INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - DECEMBER 2025

PROGRAMME: BSEM
YEAR/SEM: YEAR 2/SEMESTER 1
COURSE CODE: BSE2104
NAME: ENVIRONMENTAL INFORMATICS

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Answer all questions in this section (compulsory)

Question 1:

1. Briefly explain the term environmental informatics and its importance in environmental management. (5 marks)
2. Identify the four key components of an environmental information system. (5 marks)
3. Differentiate between data and information using environmental examples. (5 marks)
4. Explain any three types of environmental data collected in field studies. (5 marks)
5. Define remote sensing and give two examples of its application in environmental monitoring. (5 marks)
6. Explain what GIS is and describe two of its major functions. (5 marks)
7. Describe how GPS technology is used in environmental data collection. (5 marks)
8. Explain the purpose of an environmental database. (5 marks)

Question 2:

Select one environmental information systems or technologies (e.g., GIS for forest monitoring, IoT for air quality management, AI for land-cover classification, eDNA pipelines for biodiversity).

a) Define environmental informatics and explain its significance. (5 marks)

b) Describe how the technology/system works. (5 marks)

c) Explain how the system has been applied to environmental datasets. (5 marks)

d) Present at least one case study showing practical application, including location, data used, and stakeholders. (5 marks)

e) Analyze the successes and challenges/failures of the system. (5 marks)

f) Compare the system's structure or data-handling process with another informatics discipline (e.g., bioinformatics pipelines). (5 marks)

g) Discuss emerging trends or convergence, such as AI, IoT, or digital twins in environmental data management. (5 marks)

h) Discuss the lessons learned and recommendations for improving environmental information systems. (5 marks)

SECTION B

Answer only three (3) questions from this section

Question 1:

a) Define Environmental Informatics (4 marks)

b) Discuss four main goals of environmental informatics in the context of data driven environmental decision making (8 marks)

c) Provide two examples of how environmental informatics can be used to address environmental issues such as pollution or biodiversity loss (8 marks)

Question 2:

a) What is a Geographic Information System (4 marks)

b) Identify the basic components of a geographic information system (4 marks)

c) Outline four ways GIS can be applied in environmental studies (4 marks)

d) Discuss the current problems in natural resource management that require GIS (8 marks)

Question 3:

a) What is environmental data? (4 marks)

b) Why is data collection essential in environmental management (4 marks)

c) Identify four types of environmental data (4 marks)

d) Explain the importance of data quality management in environmental informatics and two strategies of ensuring data accuracy and reliability (8 marks)

Question 4:

a) What is environmental modeling, and how is it used to understand complex environmental systems (6 marks)

b) Describe the steps involved in developing and environmental model (8 marks)

c) Discuss the limitations of environmental models and how incorporating real-time data can improve model accuracy (6 marks)

Question 5:

a) Define a Decision Support System (DSS) and its role in environmental management (6 marks)

b) Explain how a DSS can assist policy makers in making decisions about water resource management (6 marks)

c) Identify the challenges in implementing a DSS for environmental management and suggest possible solutions (8 marks)

Question 6:

a) What is environmental sampling (4 marks)

b) Outline four methods used in environmental sampling (4 marks)

c) Explain four tools used in sustainable environment management system (4 marks)

d) Define the term “bio indicators” and identify four bio-indicators used in environmental sampling (8 marks)

Question 7:

a) Define the term “Environmental Information System (EIS)? (4 marks)

b) Discuss the challenges to EIS (8 marks)

c) Explain how the above challenges can be overcome (8 marks)

Question 8:

Discuss the challenges in Environmental informatics and suggest solutions to those challenges. (20 marks)

Question 9:

a) Outline the steps involved in collecting and processing environmental data. (10 marks)

b) Discuss the challenges associated with managing large datasets in environmental research. (10 marks)

Question 10:

a) Discuss the role of data modeling in environmental informatics. (8 marks)

b) Explain how environmental data can be effectively modeled. (6 marks)

c) Explain why environmental data is crucial for decision-making in environmental management. (6 marks)

Question 11:

Choose a specific environmental issue (e.g., air pollution, water scarcity)

a) Discuss how environmental informatics can be employed to address and monitor the issue. (10 marks)

b) Provide examples of relevant technologies used. (10 marks)

Question 12:

a) Explain the concept of bioinformatics. (4 marks)

b) Discuss three ways in which bioinformatics tools are applied in environmental informatics. Use relevant examples from biodiversity conservation, environmental monitoring, or pollution assessment. (6 marks)

c) Environmental DNA (eDNA) analysis has become an important technique for ecological assessments. Describe the role of bioinformatics in the processing, analysis, and interpretation of eDNA data. (10 marks)