Assignment Booklet

MSCRWEE Programme
M.Sc (Renewable Energy and Environment)

Third Semester / Fourth Semester (Electives)	
MRWE-001	Nano Technology in Energy & Environment
MRWE-002`	Energy Storage
MEV-021	Introduction to Climate Change
MEVE-001	Environmental Impact Assessment for Environmental Health
MCS-224	Artificial Intelligence and Machine Learning
MCS-226	Data Science and Big Data
MCS-227	Cloud Computing and IoT
MCS-231	Mobile Computing

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SCHOOL OF ENGINEERING & TECHNOLOGY
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
Maidan Garhi, New Delhi – 110 068

JULY 2023

Dear Student,

Please read the information on assignments in the Programme Guide that we have sent you after your enrolment. A weightage of 30%, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this Programme. The assignment for MSCRWEE (Third semester / fourth semester) has been given in this booklet.

Instructions for Formatting Your Assignments

Before attempting the assignment, please read the following instructions carefully:

1) On top of the first page of your answer sheet, please write the details exactly in the following format:

<div align="center">

ENROLLMENT NO :………………………….……………

NAME :………………………….……………

ADDRESS :………………………….……………

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PROGRAMME CODE: ………………………..

COURSE CODE: ………………………….

COURSE TITLE: …………………………….

STUDY CENTRE: ……………………..…….   DATE: …………………………………...

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION ANDTO AVOID DELAY.

2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3) Leave 4 cm margin on the left, top and bottom of your answer sheet.

4) Your answers should be precise.

5) **These assignments submitted should be hand written in your own hand writing.**

We strongly suggest that you should retain a copy of your answer sheets.

6) **You cannot fill the Exam Form without** submission of the assignments. So solve it and **submit it at the earliest.** If you wish to appear in the **TEE, June 2023,** you should submit your TMAs by **April 30, 2023.** Similarly, if you wish to appear in the **TEE, December 2023,** you should submit your TMAs by **September 30, 2023.**

7) Assignments will be submitted at **your respective regional centre.**

We wish you good luck!

ELECTIVE ASSIGNMENTS

(Attempt the assignment of the elective subject for which you are registered)

Note:

1. For any question worth 5 marks the word limit is 200 words, for a 10 mark question it is 350 words.

2. All questions are compulsory. All questions carry equal marks.

Q.1 a) What is Nano Technology? Explain the basic concept of Nano Technology? 5

   b) List out the various technologies used in Nano Technology for the measurement. Explain the working of Scanning Electron Microscope with suitable diagram (SEM). 5

Q.2 a) Differentiate between SEM and TEM. Also list out the advantages and applications of SEM and TEM. 5

   b) What is synthesis of Nano Materials? Also describe the various properties of Nano Materials. 5

Q.3 a) Discuss Top-down and Bottom-up approach. List out the various methods of Top-down and Bottom-up approach. 5

   b) Explain any one method of Top-down and Bottom-up approach with suitable diagram. 5

Q.4 a) Discuss the following 5
   (i)   Nano Materials
   (ii)   Carbon Nano Tubes
   (iii) Nano Wire
   (iv)   Nano Composite Materials
   (v)   Carbon Nano Materials

   b) Explain the working of Atomic Force Microscopy (AFM) with suitable diagram. List out the advantages. 5

Q.5 a) What is Nano Machine and Nano bot? List out its applications. 5

   b) Discuss the various applications of Nano Technology and Nano materials? 5

Q.6 a) What is Energy Conversion process? What are the methods in Energy Conversion process? Explain. 5

   b) How the Nano Technology can applied in Solar Energy? Explain. 5

Q.7 a) What do you understand about Micro Electro Mechanical Systems (MEMS) and Nano Electro Mechanical Systems (NEMS)? Explain. Also list out its advantages and applications. 5

   b) Explain Hydrogen Storage Systems with suitable diagram. List out its applications. 5

Q.8	a)	Explain Solar Power Generator Mechanism with neat sketch and list out the suitable material for solar cell.	5
	b)	Explain Nano-Micro Silicon (Si) composite structures and what are the various technologies used in Silicon (si) deposition.	5
Q.9	a)	How do you monitor the various environmental factors by using sensors? Explain.	5
	b)	What is Nano Sensor? How do you design Nano Sensor? List out its various applications.	5
Q.10	a)	How do you prevent the pollution by using Nano Technology? Explain	5
	b)	What is Green Manufacturing and what do you understand about Green Manufacturing?	5

Note:

1.   **For any question worth 5 marks the word limit is 200 words, for a 10 mark question it is 350 words.**

2.   **All questions are compulsory. All questions carry equal marks.**

Q.1	Explain the concept of "round-trip efficiency" and why it is an important consideration for energy storage systems?	10
Q.2	Discuss the role of control systems in flywheel energy storage systems. Explain the strategies used to regulate the speed, power conversion, and safety of the system.	10
Q.3	Explain the importance of advanced materials in the development of energy storage systems.	10
Q.4	a) What are the main factors to consider when selecting a chemical energy storage system for a specific application?	05
	b) What are the factors need to be considered while designing PCM?	05
Q.5	What are the major technologies used for heat storage in buildings? Discuss	10
Q.6	What is the primary purpose of solar energy storage in a grid-connected solar system?	10
Q.7	What is thermal radiation, and how does it contribute to heat loss? Discuss the factors that affect thermal radiation.	10
Q.8	Discuss the current trends and future prospects of grid-connected energy storage schemes.	10
Q.9	Discuss the potential for utilizing waste heat from industrial processes in sensible heat storage system with the help of suitable example.	10
Q.10	How does the charging and discharging process occur in LHTES systems, and what are the key considerations in designing these processes?	10

Assignment -3
(To be done **after** studying the course material)

Note:

1.   **For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.**

2.   **Attempt ANY FIVE questions. All questions carry equal marks.**

Q.1   Write short notes on the following: 20
      a) Atmospheric composition
      b) Environmental degradation

Q.2   Explain the Global Heat Budget with suitable diagram.   20

Q.3   Write short notes on the following: 20
      a) Natural drivers of climate change
      b) Anthropogenic drivers of climate change

Q.4   Write short notes on the following: 20
    c) "Cloud feedback" and "Lapse-rate feedback"
    d) Representative Concentration Pathway

Q.5   Explain the sources of palaeo climatic data.   20

Q.6   Explain the features of the Paris Agreement on Climate Change.   20

Assignment -4
(To be done **after** studying the course material)
Course Code: MEVE-001
Course Title: Environmental Impact Assessment for
Environmental Health
Assignment Code: MEVE-001/TMA/2023
Maximum Marks: 100
Last Date of Submission: September 30, 2023

Note:

1.   **For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.**

2.   **Attempt ANY FIVE questions. All questions carry equal marks.**

Q.1   Explain the basic principles of EIA?   20

Q.2   Describe the Environmental Auditing process   20

Q.3   What is the Strategic Environmental Assessment? Explain its process.   20

Q.4   Explain in detail about Cost Benefit Analysis?   20

Q.5   When can the public be involved in the EIA? What is the importance of   20
        public consultation during the EIA?

Q.6   What are the objectives and types of energy audit? Explain in detail.   20

Q.7   Give a brief account on EIA laws and guidelines.   20

Note:

1. **For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.**

2. **Attempt all questions. All questions carry equal marks.**

Q.1 Differentiate between Artificial Intelligence, Machine Learning and Deep learning.   10

Q.2 Briefly discuss the concept of single agent search and two agent search in Artificial Intelligence.   10

Q.3 Compare and contrast the predicate logic and propositional logic, give suitable example for each. Also write De Morgan's laws for both.   10

Q.4 Discuss the concept of Resolution with the help of suitable example.   10

Q.5 What do you understand by Bayesian Theory, with reference to its utility in artificial intelligence?   10

Q.6 Explain the concept of semantic nets with the help of suitable diagram   10

Q.7 What are Fuzzy sets? How do they differ from Rough sets?   10

Q.8 Differentiate between Supervised learning and Unsupervised learning, give suitable example for each.   10

Q.9 Discuss the concept of Linear regression and its utility in context of machine learning.   10

Q.10 Give brief introduction to the concept of feature selection and feature extraction, give suitable example for each.   10

Note:

1.   **For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.**

2.   **Attempt all questions. All questions carry equal marks.**

Q.1   What is data science? What are its applications? Define the terms Descriptive, Exploratory and Predictive in the context of data analysis. What is the difference between Causal inference and prediction?   10

Q.2   Explain the following with the help of an example in the context of statistics and Probability: Conditional Probability, Bayes Theorem, Normal distribution, Central limit theorem and Statistical Hypothesis   10

Q.3   A class has 25 students. Create a data set of marks of the students in Mathematics out of a maximum of 50 marks. Make the histogram and box plot for this data. Can you draw scatter plots using this data? Give reasons in support of your answer   10

Q.4   Explain Big data and its characteristics. How is Big data different to relational data? Explain with the help of an example. Define the characteristics of HDFS. Explain purpose of name node, data node and job tracker in this context.   10

Q.5   What is Map-Reduce programming? Explain the map phase, shuffling and sorting and reduce phase with the help of an example of word counting problem.   10

Q.6   What are NoSQL databases? How are they different from relational database management system? List the features of any four types of NoSQL databases.   10

Q.7   Explain the Jaccard similarity of sets with the help of an example. What are the ways of finding similarity between two documents? Also, define the term collaborative filtering.   10

Q.8   What is a data stream? How is it different to relational data? List the issues and challenges of handling data streams. What is the role of bloom filter?   10

Q.9 Explain the role of link analysis. Explain a page ranking algorithm with the help of an example. What is link spam? Explain the role of hubs and authorities for finding page rank.   10

Q.10 Create a sample data of the marks of 20 students in five different subjects using MS-Excel. How can you use this data for programming in R? Write programs using R programming language to create four different plots using this data.   10

Note:

1.	For any question worth 10 marks the word limit is 350 words, for a 20 mark question it is 550 words.

2.	Attempt all questions. All questions carry equal marks.

Q.1	Cloud Service models like Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (Saas) were discussed in the course. Explore the features, benefits and relevant use cases for other service models like Security as a Service (SECaaS), Database as a Service (DBaaS), Analytics as a Service (AaaS) and API as a Service (APIaaS).	20

Q.2	a)	What do you understand by Resource Virtualization and its underlying abstraction?	20

	b)	Describe various Hypervisor based virtualization approaches like full virtualization, para virtualization and h/w-assisted virtualization.

	c)	Compare Xenserver Vs VMware with respect to the features like Guest O/S support, Backup facility, Thin provisioning, asset management and configuration mapping, dynamic resource allocation and failover, graphics support, licensing, host server management and storage specifications.

Q.3	Define scaling concept in cloud computing. Explain the following scaling strategies:	20

	(a) Proactive Scaling

	(b) Reactive Scaling

	(c) Combinational Scaling

Q.4	Compare and contrast Cloud Computing, Fog Computing and Edge Computing. Briefly discuss two applications for each of Fog Computing and Edge Computing.	20

Q.5	Briefly discuss any two (for each of the sector) Use Cases of IoT in the following sectors:	20

	(a) Agriculture

	(b) Transportation

Note:

1. **For any question worth 20 marks the word limit is 550 words, for a 25 mark question it is 650 words.**

2. **Attempt all questions. All questions carry equal marks.**

Q.1   Briefly explain the terms "Guided Transmission" and "Unguided Transmission".   25

Q.2   What is meant by Modulation? Explain any one type of Modulation.   25

Q.3   What is meant by Multiplexing? How does TDMA differ from FDMA?   25

Q.4   What are the advantages and disadvantages of 4G networks in comparison to 3G   25
      networks?