UZO-401 Air Pollution Monitoring Cr. (2)

Introduction

Overall, the course would aim to provide students with a comprehensive understanding of air pollution monitoring, from the basics of air quality standards and measurement techniques to the more advanced topics of data analysis, quality assurance, and emerging technologies.

Course Objectives:

The main objective of an air pollution monitoring course is to provide students with a comprehensive understanding of the principles and practices of air pollution monitoring. Overall, the objective of an air pollution monitoring course is to prepare students for careers in air quality management, environmental monitoring, public health, and other related fields. By completing the course, students should have the skills and knowledge necessary to design, implement, and manage air pollution monitoring programs and develop effective strategies for reducing air pollution

The specific objectives of the course may include:

- To understand the concept of air pollution, including its sources, types, and impacts on human health and the environment.
- To familiarize students with the national and international air quality standards and regulations, and their role in air pollution control and management.
- To provide students with an understanding of the various measurement techniques used to monitor air quality, including their advantages and limitations.
- To develop students' skills in data collection, analysis, and interpretation of air pollution monitoring data.
- To train students on quality assurance and quality control procedures in air pollution monitoring, including measurement uncertainty.
- To equip students with knowledge of data management systems and tools used in air pollution monitoring.
- To introduce students to emerging technologies in air pollution monitoring, such as sensor networks, unmanned aerial vehicles, and satellite remote sensing.
- To enable students to conduct air pollution monitoring in the field and analyze samples in a laboratory.
- To enhance students' critical thinking skills and problem-solving abilities in air pollution monitoring and control.

Course Learning Outcomes:

On completion of the course, the students will be able to;

1. **Acquire** the concept of air pollution, including its sources, types, and impacts on human health and the environment.
2. **Understand** the various measurement techniques used to monitor air quality, including their advantages and limitations.
3. **Solve** the problems in measurement techniques used to monitor air quality, including their advantages and limitations.
4. **Analyse** the quality control procedures in air pollution monitoring, including measurement uncertainty.
5. **Evaluate** emerging technologies in air pollution monitoring, such as sensor networks, unmanned aerial vehicles, and satellite remote sensing.
6. **Demonstrate** and develop students' skills in data collection, analysis, and interpretation of air pollution monitoring data.

Course Outline:

Air pollution monitoring course will cover the following topics:

Introduction to air pollution monitoring: Definition of air pollution, sources of air pollution, health impacts of air pollution, and monitoring objectives.

Air quality standards: Overview of the regulatory framework for air quality, including national and international standards, and the role of monitoring in supporting compliance.
Measurement techniques: Introduction to the various measurement techniques used to monitor air quality, including continuous monitoring, passive sampling, and remote sensing.
Data analysis and interpretation: Overview of the statistical methods used to analyze air quality data, including descriptive statistics, regression analysis, and time series analysis.
Quality assurance and quality control: Importance of quality assurance and quality control in air pollution monitoring, including quality assurance objectives, quality control procedures, and measurement uncertainty.
Data management: Overview of data management systems, including data acquisition, data storage, data retrieval, and data validation.
Emerging technologies: Discussion of new and emerging technologies for air pollution monitoring, such as sensor networks, unmanned aerial vehicles, and satellite remote sensing.

Teaching-Learning Strategies
Teaching will be a combination of class lectures, class discussions, and group work. Short videos /films will be shown on occasion.

Assignments
The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work:	25 marks
Midterm Exam:	35 marks
Final term Exam:	40 marks

Text and Reference Books:

1. Ali. Z. Colbeck, I, and Nasir, Z. A. 2010. Basics of air pollution monitoring, HEC-BC Link publication.
2. Welburn, A. 2007. Air pollution and climate change: 2nd edition; Longman Scientific and Technical
3. Blumenthal, D. S., and Ruttenber, A. J. 1995. Introduction to environmental health. Second Edition. New York: Springer.
4. Lippmann, M. (Ed.). 1992. Environmental toxicants: Human exposures and their health effects. New York: Van Nostrand Reinhold.
5. Moeller, D. W. 1997. Environmental health (Revised ed.). Cambridge: Harvard University Press.
6. Moore, G. S. 1999. Living with the earth: Concepts in environmental health science. Boca Raton: Lewis Publishers.
7. Nadakavukaren, A. 2000. Our global environment: A health perspective (5th ed.) Prospect Heights: Waveland Press, Inc.
8. Philp, R. B. 1995.Environmental hazards and human health. Boca Raton: Lewis Publishers.
9. Yassi, A., Kjellstrom, T., de Kok, T., Guidotti, T. L. 2001. Basic environmental health. New York: Oxford University Press.
10. Bennett, R. and Estell, R.1991. Global Change and Challenge, Routledge
11. Lazaridis M, and Colbeck Ian, 2010. Human Exposure to Pollutants via Dermal Absorption and Inhalation. Springer.
12. Colbeck I. 2008. Environmental Chemistry of Aerosol, Blackwell Publishing
13. Wright, R.T. 2005. Environmental Science 9th Ed. Pearson Prentice Hall.
14. Purohit, S. S. and Ranjan R. 2003. Ecology Environment and Pollution, Agrobios
15. Ali, Z. Colbeck, I, and Nasir, Z. A. 2009. Basics of air Pollution Monitoring, UVAS, E-links.
16. Tiwary, A, and Colls, J. 2010. Air Pollution: Measurement, Modelling and Mitigation, 3rd edition, Taylor and Francis group.
17. Kowalski, W. J. 2006. Aerobiological Engineering Handbook, McGraw Hill.

UZO-402 Air Pollution Monitoring (Lab) Cr. (1)

Introduction

Practical air pollution monitoring involves actually collecting and analyzing air samples to measure pollutant concentrations in the atmosphere. Overall, practical air pollution monitoring involves careful planning, attention to detail during field measurements, and accurate laboratory analysis to obtain reliable results. The results of air pollution monitoring can be used to inform decision-making about air quality management and to develop effective strategies for reducing air pollution.

Course Objectives:

The main objective of an air pollution monitoring course is to provide students with a comprehensive understanding of the principles and practices of air pollution monitoring. Overall, the objective of an air pollution monitoring course is to prepare students for careers in air quality management, environmental monitoring, public health, and other related fields. By completing the course, students should have the skills and knowledge necessary to design, implement, and manage air pollution monitoring programs and develop effective strategies for reducing air pollution

4. **Analyse** the quality control procedures in air pollution monitoring, including measurement uncertainty.
5. **Evaluate** emerging technologies in air pollution monitoring, such as sensor networks, unmanned aerial vehicles, and satellite remote sensing.
6. **Demonstrate** and develop students' skills in data collection, analysis, and interpretation of air pollution monitoring data.

Course Outline:

Here are some steps to follow for conducting practical air pollution monitoring:

Define monitoring objectives: Determine the specific pollutants to be monitored, the locations where measurements will be taken, and the frequency and duration of monitoring.

Select monitoring equipment: Choose appropriate monitoring equipment based on the monitoring objectives, including sampling equipment and analytical instruments for pollutant analysis.

Develop a sampling plan: Determine the appropriate sampling methodology and sampling locations based on the monitoring objectives. Develop a sampling plan that includes the type of sampling equipment to be used, the sampling time and duration, and any other relevant details.

Conduct field measurements: Follow the sampling plan to collect air samples at the specified locations and times. Record all relevant data, such as weather conditions, location, and any other environmental factors that could affect the sampling results.

Analyze samples: Analyze the collected air samples in a laboratory using appropriate analytical techniques, such as gas chromatography, spectrophotometry, or mass spectrometry. Ensure that the analytical methods used are appropriate for the pollutants being measured.

Interpret results: Analyze the data obtained from the laboratory analysis and interpret the results. Compare the results to relevant air quality standards and guidelines to determine the level of air pollution in the monitored areas.

Report findings: Compile the results of the air pollution monitoring into a report that includes a description of the sampling methodology, analytical methods, results, and interpretation. The report should also include any recommendations for improving air quality in the monitored areas.

Teaching-Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos /films will be shown on occasion.

Assignments

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

Assessments and Examination

Sessional Work:	25 marks
Midterm Exam:	35 marks
Final term Exam:	40 marks