TUTORIAL MANUAL

OF

3110007 ENVIRONMENTAL SCIENCE

SEMESTER: 1

COURSE OFFERED BY

CIVIL ENGINEERING DEPARTMENT

TO THE STUDENTS OF

CIVIL & MECHANICAL ENGINEERING DEPARTMENT

GOVERNMENT ENGINEERING COLLEGE - DAHOD

ACADEMIC YEAR: 2022-23

:: VISION STATEMENT OF THE INSTITUTE ::

To be a value-based engineering institute to disseminate globally acceptable education and nurturing research, innovation and entrepreneurship.

:: MISSION STATEMENTS OF THE INSTITUTE ::

1. To provide quality education in the engineering disciplines through creative balance of academics and extracurricular programs.
2. To provide learning environment for innovation and entrepreneurship.
3. To disseminate ethical values, social values and sensitivity towards environmental issues.

:: VISION STATEMENT OF THE CIVIL ENGINEERING DEPARTMENT ::

To be a recognized department in the field of civil engineering education to produce professional civil engineers, innovators and entrepreneurs for the development of the society.

:: MISSION STATEMENTS OF THE CIVIL ENGINEERING DEPARTMENT ::

1. To provide quality education to civil engineering undergraduates through creative balance of academic, professional and extra-curricular activities.
2. To impart knowledge in the field of civil engineering for the development of infrastructure facilities with environmental concern for betterment of the society.
3. To contribute in the nation's development through innovative ideas in the field of civil engineering.

:: VISION STATEMENT OF THE MECHANICAL ENGINEERING DEPARTMENT ::

The Mechanical Engineering Department endeavors to be recognized for quality education and research, leading to well qualified innovative mechanical engineers having essential technical, managerial and entrepreneurial skills.

:: MISSION STATEMENTS OF THE MECHANICAL ENGINEERING DEPARTMENT ::

1. Developing essential technical and managerial skills of the students by imparting fundamental knowledge of engineering and its practical applications through qualified, trained and experienced faculties.
2. To enhance the creative and innovative skills of the students by providing state-of-the-art infrastructure and teaching-learning environment and encouraging them for development activities and higher education through research.

3. To provide a collaborative environment establishing links with industries that stimulate faculty and students with opportunities to create, analyze, apply and disseminate knowledge.
4. To encourage the students for life-long learning, ethical values and entrepreneurial culture for industrial and societal needs.

:: PROGRAM OUTCOMES (POs) ::

Program Outcomes (POs) as identified by National Board of Accreditation (NBA), India are the attributes that the students are expected to attain at the point of graduation. Following are the POs of B.E Civil & Mechanical Engineering programs:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
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.
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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.

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.
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 OUTCOMES (PSOs) ::

Program Specific Outcomes (PSOs) are what the graduates of a specific undergraduate engineering program should be able to do at the time of graduation.

Civil Engineering Graduates shall have

PSO 1: Ability to analyze, design and rehabilitate the infrastructural projects of civil engineering.

PSO 2: Ability to use advanced civil equipment, software, techniques and work seamlessly in teams.

PSO 3: Ability to apply gained knowledge to choose from the innovative career paths, to be an entrepreneur, and a zest for higher studies.

Mechanical Engineering Graduates shall have

PSO 1: Analyse, design and evaluate mechanical components / systems as per given specifications using conventional engineering design procedures and modern software tools.

PSO 2: Operate and maintain different mechanical systems.

PSO 3: Develop process plans and use appropriate material, man power, machines and method / technology to manufacture mechanical components /systems with quality assurance.

:: PROGRAMME EDUCATION OBJECTIVES (PEOs) ::

Program Educational Objectives (PEOs) describe the career and professional accomplishments that programs are preparing graduates to attain within a few years (3-5 years) of graduation.

Following are the PEOs of B.E Civil Engineering Program:

1. Establish themselves as civil engineering professionals in government, public and private sectors.
2. Manage infrastructural and sanitary facilities.
3. Solve real world problems environmental concerns to serve society.

4. Adapt to changing trends in analysis and design of civil engineering structures.
5. To do testing, survey and planning of civil engineering structures using modern tools.

Following are the PEOs of B.E Mechanical Engineering Program:

1. Apply knowledge of science, mathematics, technology, engineering, management, humanities and various other interdisciplinary subjects to identify and address the technical and societal problems.
2. Enhance their intellectual and analytical abilities in taking initiatives and/or develop innovative ideas for technological and professional growth as a technocrat / an entrepreneur in mechanical and allied disciplines.
3. Work effectively as a team member or lead multidisciplinary teams while demonstrating the interpersonal & management skills and ethical responsibilities.

:: COURSE OUTCOMES (COs) ::

Course Outcomes are narrower statements that describe what students are expected to know, and be able to do at the end of each course. These relate to the skills, knowledge, and behaviour that students acquire in their matriculation through the course.

PROGRAM NAME: B.E. CIVIL ENGINEERING & B.E. MECHANICAL ENGINEERING		
COURSE NAME: 3110007 ENVIRONMENTAL SCIENCE		
SEMESTER: 1	A.Y 2020-21	Weightage %
3110007.1	**Identify** the types of pollution in society along with their sources	55
3110007.2	**Realize** the global environmental issues	25
3110007.3	**Conceptualize** the principles of Green Buildings and Smart cities	10
3110007.4	**Implement** the concept of recycle and reuse in all fields of engineering	10

DISTRIBUTION OF THEORY MARKS AS PER GTU					
R Level	U Level	A Level	N Level	E Level	C Level
40%	40%	20%	00%	00%	00%

Legends: **R**: Remembrance; **U**: Understanding; **A**: Application; **N**: Analyze; **E**: Evaluate **C**: Create and above Levels (As per revised Bloom's Taxonomy)

:: TEACHING AND EXAMINATION SCHEME ::

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE(E)	PA (M)	ESE (V)	PA(I)	
2	2	0	0	70	30	0	0	100

ESE - END SEMESTER EXAMINATION, **PA** - PROGRESS ASSESSMENT, **ALA** - ACTIVE LEARNING ASSIGNMENTS, **OEP** - OPEN ENDED PROBLEM

:: TUTORIAL PLANNING ::

COURSE NAME: 3110007 ENVIRONMENTAL SCIENCE Program: Semester:2	Batch b2

Sr. No.	Content	Title	Planning Date	Actual Date	Total Hours
1	Tutorial – 1	Introduction to environment & Environmental pollution			12
2	Tutorial – 2	Global environmental issues			8
3	Tutorial – 3	Basic concept of green building and smart cities			8
4	Tutorial – 4	Concept of 4R's			6

:: REFERENCE BOOKS ::

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition,2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP -Lambert Academic Publishing , Germany
3. Environmental Studies by Anindita Basak ,2009 Publisher: Drling Kindersley(India)Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by : S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill

List of Open Source Software/learning website: MOEF, NPTEL

:: INDEX ::

Sr. No.	Date	Title	Page No.	CO attained	Marks	Sign of Faculty with Date
1		Introduction to environment & Environmental pollution		CO1		
2		Global environmental issues		CO2		
3		Basic concept of green building and smart cities		CO3		
4		Concept of 4R's		CO4		

Tutorial No.	Date	Title	CO attained
1		Introduction to environment & Environmental pollution	CO1

1. Define the following terms:
    a. Environment
    b. Environmental Science
    c. Natural Resources
    d. Sustainable Development
2. Write a short note on "Global Human Population Growth".
3. What are the challenges – issues that we are facing today in environment ? Explain each in detail.
4. What is sustainability ? Explain in detail about sustainable solutions.
5. Write a short note on "Sustainable Development".
6. What is Ecological Footprint ? Explain & Compare Scenario on various developed countries and developing countries for inequality in ecological footprint.
7. What are the components of environment? Explain in detail **ALL** components with the help of neat sketches.
8. Explain the structure of atmosphere in detail with neat sketch.
9. Write short note on:
    a. Environmental Degradation
    b. Impact of Technology and Development on Environment.
10. Why environmental education is provided to engineers? State the Objectives of Environmental Education.
11. What is Environmental Engineering? Explain in detail
    i) Role of Environmental Engineers and
    ii) Activities handled by Environmental Engineers.

12. Describe the man-environmental relationship in detail.
13. What is population explosion? Explain the effects of population explosion in detail.
14. Explain in detail various schemes of human health program initiated by Indian government on effects of population growth.
15. Explain the role of Information Technology on Environment Protection and Human Health Protection.
16. Explain the Scope, importance and multidisciplinary nature of Environmental science.
17. State the role and responsibility of an individual in the prevention of pollution.
18. Enlist different types of environmental pollution and write short note on ill-effects of fireworks.
19. What is environmental pollution? Discuss in detail different sources of pollution.
20. Write brief note on:
    a. Air Pollution
    b. Water Pollution
    c. Land Pollution
    d. Noise Pollution
    e. Thermal Pollution
    f. Marine Pollution
    g. Bio-medical waste
    h. Eutrophication
    i. E-waste
    j. Photochemical Smog
    k. Land filling methods for solid waste
    l. National Ambient Air Quality Standards
21. Sketch the various stages of solid waste management and explain in detail.
22. What is meant by "Hazardous Waste"? Explain in detail with any one example.
23. Explain the causes, effects and control measures of Nuclear hazards.
24. Define the terms DO, COD, BOD and Toxicity.

25. Define Ecology and Explain in detail classification of Ecology.
26. Define Ecosystem. Explain aspects of Ecosystem and Write in Detail "Structure of an Ecosystem" with neat sketch.
27. Narrate in detail energy flow in an ecosystem. Explain with one of the Model of Energy flow.
28. Define ecological pyramid. State the types of ecological pyramid and describe any one in detail with figure.
29. Write brief note on Food Chain and food web. Also explain them with example of Aquatic and Terrestrial ecosystem.
30. Differentiate the following:
    a. Food Chain and Food Web
    b. Ecology and Ecosystem
31. Write in detail about Bio-Amplification.
32. Write brief note on
    I. Water / Hydrologic Cycle
    II. Carbon Cycle
    III. Nitrogen Cycle
    IV. Sulfur Cycle
    V. Phosphorous Cycle
    VI. Oxygen Cycle
33. Explain the aim & objectives of "Air (Prevention & control of pollution) Act 1981".
34. Give full form of: GPCB, GEMI, GEC and GSDMA
35. Write a brief note on "Environmental Protection Act 1986".
36. Differentiate the role of CPCB and GPCB.
37. Explain the aim and objectives of "Water (Prevention & Control of Pollution), Act 1974".
38. Discuss in detail the causes and consequences of overexploitation of forest resources.
39. Discuss the following: Land Resources, Land Degradation, Soil erosion and Desertification.
40. What is land degradation? Explain factors responsible and controlling measures of land degradation.

Tutorial No.	Date	Title	CO attained
2		Global environmental issues	CO2

1. Write brief Note on: Conventional Energy Sources.
2. Non - Conventional Energy Sources.
3. Discuss in detail: “Solar Energy is the Energy for Future in India”.
4. Discuss the Effect of Overpopulation on Energy Problems.
5. Prepare a list of fossil fuels and explain the Environmental impacts of any one.
6. State and Explain problems due to overexploitation of energy resources.
7. What are the environmental impacts of a coal based thermal power plant? Suggest suitable solution to the energy problems in view of growing population and industrialization of India.
8. Differentiate between:
   a. Conventional and Non-Conventional Energy Source.
   b. Renewable and Non-Renewable Energy Source.
9. Write brief note on:
   a. Acid Rain
   b. Green House Effect
   c. Global Warming
   d. Sustainable Development
   e. Climate Change
   f. Ozone Layer Depletion
   g. Watershed Management
   h. Cleaner Development Mechanism (CDM)
   i. International Steps for Mitigating Global Change
   j. Rainwater Harvesting
   k. Urbanization
   l. Bhopal Gas Tragedy
   m. Chernobyl disaster
10. Explain the effects of nuclear accidents with two case studies.

Tutorial No.	Date	Title	CO attained
3		Basic concept of green building and smart cities	CO3

1. Write brief note on
   a. Smart City: concept, core infrastructure elements, list of smart cities in India
   b. Green Buildings : concept, objectives, fundamental principles & benefits
   c. Green building rating systems
2. What are the requirements of smart cities? Describe the features of smart cities.
3. Describe impact of smart cities on Indian infrastructure.
4. Discuss impact of infrastructure facilities on development of nation.
5. Describe methods of achieving energy efficiency in buildings.
6. Define: repair, restoration and retrofitting
7. Write brief note on
   a. LEED rating system for green buildings
   b. The rating systems from IGBC
   c. GRIHA rating system

Tutorial No.	Date	Title	CO attained
4		Concept of 4R's	CO4

1. Write brief note on
    a. Concept of 4R's
    b. Hazardous Waste Management Rules, 2016
    c. Solid Waste Management Rules (SWM), 2016
    d. Bio-Medical Waste Management Rules 2016
    e. Municipal Solid Waste Management
    f. Solid and Liquid Waste Management in Rural Areas
    g. E-Waste Management Rules, 2016
    h. Plastic Waste Management Rules, 2016
    i. Construction and Demolition Waste Management Rules 2016
2. What do you understand by environmental ethics and what are its objectives?
3. List out important days celebrated related to Environment in India and write down its aim and objectives.
4. How the concept of reduction of waste helps in waste management ? Give suitable examples.
5. Explain the ways in which you can reuse the materials to reduce the waste.
6. Explain the concept of recycling and write brief note on recycling of materials.
7. Explain the concept of recover the waste material and how the waste can be treated as a resource?
8. Explain the concept of "Composting" method to recover the waste material.
9. Suggest some ways to covert wastes to resources.
10. Explain the principles of 4R's and describe how these principles are applicable to control environmental pollution.