


ENVIRONMENTAL REMEDIATION OF CONTAMINATED SITES

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PRE-REQUISITES : Entry level chemistry course, and understanding of chemical, physical and biological processes on Environmental Engineering
INTENDED AUDIENCE : Environmental engineering professionals and students pursuing a degree with emphasis in Environmental engineering.
INDUSTRIES APPLICABLE TO : CPCB, SPCB, Degremont, ERM, Ramky Enviro Engineers, Veolia Water, SFC Environmental Technologies Pvt. Ltd., Nalco Water, VA Tech Wabag, Thermax

COURSE OUTLINE :
The course details the usual remediation techniques practiced worldwide and provide an understanding of the relevant theoretical concepts. The current course will enable a student to:

- Develop understanding of integrated approaches to remediating contaminated sites.
- Develop the ability to screen, choose and design appropriate technologies for remediation.

ABOUT INSTRUCTOR :
Prof. Bhanu Prakash Vellanki, is an Assistant Professor at IIT Roorkee. He holds a PhD in Civil Engineering with a specialization in Environmental Engineering from Texas A&M University. During the course of his doctoral work, Dr. Vellanki developed a new class of treatment processes, called the Advanced Reduction Processes. His research interests include Advanced Redox Processes, industrial/hazardous waste treatment, and emerging contaminants.

Prof. Thomas Boving is a Professor in the Department of Geosciences and the Department of Civil and Environmental Engineering at the University of Rhode Island, Kington, USA. He received his Ph.D. degree in Hydrogeology from the University of Arizona, Tucson, in 1999. His expertise is the fate and transport of contaminants in the subsurface, innovative remediation technologies for emerging contaminants, and sustainable water treatment technologies. His academic work has been cited over 5000 times and he has been recognized for his national and international contributions, including receiving three Fulbright scholarships for work in India, Nepal and Indonesia.

COURSE PLAN :

Week 1: Introduction
Week 2: Laws, Regulations and Remediation

A.Legal Concepts
1.Types of Law
2.Regulations

a)Federal

B.Laws/Regulations
a)History
b)Objectives
c)Remediation Process
d)Definition of hazardous waste
e)Waste Classification
f)Corrective Action

Week 3: Risk Assessment
A.Introduction
1.Terminology
2.History
B .Steps in Human Health Risk Assessment
1.Data Collection and Evaluation
2.Exposure Assessment
3.Toxicity Assessment
4.Risk Characterization
5.Risk Management
6.Risk Communication
C.Ecological Risk Assessment
D.Risk-based Corrective Action

Week 4: Remedial Options:Introduction
Week 5: Administrative Options
Week 6: Groundwater

1.Plume Containment
a)introduction
b)extraction wells
c)extraction trenches
d)injection wells/trenches
e)wells/barriers
2.Pump and Treat
a)Introduction
b)Contaminant behavior
c)Design considerations
3.Source Control
a)Philosophy
b)Options
4.Permeable Reactive Barriers
a)Introduction
b)Redox reactions
c)Kinetics
d)Design considerations
5.Monitored Natural Attenuation
a)Introduction
b)Evaluation
c)Monitoring
d)Mechanisms
e)Plume Types
f)Lines of Evidence
g)Case Study

Week 7: Soils/Sediments
1.Excavation
a)Use
b)Techniques
c)Control of contaminant transport
d)Typical costs
2.Landfill
a)Hazardous waste landfill
b)Solid waste landfill
3.Containment
a)characteristics of barrier materials
b)alternatives

Week 8: Solidification/Stabilization
a)Introduction
b)Fundamentals
(1)Chemical
(2)physical
c)Leaching
(1)single-component
(2)multi-component
d)Design Considerations
(1)TCLP-based approach
(2)Risk-based approach

Week 9: Chemical Treatment

Week 10: Bioremediation
a)Introduction
b)Fundamentals
c)Important processes
d)Examples

Week 11: Phytoremediation
a)Mechanisms
b)Examples

Week 12: Thermal Processes
a)Introduction
b)Incineration
c)Thermal Desorption
d)Aqueous Oxidation

Soil Washing
a)Introduction
b)Process Description
c)Design Considerations