



UNIVERSITI TEKNOLOGI MARA

EVT577: WASTEWATER TECHNOLOGY

Course Name (English)	WASTEWATER TECHNOLOGY APPROVED
Course Code	EVT577
MQF Credit	4
Course Description	This course will interactively engage students cognitively and scientifically in areas of wastewater treatment technology and sludge processing technology. Students will state, write, and explain the fundamental principles behind the various wastewater treatment methods (physical, chemical and biological) and the operation and maintenance of wastewater system. Students will calculate a wide variety of wastewater mathematics encountered in wastewater collection and treatment. The designated lecture session is used to discuss various wastewater treatment technologies and practices. Lecture sessions employ a mixture of lectures and active learning (self and peer discussions). Students will perform evaluation of wastewater, via standard sampling and preservation procedures, as well as standard analytical techniques and wet chemistry during the practical sessions and will verbally and in writing discuss the results and relationships with peers and facilitator. The outcomes shall be assessed through a variety of tools which include the traditional paper examination, tests, written assignment and oral presentation, laboratory reports and classroom engagement.
Transferable Skills	students can able to apply and explain in areas of wastewater treatment technology and sludge processing technology.
Teaching Methodologies	Lectures, Blended Learning, Lab Work, Case Study
CLO	<p>CLO1 Explain the sources of wastewater, the physical, chemical characteristics of wastewater, the objectives of wastewater and sludge treatment, and the concepts and principles of physical, biological and chemical treatment processes.</p> <p>CLO2 Describe operating principles, basic design aspects fo various unit processes, application, advantages, maintenance of each treatment unit and wastewater mathematics problems.</p> <p>CLO3 Report in writing and verbally the appropriate technologies, unit flow for the treatment of wastewater arising from particular industries, depending on the nature of the impurities to be removed.</p> <p>CLO4 Report on scientific techniques in areas of wastewater analysis.</p>
Pre-Requisite Courses	No course recommendations
Topics	<p>1. Introduction 1.1) 1.1 Malaysian legislation - Environmental Quality Act and Regulations 1974 1.2) 1.2 International related standards and guidelines; Effluent guidelines – USEPA, Standard Methods for the Examination of Water and Wastewater, APHA, AWWA</p> <p>2. Wastewater Flows 2.1) 2.1 Wastewater sources; domestic, industrial, municipal wastewater 2.2) 2.2 Infiltration and inflow</p> <p>3. Characteristics of Wastewater 3.1) 3.1 Physical characteristics – solids in wastewater, odour, temperature and colour 3.2) 3.2 Chemical characteristics – pH, dissolved oxygen, oxygen demand (BOD and COD), organic matter, nitrogen and phosphorus 3.3) 3.3 Evaluation of wastewater; sewage strength and analysis of wastewater</p>

4. Wastewater Processing

- 4.1) 4.1 Purpose of conventional wastewater treatment – preliminary, primary, secondary, tertiary treatment; abiotic processes and biotic processes in wastewater treatment plant
- 4.2) 4.2 Primary treatment; equalization tank, screening, grit, primary clarifier
- 4.3) 4.3 Secondary treatment; aerated lagoon, secondary clarifier, disinfection
- 4.4) 4.4 Tertiary and advanced treatment; further removal of nutrients

5. Aerobic Wastewater Treatment Processes

- 5.1) 5.1 Attached growth biological treatment system; trickling filter, rotating biological contactor (RBC), aerobic ponds and lagoons, its principles, design and operational parameter
- 5.2) 5.2 Suspended growth biological treatment system; activated sludge processes, its principles, design and operational parameter

6. Anaerobic Wastewater Treatment Processes

- 6.1) 6.1 Anaerobic digestion process; hydrolysis, acidogenesis, methanogenesis
- 6.2) 6.2 Anaerobic wastewater treatment techniques; conventional anaerobic digestors, upflow anaerobic sludge blanket, anaerobic contact, anaerobic upflow filter, anaerobic rotating biological contactor, modified clarigester

7. Tertiary and Advanced Wastewater Treatment

- 7.1) 7.1 Purpose of advanced wastewater treatment
- 7.2) 7.2 Nitrogen in wastewater: Forms, sources, operation and process for the control of nitrogen; biological nitrification, denitrification, biological nitrification-denitrification; Alternative means of ammonia-nitrogen control; air-stripping and ion exchange.
- 7.3) 7.3 Phosphorus in wastewater: Forms, sources, operations and process for phosphorus removal; chemical and biological methods

8. Sludge Characteristics and Processes

- 8.1) 8.1 Characteristics of waste sludges – sludge volume and sludge index
- 8.2) 8.2 Sludge treatment processes; aerobic and anaerobic digestion of sludge, sludge stabilization, dewatering, and conditioning
- 8.3) 8.3 Sludge disposal; landfilling, composting, incineration

9. Wastewater Maintenance

- 9.1) 9.1 Importance of operation and maintenance
- 9.2) 9.2 Basic principles of operation and maintenance; corrective and preventive maintenance
- 9.3) 9.3 Monitoring of performance for compliance

Assessment Breakdown	%
Continuous Assessment	70.00%
Final Assessment	30.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment	20%	CLO3
	Lab Exercise	Cumulative of 4 labs	30%	CLO4
	Test	Test	20%	CLO1

Reading List	Recommended Text	<ul style="list-style-type: none"> • Hammer M.J. and Hammer M.J. Jr. 2004, <i>Water and Wastewater Technology</i>, 5 Ed., Prentice Hall
	Reference Book Resources	<ul style="list-style-type: none"> • Stoddard A., Haream J.B., Simpson J.T., Pagenk 2002, <i>Municipal Wastewater treatment</i>, 1 Ed., , Wiley [ISBN:] • Metcalf and Eddy Inc. 2002, <i>Wastewater engineering; treatment, disposal a</i>, 6 Ed., , McGraw Hill. [ISBN:] • George Tchobanoglous 2003, <i>Wastewater engineering; treatment and reuse</i>, 4 Ed., , McGraw Hill
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	