7th Semester	REV7D003	Advanced Water and Wastewater Treatment	L-T-P 3-0-0	3 Credits

Module-I: (14 hours)

Capabilities and limitations of conventional water and waste water treatment methods Need for advanced treatment of water and waste water, Advanced water treatment- Iron and manganese removal, colour and odour removal, activated carbon treatment, carbonate balance for corrosion control, ion exchange, electro-dialysis, reverse osmosis and modern methods and flouride Management.

Module-II: (8 hours)

Nitrogen and phosphorus removal methods including biological methods, Methods for the removal of heavy metals, oil and refractory organics, Micro-screening, ultra-filtration, centrifugation and other advanced physical methods- aerobic/anaerobic digestion, anaerobic filtration, novel methods of aeration etc.,

Module-III: (14 hours)

Combined physico-chemical and biological processes, Pure oxygen systems, Filtration for high quality effluents, Multistage treatment systems, Land treatment and other resources recovery systems. Decentralised wastewater treatment systems; Reliability and cost effectiveness of wastewater systems. Natural treatment systems- floating aquatic plant treatment systems, constructed wetlands. Industrial Wastewater management and reuse, removal of industry specific pollutants.

Books:

[1] Metcalf & Eddy., Wastewater Engineering- Treatment and Reuse (Revised by G. Tchobanoglous, F. L. Burton and H. D. Stensel), Tata McGraw Hill.

[2] PeavyH. S.,Rowe D. R.,andTchobanoglous G., Environmental Engineering, McGraw-HillInternational Edition.

[3] Arceivala S.J. and Asolekar S.R., Wastewater Treatment for Pollution Control and Reuse, TataMcGraw Hill.

[4] Nemerow, N. L., Zero Pollution for Industry: Waste Minimization through Industrial Complexes, John Wiley & Sons.

[5] Cites R W., Middlebrooks E J., Reed S C., Natural wastewater Treatment Systems, CRC Taylorand Francis.

[6] S. Vigneswaran and C. Visvanathan, "Water Treatment Processes: Simple Options", CRC Press.

[7] Eckenfelder, W. W., Industrial Water Pollution Control, McGraw-Hill.

[8] Patwardhan A.D., Industrial Wastewater Treatment, PHI Learning