



# PHYSICO-CHEMICAL PROCESSES FOR WASTEWATER TREATMENT

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**INTENDED AUDIENCE :** Undergraduate, postgraduate and Ph.D. students of Environmental Engineering, Chemical Engineering and Civil Engineering.

### COURSE OUTLINE :

This course is essential for Engineers, considering the expectation of the Industries for wastewater pollution control in their premises to comply with newer and more stringent laws and acts that are being enforced in India and globally. This course introduces the principles and physicochemical methods to control wastewater pollution. The course will be presented in a logical manner with several numerical problems and case studies so that the students may adequately understand the subject and apply the knowledge after their graduation in industry and higher studies. The topics to be covered include (but not limited to): Physical treatment, pre-treatment, solids removal by setting and sedimentation, aeration, filtration, centrifugation, coagulation and flocculation; Adsorption and ion-exchange; Membrane processes; Advanced Oxidation Processes.

### ABOUT INSTRUCTOR :

Prof. Vimal Chandra Srivastava (emails: vimal.srivastava@ch.iitr.ac.in, vimalcsr@yahoo.co.in) is currently serving as a Professor in the Department of Chemical Engineering, Indian Institute of Technology (IIT), Roorkee, India. His major research interests are in Chemical & Environmental Engg., Wastewater Treatment, Desulfurization, Solid waste management, and Valorization of spent-adsorbents/catalysts/residues. He has authored >10 book chapters, >210 papers (>202 in ISI) in peer-reviewed journals, and more than 115 papers in conferences/seminars. He has received more than 11,050 citations (as per Scopus as of June 2021) with an h-index of 50. He has guided 16 Ph.D. thesis, 11 more are in progress. In addition, he has guided 50 M.Tech. Dissertations. Dr. Vimal has several sponsored and consultancy projects (>10) to his credit with a total overlay of more than Rupees Sixty million (6 crores). He has also organized 11 short-term courses sponsored by Central Pollution Control Board (CPCB), India and All India Council for Technical Education (AICTE). He was awarded the prestigious International award "Prosper.Net-Scopus Young Researcher Award 2010 – First Runner-up Prize" held at Tongji University, Shanghai, China, on 5 July 2010. This award is sponsored by SCOPUS, United Nations University, and the International Bureau of BMBF, Germany. Dr. V.C. Srivastava has been awarded numerous Top National Awards like "NASI-Scopus Award 2018" by the National Academy of Science, India (NASI) & Scopus, "INAE Young Engineers Award 2012" by Indian National Academy of Engineering (INAE); "INSA Young Scientist Medal 2012" by Indian National Science Academy (INSA) in the "Engineering Science Category"; "IE Young Engineer Award 2013" by Institution of Engineers, India in the "Environmental Engineering" division; "Amar Dye-Chem Award 2013", "Hindustan Lever Benial Award for Outstanding Chemical Engineer of the Year 2020" "Sisir Kumar Mitra Memorial Award 2018" & "CSIR-NEERI Chemcon Distinguished Speaker (CDS) Award 2019" by Indian Institute of Chemical Engineers (IChE). Dr. Srivastava also received the "IIT Roorkee Outstanding Young Faculty Award 2017" (with Institute Research Fellowship). Dr. Srivastava is a Young Associate of INAE; Member of American Chemical Society (ACS); Fellow of Institution of Engineers, India; Life Member of National Academy of Science, India (NASI), IChE, Indian Science Congress Association (ISCA) and Indian Society for Electro-Analytical Chemistry (ISEAC); and The Biotech Research Society, India (BRSI).

### COURSE PLAN :

**Week 1:** Introduction to Water Pollution and Control

**Week 2:** Pre-treatment & Physical treatment: Flow equalization & Aeration

**Week 3:** Pre-treatment & Physical treatment: Coagulation and Flocculation

**Week 4:** Setting and Sedimentation & Settling Chamber Design

**Week 5:** Filtration & Filtration System Design

**Week 6:** Wastewater treatment by Adsorption & Ion Exchange

**Week 7:** Wastewater treatment by Membrane Based Technologies

**Week 8:** Advanced Oxidation Processes: Introduction

**Week 9:** Advanced Oxidation Processes: Fenton and catalytic treatment

**Week 10:** Advanced Oxidation Processes: Photo-induced processes

**Week 11:** Advanced Oxidation Processes: Sono- and Electro-chemical Treatment

**Week 12:** Case studies on wastewater treatment in various process, chemical and allied industries