

<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
<b>ENS-854</b>	<b>Principles and Applications of Bioremediation</b>	<b>3 (3+0)</b>

### **Course Description**

The course will emphasize how bioremediation works and the students will also learn the role of microbes and different enzymes in bioremediation. This course will also help to design different bioremediation strategies.

### **Course Outline**

Introduction to biodegradation and bioremediation.

Types and nature of recalcitrants, xenobiotics. Types and mechanisms of biodegradation and bioremediation.

Bioremediation of organic pollutants (hydrocarbons, PCBs, PAHs, halogenated compounds, plastics, dyes, herbicides and pesticides). Bioremediation of heavy metals.

Various methods and technologies used for remediation. Role of enzymes in bioremediation. Factors effecting bioremediation. Aerobic and anaerobic degradation pathways of contaminants.

Microbial ecology and metabolism. Microbial community dynamics during bioremediation.

Molecular strategies used to explore the role of microbes in bioremediation.

### **Recommended Books**

1. Singh and Ajay. (2004). Biodegradation and Bioremediation- Vol 2. Springer-Verlang Berlin and Heidelberg GmbH & Co. Kg, Germany.
2. Ronald M. Atlas and Jim Philp (2005). Bioremediation: Applied Microbial Solutions for Real-World Environment Cleanup.
3. Jordening H.-J., Winter, J. (2005). Environmental Biotechnology. Concepts and Applications. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim.

4. Wackett, L. P., Hershberger, C. D. (2001). Biodegradation and Biocatalysis. ASM Press, American Society for Microbiology, N. W. Washington, DC.
5. Mitchell, T., Dong, G. J. (2010). Environmental Microbiology (2<sup>nd</sup> ed). John Wiley & Sons, Inc., Hoboken, New Jersey.