SYLLABUS

TLI 555 Permodelan Kualitas Lingkungan
(Environmental Quality Modelling)

Lecturers:
Dr. Eng. Denny Helard
Dr. Eng. Slamet Raharjo
Prof. Vera Surtia Bachtiar, Ph.D

MASTER STUDY PROGRAM OF ENVIRONMENTAL ENGINEERING
FACULTYOF ENGINEERING
UNIVERSITAS ANDALAS
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	SYLLABUS SEMESTER	No.Dok : ....
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	(TLI 555 Environmental Quality Modelling)	Tanggal : June 2020
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SYLLABUS

1. **Lecture Information**

Study Program Name : Environmental Sanitation Infrastructure
Lecture Name : Environmental Quality Modelling
Lecture Code : TLI 555
Category : Required Study Program
Unit : 3 units

Year	: Year 1
Semester	: 2 (two)
Prasyarat	: -
Status (required/elective)	: Required
Lecturers	: Dr. Eng. Denny Helard Dr. Eng. Slamet Raharjo Prof. Vera Surtia Bachtiar, Ph.D

2. **Description of Lecture**

The aim of this module is to provide guidance and tools to prepare for understanding of conceptual and mathematical modelling for simulating environmental problems based on the real conditions in the field of water and atmospheric environment, and solid waste management.

3. **Learning Achievement of Study Program**
   – Mastering the theory of engineering science, design engineering, methods and the latest techniques needed for the analysis and design of environmental management efforts;
   – Mastering the contextual and current interdisciplinary approach related to the design of integrated environmental management systems.
   – Able to solve engineering and technological problems and design systems, processes and components in environmental management efforts including management of drinking water, wastewater, solid waste, settlement drainage, liquid, solid and gas waste control systems, air pollution control and occupational health and safety (OHS) by utilizing other fields of science (if needed) and taking into account economic, health and public safety, cultural, social and environmental factors;

4. **Learning Achievement of Lecture**
   1. Explain the usage of mathematical modelling in the field of water and atmospheric environment, and solid waste management;
   2. Explain the basic of environmental modelling, asumptions, input, output, of various mathematical modelling that widely used in environmental quality management;
   3. Apply environmental modelling in environmental quality management

5. Description of Lesson Plan

Week	Indicator of Learning Achievements of Subjects	Topics	Method of Learning	Course Time	Assignment and Evaluation	Reference
1	Students are able to explain an overview of the process of modeling and identified of different approaches to modeling	Introduction to modelling	Lecturing, Discussion, Group work exercise	3x50 minutes	Summative - Written Exam	Khandan, N.N. (2002) Modelling Tools for Environmental Engineers and Scientists, CRC Press
2	Students are able to summarize the mathematical methods and tools as they apply to environmental modeling	Basic of mathematical modelling in Environmental System	Discussion, Group work exercise	3x50 minutes	Summative - Written Exam	Khandan, N.N. (2002) Modelling Tools for Environmental Engineers and Scientists, CRC Press
3	Students are able to describe fundamental concepts and principles of environmental processes commonly encountered in both engineered and natural systems	Basic Environmental Processes	Discussion, Group work exercise	3x50 minutes	Summative - Written Exam	Khandan, N.N. (2002) Modelling Tools for Environmental Engineers and Scientists, CRC Press
4	Students are able to explain the applications of the fundamentals of transport processes and reactions in developing material balance equations for engineered environmental systems	Engineered Environmental System	Discussion, Group work exercise	3x50 minutes	- Formative - feedback during group work - Summative - group report and presentation	Khandan, N.N. (2002) Modelling Tools for Environmental Engineers and Scientists, CRC Press
5	Students are able to explain the fluid flow and material balance equations for modeling the fate and transport of contaminants in unsaturated and saturated soils, lakes, rivers, and groundwater	Natural Environmental System	Discussion, Group work exercise	3x50 minutes	Formative - feedback during group work Summative - group report and presentation	Khandan, N.N. (2002) Modelling Tools for Environmental Engineers and Scientists, CRC Press

Week	Indicator of Learning Achievements of Subjects	Topics	Method of Learning	Course Time	Assignment and Evaluation	Reference
6	Students are able to explain environmental model creation relating to solid waste management.	Introduction to Modelling in Solid Waste Management	Lecture and discussion	3x50 minutes	Quiz	Wainwright, John, et al. (2013). Environmental Modelling: Finding Simplicity in Complexity. 2nd edition. Wiley-Blackwell
7	Students are able to explain about name, description, algorithm, and function of various models widely used in environmental research.	Application of Environmental Modelling in Research	Assignment and discussion	3x50 minutes	Work individual assesment	International journals
8	Mid-term Examination					
9	Students are able to explain the use of various modelling in solid waste management research	Application of Environmental Modelling in Solid Waste Management Research	Assignment, presentation and discussion	3x50 minutes	Work in groups assesment	International journals
10	Students are able to use some of solid waste management models to solve environmental problem	Application of solid waste management model (in class training)	Practicess and discussion	3x50 minutes	Work individual assesment	Solid waste management model software and manuals
11	Students are able to use some of solid waste management models to solve environmental problem of some given case studies.	Application of solid waste management model (case study)	Assignment, presentation, and discussion	3x50 minutes	Work individual assesment	Solid waste management model software and manuals
12	Students are able to explain about modelling principles, model building and model types,	Principal of Environmental Modelling	Lecture and discussion	3x50 minutes	Work individual and/ in groups	Aral, M.M. (2010) Environmental Modeling and

Week	Indicator of Learning Achievements of Subjects	Topics	Method of Learning	Course Time	Assignment and Evaluation	Reference
	model calibration, validation, verification and sensitivity Analysis, model scale, Error and Uncertainty of model.					Health Risk Analysis (Acts/Risk)
13	Students are able to calculate and analyze air pollution dispersions using air dispersion formulas	Air Dispersion Analysis	Lecture and discussion	3x50 minutes	Work individual and/ in groups	Visscher, A. D. (2014) Air Dispersion MoDeling Foundations and Applications
14	Students are able to solve the problem of air dispersion using air quality models	Air Dispersion Analysis	Individual / Group Presentation	3x50 minutes	Work individual and/ in groups	International journals
14, 15	Students are able to use models in air pollution problems	Air Dispersion Analysis	Model Application using Computer /Laptop	3x50 minutes	Work individual	Software Air Quality Models
16	Final Examination					

6. . References

1. Wainwright, John. and Mulligan, Mark (ed.) Environmental Modelling: Finding Simplicity in Complexity. 2nd edition. Wiley-Blackwell, West Sussex, UK. 2013
2. NirmalaKhandan, N. Modelling Tools for Environmental Engineers and Scientists. CRC Press, Boca Raton, Florida, 2002.
3. Handbook of Recycling, 1st Edition, State-of-the-art for Practitioners, Analysts, and Scientists, Ernst Worrell and Markus Reuter, Elsevier.
4. Tchobanoglous, et. al. "Intergated Solid Waste Management", McGraw-Hill.
5. IWM manual
6. IPCC manual
7. HI System manual
8. Other related scientific articles

7. Annex

Scoring Instrument: Mid-term examination : 35%; Final Examination: 35%; Assignment: 30%