INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTOR

Course Title	**ENVIRONMENTAL SCIENCE**				
Course Code	AHSB07				
Programme	B.Tech				
Semester	IV	AE | CSE | IT | ECE | EEE | ME | CE			
Course Type	Foundation				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	-	-
Chief Coordinator	Ms. M Malathi, Assistant Professor				
Course Faculty	Dr. V Anita Rani, Professor Dr. Venkateshwar Rao, Professor Mr. B Raju, Assistant Professor Mr. M Praveen, Assistant Professor Ms. T Mallika, Assistant Professor Mr. G Mahesh Kumar, 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 concepts of environmental science

III. MARKSDISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Environmental Science	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	20	05	05	30

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8^{th} and 16^{th} 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.

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.	1	Seminar
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.	2	Term Paper
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.	2	NPTEL Video
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.	3	Presentation on real-world problems

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.	2	Seminar
PSO 2	**Problem-Solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	-	-
PSO 3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES:

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 OUTCOMES (COs):

COs	Course Outcomes	CLOs	Course Learning Outcome
CO 1	Discover knowledge in ecological perspective and value of environment.	CLO 1	Summarize about environment and its importance and Discuss environment and importance of ecosystems.
		CLO 2	Provides the information regarding ecosystem and applicability. 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 3	Describe the flow of energy through the various components of ecosystem. Examine the importance a of nutrients and flow of nutrients in ecosystem
		CLO 4	Summarize about the toxicity of heavy metals on the biotic and a biotic components.
CO 2	Understand the significance of various natural resources and its management.	CLO 5	Distinguish about different types of natural resources and their applicability and illustrate the utility of renewable resources efficiency.

COs	Course Outcomes	CLOs	Course Learning Outcome
		CLO 6	Describe the impact of over utilization of underground and surface water. Discuss the disaster manage mental plans.
		CLO 7	Describe the benefits and property of dams. Illustrate the uses of mineral resources.
		CLO 8	Enumerate the applications of the solar energy and wind energy in modern days.
CO 3	Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.	CLO 9	Illustrate the definition and importance of biodiversity. Acquire the genetic diversity, species and ecosystem diversity.
		CLO 10	Describe the ecological values and consumptive use of ecosystem. Recall India is mega diversity nation. Discuss the hot spot center in and around.
		CLO 11	Analyze the information regarding different causes for loss of biodiversity. Analyze various reasons for conflict of species. Illustrate different methods to protect the biodiversity. Correlate national biodiversity act.
CO 4	Categorize different types of pollutions and their control measures. Discover effective methods of waste management. Analyze global environmental problems and come out with best possible solutions.	CLO 12	Explain the meaning of environmental pollution and classification. Analyze the important pollutants in air pollutants.
		CLO 13	Enumerate the sources types and effects of water pollution. Correlate the sources types and effects of soil pollution. Analyze the noise quality and permissible levels
		CLO 14	Describe the various methods commonly employed for the disposal of solid waste.
		CLO 15	Identify To understand the recent trends in e-waste management practices.
		CLO 16	Understand concept of climate change and impacts.
		CLO 17	Summarize the remedial measures of ozone depletion.
CO 5	Understand environmental laws and sustainable development.	CLO 18	Evolve strategies to environmental issues. Describe the role of government and legal aspects in environmental protection
		CLO 19	Discuss the silent features of the hazardous waste management rules. Understand the importance of EIA for developmental activities
		CLO 20	State the aim and objectives of sustainable development. Enumerate population and its explosion.
		CLO 21	State the aim and objectives of sustainable development. Acquire knowledge of environmental education. Summarize the environmental ethics and objectives of green buildings

X. 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
AHSB07.01	CLO 1	Summarize about environment and its importance and Discuss environment and importance of ecosystems.	PO1, PO7	2
AHSB07.02	CLO 2	Provides the information regarding ecosystem and applicability. Acquire knowledge of how all the animals are competing with their food requirements and also understand the various trophic levels in the food chain.	PO1, PO7	2
AHSB07.03	CLO 3	Describe the flow of energy through the various components of ecosystem. Examine the importance a of nutrients and flow of nutrients in ecosystem	PO1, PO2, PO7	3
AHSB07.04	CLO 4	Summarize about the toxicity of heavy metals on the biotic and a biotic components.	PO1, PO2, PO4	2
AHSB07.05	CLO 5	Distinguish about different types of natural resources and their applicability and illustrate the utility of renewable resources efficiency.	PO1, PO2, PO4	3
AHSB07.06	CLO 6	Describe the impact of over utilization of underground and surface water. Discuss the disaster manage mental plans.	PO1, PO7	2
AHSB07.07	CLO 7	Describe the benefits and property of dams. Illustrate the uses of mineral resources.	PO1, PO7	2
AHSB07.08	CLO 8	Enumerate the applications of the solar energy and wind energy in modern days.	PO1, PO7	2
AHSB07.09	CLO 9	Illustrate the definition and importance of biodiversity. Acquire the genetic diversity, species and ecosystem diversity.	PO1, PO7	2
AHSB07.10	CLO 10	Describe the ecological values and consumptive use of ecosystem. Recall India is mega diversity nation. Discuss the hot spot center in and around.	PO1, PO7	2
AHSB07.11	CLO 11	Analyze the information regarding different causes for loss of biodiversity. Analyze various reasons for conflict of species. Illustrate different methods to protect the biodiversity. Correlate national biodiversity act.	PO1,PO2, PO4, PO7	3
AHSB07.12	CLO 12	Explain the meaning of environmental pollution and classification. Analyze the important pollutants in air pollutants.	PO1, PO2, PO7	3
AHSB07.13	CLO 13	Enumerate the sources types and effects of water pollution. Correlate the sources types and effects of soil pollution. Analyze the noise quality and permissible levels	PO1, PO2, PO7	3
AHSB07.14	CLO 14	Describe the various methods commonly employed for the disposal of solid waste.	PO1, PO2, PO7	2
AHSB07.15	CLO 15	Identify To understand the recent trends in e-waste management practices.	PO1, PO2, PO7	2
AHSB07.16	CLO 16	Understand concept of climate change and impacts.	PO1, PO2, PO7	3
AHSB07.17	CLO 17	Summarize the remedial measures of ozone depletion.	PO1, PO2, PO7	3

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AHSB07.18	CLO 18	Evolve strategies to environmental issues. Describe the role of government and legal aspects in environmental protection	PO1, PO2, PO4, PO7	3
AHSB07.19	CLO 19	Discuss the silent features of the hazardous waste management rules. Understand the importance of EIA for developmental activities	PO1, PO2, PO4, PO7	3
AHSB07.20	CLO 20	State the aim and objectives of sustainable development. Enumerate population and its explosion.	PO1, PO2, PO7	3
AHSB07.21	CLO 21	State the aim and objectives of sustainable development. Acquire knowledge of environmental education. Summarize the environmental ethics and objectives of green buildings	PO1, PO2, PO7	3

3 = High; 2 = Medium; 1 = Low

XI. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

Course Outcomes (COs)	Program Outcomes (POs)				Program Specific Outcomes (PSOs)
	PO1	PO2	PO4	PO7	PSO1
CO 1	3	2	2	3	1
CO 2	2	3			
CO 3	2				
CO 4	2		2		
CO 5	3	2			

3 = High; 2 = Medium; 1 = Low

XII. 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
CLO 1	3						2						1		
CLO 2	2						2						1		
CLO 3	3	2					3						1		
CLO 4	2	3					2						1		
CLO 5	3	3					3						1		
CLO 6	2						2						1		
CLO 7	2						2						1		
CLO 8	2						2						1		
CLO 9	2						2						1		

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

3 = High; 2 = Medium; 1 = Low

XIII. ASSESSMENT METHODOLOGIES–DIRECT

CIE Exams	PO1,PO2, PO4,PO7, PSO1	SEE Exams	PO1, PO2, PO4,PO7, PSO1	Assignments	-	Seminars	-
Laboratory Practices	-	Student Viva	-	Mini Project	-	Certification	-
Term Paper	-						

XIV. ASSESSMENT METHODOLOGIES-INDIRECT

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

XV. SYLLABUS:

Module-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 Hydrological cycle, Phosphorous cycle, Nitrogen cycle. Biomagnifications.	

Module-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.	
Module-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; Endangered and Endemic species, 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.	
Module-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: Global Warming, Climate change, Sea level rise, ozone depletion, ozone depleting substances, deforestation and desertification; International conventions / protocols: Earth summit, Kyoto protocol and Montreal protocol	
Module-V	**ENVIRONMENTAL LEGISLATIONS AND SUSTAINABLE DEVELOPMENT**
Environmental legislations: Environmental protection act, air act1981, water act, forest 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, "Environmental Studies", Tata Mc Graw Hill Publishing Co. Ltd, New Delhi, 1st Edition, 2006. 2. Erach Bharucha, "Textbook of Environmental Studies for Under Graduate Courses", Orient Black Swan, 2nd Edition, 2013. 3. Dr. P. D Sharma, "Ecology and Environment", Rastogi Publications, New Delhi, 12th Edition, 2015.	
Reference Books:	
1. Tyler Miller, Scott Spoolman, "Environmental Science", Cengage Learning, 14th Edition, 2012. 2. Anubha Kaushik, "Perspectives in Environmental Science", New Age International, New Delhi, 4th Edition, 2006. 3. Gilbert M. Masters, Wendell P. Ela, "Introduction to Environmental Engineering and Science, Pearson, 3rd Edition, 2007	

XVI. COURSE PLAN:

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

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
1	Remember the definition .Scope, importance and need for Public Awareness	CLO 1	T1:1.1.3 R1:2.1
2	Understand the Ecosystem: Definition**,** scope and importance of ecosystem	CLO 1	T1:1.1.4 R1:2.7.1
3	Understand the Structure and function of ecosystem	CLO 1	T1:1.1.6 R1:2.7.4
4	Understand the Food chain food web and pyramids	CLO 2	T1:1.7.2 R1:2.15

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
5	Understand the Flow of energy	CLO 3	T1:1.7.2 R1:2.16
6	Understand the Biogeochemical cycles.	CLO 3	T1:1.7.6 R1:2.17
7	Understand the Biomagnification.	CLO 4	T1:1.7.3 R1:2.19
8	Remember the Living and non living resources	CLO 5	T1:2.1 R1:2.21
9	Understand the Water resources: use and over utilization of surface and ground water	CLO 6	T1:2.2.2 R1:2.3
10	Understand the Floods and Drought	CLO 6	T1:2.2.4 R1:4.1
11	Understand the Dams: befit and problems	CLO 7	T1:2.3.1 R1:4.3
12	Understand the Mineral resources: use and exploitation of minerals	CLO 7	T1:2.4 R1:4.8
13	Understand the Energy resources and introduction and applications	CLO 8	T1:2.5.2 R1:4.6
14	Understand the Wind energy and its application	CLO 8	T1:2.5.3 R1:4.6
15	Remember the Biodiversity and Biotic introduction and definition.	CLO 9	T1:3.1 R1:4.5
16	Remember the Classification of biodiversity	CLO 9	T1:3.2.2 R1:4.8
17	Understand the Values of biodiversity	CLO 9	T1:3.3.1 R1:4.7
18	Understand the India is mega diversity nation	CLO 10	T1:3.4 R1:4.9
19	Understand the Hot spots of biodiversity	CLO 10	T1: 3.4 R1:4.10
20	Understand the Threats to biodiversity	CLO 11	T1: 3.5 R1:1.10
21	Understand the Man wild life conflict	CLO 11	T1:3.5.2 R1:1.10
22	Understand the Conservation of Biodiversity	CLO 11	T1:3.7 R1:1.16
23	Remember the National biodiversity act	CLO 11	T1: 3.9 R1:1.16
24	Remember the Environmental pollution : Introduction and classification	CLO 12	T1: 4.1 R1:1.16
25	Understand the Air pollution: primary and secondary pollutants, effects and its control	CLO 12	T1: 4.2 R1:1.11
26	Understand the Water pollution: types effects and control of water pollution	CLO 13	T1:4.6 R1:5.2
27	Understand the Soil pollution: sources effects and control of soil pollution	CLO 13	T1: 4.8 R1:5.2
28	Understand the Noise pollution: sources effects and control of noise pollution	CLO 13	T1: 4.13 R1:5.10
29	Understand the Solid waste: Municipal and solid waste management	CLO 14	T1: 4.16 R1:5.2.3
30	Understand the E-waste: characteristics and its management	CLO 15	T1: 4.16.3 R1:5.2.4
31	Understand the Global environmental problems: climate change and impact on human	CLO 16	T1: 5.5 R1:5.4
32	Understand the Ozone depletion and consequences	CLO 17	T1: 5.6 R1:5.5
33	Remember the International protocols	CLO 18	T1: 5.10 R1:5.6

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	Reference
34	Remember the Environmental protection act, air act, water act, forest act, wild life act	CLO 18	T1: 7.3
35	Remember the Hazardous waste management and handling rules 2016	CLO 19	T1:7.10
36	Remember the EIA structure and concept of sustainable development	CLO 19	T1: 8.1
37	Understand Towards sustainable features: concepts of sustainable development	CLO 20	T1: 8.2
38	Understand the Consequences of population and its explosion	CLO 20	T2: 8.2.3 T3:2
39	Understand the Crazy consumerism urban sprawl	CLO 21	T2: 8.2.3 T3:7
40	Understand the Environmental education	CLO 21	T2:8.4 T3:7
41	Understand the Environmental ethics and concepts of green buildings	CLO 21	T2:8.12 T3:15,21

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

S No	Description	Proposed Actions	Relevance with POs	Relevance with PSOs
1	Global environmental problems: climate change and impact on human	Seminars / Guest Lectures / NPTEL	PO1, PO 7	PSO 1
2	Solid waste: Municipal and solid waste management	Seminars / Guest Lectures / NPTEL	PO1, PO 7	PSO 1
3	Concepts of green buildings	Seminars / Guest Lectures / NPTEL	PO1, PO 7	PSO 1

Prepared by:
Ms. M Malathi, Assistant Professor

HOD, IT