

LO 1: INTRODUCTION TO REMEDIATION TECHNOLOGY

The **Learning Outcome (LO) 1: Introduction to remediation technology** presents basic information about pollutants as substances contaminating natural environment. It discusses the process of pollution - its occurrence when the natural environment cannot eliminate the negative effects of the hazardous substance. Human activities as major factors linked to environmental pollution and global warming, and remediation of the polluted environment and keeping it free from hazardous contaminants as essential issues in maintaining ecological balance are revealed. The need of human intervention for fast remediation of polluted environments and the application of diversity of remedial procedures depending on the nature and level of contamination are also discussed. Data about the utilization of conventional and modern techniques for remediation of polluted environments are given. The sustainability of remediation technologies as an extremely important element for assurance of the long-term remediation effect and avoiding any potential problems in future is stressed upon. Finally, the use of certain genetically modified organisms for bioremediation purposes is commented.

LO 2: BIOREMEDIATION OF HAZARDOUS POLLUTANTS

The **Learning Outcome (LO) 2: Bioremediation of hazardous pollutants** is focused on the main today's environmental problems in the context of their direct link to the development of human civilization and the significant increase in environmental pollution that have started with industrial revolution in the 19th century. The learning material discusses the increased consumption of carbon-based energy sources, extraction and processing of mines, and uncontrolled release of contaminants that created the nowadays environmental pollution crisis. Information about the contaminants created by human activities that present major risks to environment and human health is provided. The possibilities to utilize plants and microorganisms to remediate polluted sites are discussed. Bioremediation as an environment friendly procedure that can be utilized to remediate the contaminated sites is described. Various bioremediation techniques that have been developed to clean up sites polluted with hazardous contaminants are commented. Information about plants and microorganisms that can remediate polluted sites by converting toxic compounds into non-toxic forms is given. The decrease in the production and release of pollutants to environment as an approach to control the environmental pollution is also discussed. The application of bioremediation in combination with conventional techniques to ameliorate the effects of environmental pollutants is presented as well.

BASIC DATA ABOUT THE COURSE

Course Title: Advances in bioremediation

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Course type:

Academic	Enrichment	Work-oriented training
✓		

Target Group: Teachers/trainers in adult education; career officers, counselors, inspectors; head teachers / principals

EQF level:

EQF level 5	EQF level 6	EQF level 7
✓	✓	✓

Course aim: to provide general information about remediation technology and diversity of remedial procedures applied to polluted environments with special emphasis on bioremediation of hazardous pollutants.

Knowledge background: basic knowledge in plant physiology, microbiology, ecology

Course content:

Learning Outcome 1: Introduction to remediation technology

1. Introduction to remediation technology
 - 1.1 Terms in remediation
 - 1.2. Classes of remediation
2. Hazardous environmental contaminants
 - 2.1. Fossil fuels (petroleum, natural gas and coal)
 - 2.2. Industrial waste
 - 2.3. Municipal waste (solid waste and sewage)
 - 2.4. Agricultural waste
 - 2.5. Pesticides
 - 2.6. Heavy and non-heavy metals
3. Characterization of a contaminated site
4. Bioremediation
 - 4.1. Criteria for bioremediation strategies
 - 4.2. Bioremediation Technologies
5. References

Learning Outcome 2: Bioremediation of hazardous pollutants

1. Bioremediation of hazardous pollutants
 - 1.1. Bioremediation of ecosystems contaminated with heavy metals
 - 1.2. Bioremediation of ecosystems contaminated with organic pollutants
2. Future prospects
3. Conclusions
4. References