



APPLIED ENVIRONMENTAL MICROBIOLOGY

PROF. GARGI SINGH

Department of Civil Engineering
IIT Roorkee

TYPE OF COURSE : Rerun | Elective | PG

COURSE DURATION : 12 weeks (24 Jan' 22 - 15 Apr' 22)

EXAM DATE : 23 Apr 2022

INTENDED AUDIENCE : Students of Civil Engineering, Chemical Engineering, and related sciences

INDUSTRIES APPLICABLE TO : Water and waste water treatment companies such as VA Tech Wabad GMBH, Thermax India, GE Water, Siemens Water, SFC Environmental Technologies Pvt. Ltd., Voltas Ltd.; Biotechnological companies such as: Bharat Biotech International, Biocon, Biotech Consortium India Ltd; Bioremediation companies such as ONGC Teri Biotech Ltd, Chempure Technologies; CPCB, Department of Irrigation and Public Health

COURSE OUTLINE :

This course prepares the student to address pressing environmental challenges by developing a fundamental understanding of the microbial communities and processes in natural and built environments. It lays and builds upon the foundation of basic microbiology, microbial energetics and diversity to applying tools provided by microbiology ranging from traditional to state of art for addressing relevant environmental concerns. It provides an indepth exploration of the diverse role microbes and microbial communities and includes topics such as: cell structure and elements, microbial energetics and diversity, ecology and population dynamics, environmental microbial processes including biogeochemical cycling, and microbes involved in biodeterioration and bioremediation.

ABOUT INSTRUCTOR :

Prof. Gargi Singh is currently working at the interface of microbiology and environmental engineering at IIT Roorkee to address environmental challenges of pathogen ingress in water distribution network and environmental proliferation of antibiotic resistance. In her doctoral research, she applied molecular biology tools including quantitative polymerase chain reaction, isolation, selection, high-throughput sequencing on pyrosequencing and Illumina based platforms, and metagenomics to investigate biodegradation of petroleum and nanocellulose, and sequestration of heavy metals. She is also faculty member of Centre of Nanotechnology at IIT Roorkee, where she is currently teaching environmental statistics and environmental implications of nanotechnology.

COURSE PLAN :

Week 1: Introduction

Week 2: Microbial energetics and diversity Stoichiometry and bioenergetics Oxidation-reduction NAD

Week 3: Microbial metabolism and functional diversity of bacteria Prokaryotic diversity
Classical taxonomy Origin of life Tree of life

Week 4: Microbial ecosystems Population

Week 5: Environmental genomics and microbial ecology

Week 6: Microbial symbiosis and virus

Week 7: Investigations in environmental microbiology

Week 8: Bioremediation and wastewater microbiology

Week 9: Drinking water microbiology, Drinking water microbiome and treatment, Microbial instability
Water borne microbial diseases

Week 10: Solid waste microbiology and antimicrobial resistance, Landfills, Leachate, Anaerobic
degradation phases, Antimicrobial resistance

Week 11: Epidemiology and biosensors ,Public health, Epidemics, Biosensors ,Wearable biosensors

Week 12: Built microbiology, exposomes and bioinformatics, Exposure routes