JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OFCIVIL ENGINEERING

III Year – I Semester		L	T	P	C
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ENVIRONMENTAL ENGINEERING - II					

Course Learning Objectives:

The objective of this courses:

- Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
- Provide knowledge of characterization of wastewater generated in a community
- Impart understanding of treatment of sewage and the need for its treatment.
- Summarize the appurtenance in sewerage systems and the irnecessity
- Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
- Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

- Plan and design the sewerage systems by estimating the flow
- Design of Plumbing for an apartment, Gated community or Hotels or Individual houses and Select the appropriate appurtenances in the sewerage systems
- Estimation of BOD and COD and Suggest a suitable disposal method with respect to effluent standards, and Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river
- Analyze sewage and design suitable treatment system for sewage treatment for a village/City.
- Design of sewage treatment systems like Septic tank soak pit system and FAB reactor for buildings and understanding tertiary treatment of sewage.

UNIT – I: **Introduction to Sanitation** – Systems of sanitation – relative merits & demerits – collection and conveyance of wastewater – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers.

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UNIT – II: **Sewer appurtenances** – cleaning and ventilation of sewers. **Pumping of wastewater**: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.
House Plumbing: Systems of plumbing-sanitary fittings and other accessories– one pipe and two pipe systems – Design of drainage in Gate communities, Apartments and Hotels.

UNIT – III: **Sewage characteristics** – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD – BOD equations. ThOD and Nirogen Oxygen Demand. **Ultimate Disposal of sewage**: Methods of disposal – disposal into water bodies-Oxygen Sag Curve- Disposal into sea, disposal on land, Crown corrosion, Sewage sickness. Effluent standards.

UNIT – IV: Treatment of Sewage: Primary treatment- Screens- Grit chambers- Grease traps– floatation– Sedimentation – Design of preliminary and primary treatment units. **Secondary treatment**: Aerobic and anaerobic treatment process-comparison. **Suspended growth process**: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons. **Attached Growth Process:** Trickling Filters – mechanism of impurities removal – classification – design, operation and maintenance problems. RBCs, Fluidized bed reactors.

UNIT V: Miscellaneous Treatment Methods: Nitrification and Denitrification-Removal of Phosphates – UASB–Membrane reactors- Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design– Reuse and disposal of septic tank effluent, FAB Reactors. **Bio-solids (Sludge) management**: Characteristics-SVI, handling and treatment of sludge-thickening – anaerobic digestion of sludge, Sludge Drying Beds. Centrifuge. Case studies.

Text Books

1. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna.
2. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition.
3. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New Delhi,2012.

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References

1. Environmental Engineering, Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi,1985
2. Wastewater Treatment for Pollution Control and Reuse, Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, New Delhi; 3rdEdition
3. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, Garg, S. K., Khanna Publishers
4. Sewage treatment and disposal, P. N. Modi & Seth.
5. Environmental Engineering, Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier,2003
6. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.