaning of environmental pollution and classification.	CLO 9	T2:5.1 R1:5.1 R3:4.1
27	Analyze the important pollutants in air pollutants	CLO 9	T2:5.2.1 R1:5.3 R3:4.2
28	Enumerate the sources types and effects of water pollution	CLO 9	T2:5.2.2 R1:5.4 R3:4.6
29	Correlate the sources types and effects of soil pollution	CLO 9	T2:5.2.3 R1:5.5 R3:4.8
30	Analyze the noise quality and permissible levels	CLO 9	T2:5.2.5 R1:5.7 R3:4.13
31	Describe the various methods commonly employed for the disposal of solid waste.	CLO 9	T2:5.3 R1:7.7
32	Identify To understand the recent trends in e- waste management practices.	CLO 10	R1:5.10.6 R3:4.16.3
33	Understand concept of climate change and impacts.	CLO 10	T2:6.6.1 R1:6.5 R3:5.5
34	Summarize the remedial measures of ozone depletion	CLO 10	T2:6.6.4 R1:6.6 R3:5.6,5.7
35	Evolve strategies to environmental issues	CLO 10	R1:6.8 R3:5.10
36	Describe the role of government and legal aspects in environmental protection	CLO 10	T2:6.9-6.14 R1:7.2,7.3,7.4, R3:7.3,7.4,7.5, 7.6,7.7
37	Discuss the silent features of the hazardous waste management	CLO 11	R1:7.9 R3:7.10
38	Understand the importance of EIA for developmental activities	CLO 12	T2:6.14 R3:6.3,6.4

Lecture No	Topic/s to be covered	Course Learning Outcomes (CLOs)	Reference
39	Understand the importance of EIA for developmental activities	CLO 12	T2:6.14 R1:10.1 R3:6.3,6.4
40	State the aim and objectives of sustainable development	CLO 12	T2:6.1 R1:10.5 R3:8.3
41	State the aim and objectives of sustainable development	CLO 13	T2:6.1 R1:10.5 R3:8.3
42	Enumerate population and its explosion	CLO 15	T2:7.2 R1:10.3 R3:8.2
43	State the aim and objectives of sustainable development	CLO 19	T2:7.2.2.2 R1:10.8 R3:8.6
44	Acquire knowledge of environmental education	CLO 18	T2:7.3 R1:10.6 R3:8.4
45	Summarize the environmental ethics and objectives of green buildings	CLO 21	T2:6.5 R1:10.10,10.12 R3:8.10,8.12

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Types of ecosystem, Energy flow, Biomagnification	Seminars / Field visit	PO 1	-
2	Dams ,Mining Activities, Alternative energy resources	Seminars / NPTEL	PO 3	PSO 1
3	Sources of pollution EIA Methodology, Green building	Guest Lecture	PO 7	-

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