Course Syllabus (Academic Year 2022)

School of Interdisciplinary Studies, Kanchanaburi Campus, Mahidol University

1. **Course No. and Title**: KAED 445 Mathematical modelling for disaster and environmental management

   Credit (study hours): 3(3-0-6)
2. **Program Name**: Bachelor of Engineering in Environmental Engineering and Disaster Management
3. **Course Module**: Major Required Course (Environmental Engineering).

   Pre/co-requisite: KAED224 Computer Programming and KAED 228 Survey for environmental engineering and disaster management
4. **Class Semester**: ☑ 1st Semester ☐ 2nd Semester Academic Year 2022
5. **Class Schedule & Venue**: Monday 13.00 - 16.00 น. Computer Room 3rd Floor, Lecture Building, MUKA
6. **Class Coordinator**: Asst. Prof. Dr. Arika Bridhikitti Contact No.: 084-660-2919... Email: arika.bri@mahidol.ac.th
7. **Course Description**

Simulation; modelling; type of modelling; mathematical modelling for disaster forecasting and warning; hydrological modelling for surface water and ground water; fate and transport modellings for pollutants in air, water, and soil; water quality modelling; and land use change modelling

8. **Course Objectives / Course Learning Outcomes (CLOs)**

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific	Generic	Knowledge	
8.1	Be able to explain the principle of the mathematical models for environmental simulation and forecast	-Model tool usage -Spatial analysis -Applying modern IT	-Basic Computer skills - Planning and Organizing	-GIS -Mapping -Computer simulation	3 (Practical)

8.2	Be able to apply mathematical models for simulating or forecasting disaster or environmental problems	-Innovation -Attention to Detail	-Ability to motivate others -Independent Thinking -Adaptability -Creative thinking		6 (Reinforced)

Program learning outcomes

Program learning outcomes

.PLO3 Apply geo-informatics system and information technologies in planning to handle environmental and disaster problems in accordance with academic principles

PLO6 Develop a creative technology in environmental engineering and disaster management

9. Class Instructor List

9.1 Name: Asst. Prof. Dr..Arika Brihdhikitti (AB), Environmental Engineering and Disaster Management Program, Mahidol University Kanchanaburi Campus, Contact No.:084-6602919 Email: arika.bri@mahidol.ac.th

9.2 Name: Asst. Prof. Dr. Yuttana Punkamonslip (YP), Environmental Engineering and Disaster Management Program, Mahidol University Kanchanaburi Campus, E-mail: yutthana.pun@mahidol.ac.th

9.3 Name: Dr. Pensiri Prachakittikul (PP), Environmental Engineering and Disaster Management Program, Mahidol University Kanchanaburi Campus, E-mail: pensiri.pra@mahidol.ac.th

9.4 Name: Mr. Narongsak Kaewdum (NR), Geoscience program, Mahidol University Kanchanaburi Campus, Email: narongsak.kae@mahidol.ac.th

9.5 Name: Dr. Maneerat Rumsamrong (MR), Business Administration Program, Mahidol University Kanchanaburi Campus, Email: maneerat.rum@mahidol.ac.th

9.6 Name: Asst. Prof. Dr. Thongchai Kanabkaew (TK), Faculty of Public Health, Thammasat University

10. Course Outline

Week	Date	Contents	CLOs	Teaching & Learning	Instructor's Names
1	8 Aug 2022	• Course structure, grading system, class requirement and goal • **Intro to mathematical modeling**	8.1	Lecture	AB
2	15 Aug 2022	Hydrological modeling: Introduction and concept	8.1	Lecture-based Demonstrating	YP
3	22 Aug 2022	Hydrological modeling: WEAP	8.2	Learning by Doing Mini-project-based	YP
4	29 Aug 2022	Hydrological modeling: HEC-RAS	8.2	Learning by Doing Mini-project-based	YP
5	5 Sep 2022	Hydrological modeling: EPANET	8.2	Learning by Doing Mini-project-based	YP
6	12 Sep 2022	Water quality modeling: Introduction and Concept	8.1	Lecture-based Demonstrating	PP
7	19 Sep 2022	Water quality modeling: Streeter-Phelps, Nitrogen Model	8.2	Learning by Doing Mini-project-based	PP
8	26 Sep 2022	Soil loss modeling: Concept and Practice	8.1, 8.2	Lecture-based Demonstrating Learning by Doing Mini-project-based	AB
	3-7 October 2022 Midterm exam				
9	Sat 8th - Sun 9th October 2022 9.00 AM-4.00 PM (6 hr/day)	Air Dispersion Modeling: AERMOD	8.1, 8.2	Lecture-based Demonstrating Learning by Doing	TK
10					TK
11	31 Oct 2022	Ground water modeling: Introduction and Concept	8.1	Lecture-based Demonstrating	NK
12	7 Nov 2022	Ground water modeling: Practice	8.2	Learning by Doing Mini-project-based	NK
13	14 Nov 2022	Land use modeling: Introduction and Concept	8.1	Lecture-based Demonstrating	AB

Week	Date	Contents	CLOs	Teaching & Learning	Instructor's Names
14	21 Nov 2022	Land use modeling: CLUE	8.2	Learning by Doing Mini-project-based	AB
15	28 Nov 2022	Artificial neural networks model with rainfall data in crisis situations	8.1, 8.2	Lecture-based Case study-based	MR
16	6th to 16th December 2022 Final Examination				

11. Course Assessment

No.	Methods / Activities	Regulations	CLOs	Week	Weight Distribution (%)
11.1	Mid-term exam		8.1	8	20
11.2	Final exam		8.1	16	20
11.3	Mini Projects	**Activities:** problem-solving or environmental simulation using math modeling **Assessment:** Grading assignment report by class lecturers	8.2	3,4,5,7,8, 12, 14	40
11.4	Class participation	**Activities:** Collaborate in class activities, Active participation **Assessment:** Observed by class coordinators		1-15	10
11.5	Group Discussion: Mini Project showcase	**Activities:** Exchange knowledge and ideas for solving the problems **Assessment:** Observed by class coordinators	8.2	15	10
				Total	**100**

12. Grading System

／Criterion-referenced evaluation

Grade	Score	Grade	Score	Grade	Score	Grade	Score
A	≥ 80 %	B	70 – 74.99%	C	60 – 64.99%	D	50 – 54.99%
B+	75 – 79.99%	C+	65 – 69.99%	D+	55 – 59.99%	F	< 50 %

☐ Norm-referenced evaluation

*If use both criterion and norm-referenced evaluation, please tick two boxes.

13. References

13.1. Benavidez, R., Jackson, B., Maxwell, D., & Norton, K. (2018). A review of the (Revised) Universal Soil Loss Equation ((R) USLE): with a view to increasing its global applicability and improving soil loss estimates. *Hydrology and Earth System Sciences*, *22*(11), 6059-6086.

13.2. Verburg, P. (2010). The CLUE model. *Hands-on Exercises. Course Material. Institute for Environmental Studies, University of Amsterdam*, 53.