Course Syllabus (Academic Year 2022)

School of Interdisciplinary Studies, Kanchanaburi Campus, Mahidol University

1. **No. and Title** : KAED 212 Meteorology and Climate Change
   Credit (study hours) : 3(3-0-6).....
2. **Program Name** : Bachelor of Engineering in Environmental Engineering and Disaster Management Program
3. **Course Module** : No.
   Pre/co-requisite : No.
4. **Class Semester** :/ 1st Semester ☐ 2nd Semester Academic Year 2022
5. **Class Schedule & Venue**: Friday 09:00 – 12:00, R2216
6. **Class Coordinator** : Asst. Prof. Dr. Arika Bridhikitti
   Contact No : 084-6602919.....
   Email :...arika.bri@mahidol.edu.....
7. **Course Description**

   Physics to explain the phenomena in the atmosphere, including solar radiation, air pressure, air mass circulation, the water system in the environment, atmospheric stability; the climate system; weather monitoring and forecasting; climate change and its effects; mitigation approaches; meteorology for air pollution simulation

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

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific	Generic	Knowledge	
8.1	Accurately explain atmospheric phenomenon based in scientific theories and evidence	- Mathematical problem Solving	- Systematic Thinking	- Sciences and Mathematics - Physics of atmosphere - Meteorology - Climatology - Fluid mechanics, hydraulics, and hydrology	1 (Introductory)

8.2	Express ideas and use appropriated media for communication in the consideration of future consequences	- Engineering Terminology	- Coordinating - Communication -	- Language - Microsoft Offices Program tool	4 (Practical)
8.3	Logically discuss and criticize experimental results	- Innovation	- Ability to motivate others - Attention to detail - Creative thinking - Critical thinking		6 (Introductory)

Program learning outcomes

PLO1 Apply environmental engineering principles and knowledge to systematic solutions according to Professional Standards

PLO4 Effectively present and discuss engineering knowledge to related professional people for objective fulfillment by using proper language and media

PLO6 Develop a creative technology in environmental engineering and disaster management

9. Class Instructor List

9.1 Name : Dr. .Arika Bridhikitti.... Contact No. : 084-6602919 Email:.....arika.bri@mahidol.edu.....

10. Course Outline

Week	Date	Contents	CLOs	Teaching & Learning	Instructor's Names
1	19 Aug 2022	Course structure, grading system, class requirement and goal	8.1	Lecture	AB
2	26 Aug 2022	Relationship between air volume and temperature Air density (wet/dry)	8.1, 8.5	- Lecture - Demonstration - Think-Share - Assignment	AB
3	2 Sep 2022	Electromagnetic wave, Solar	8.1, 8.5	- Lecture	AB

Week	Date	Contents	CLOs	Teaching & Learning	Instructor's Names
		radiation and surface reflection		- In-class Activities - Assignment	
4	9 Sep 2022	Longwave radiation	8.1, 8.5	- Lecture - In-class Activities - Assignment	AB
5	16 Sep 2022	Atmospheric Pressure Region air mass circulation	8.1, 8.5	- Lecture - In-class Activities - Assignment	AB
6	23 Sep 2022	Water in the atmosphere: Humidity ● Cloud and Fog ● Fronts ● Precipitation (rain, snow, dew, and hail) ● Thunderstorms/ tropical cyclone	8.1, 8,5	- Lecture - In-class Activities - Assignment	AB
7	30 Sep 2022				
8	3 - 7 October 2022 Midterm Examination				
9	14 Oct 2022	Atmospheric Layers: - Chemical constitutions - Temperature profiles - Electromagnetic absorption	8.1, 8.5	- Lecture - BYOE - VDO discussion - Assignment	AB
10	21 Oct 2022	General Circulation	8.1, 8.5	- Lecture - VDO - Assignment	AB
11	28 Oct 2022	Ocean circulation Light refraction/reflection and Rainbow ● Light scattering ● Visibility ● Mirage	8.1, 8.5	- Lecture - Demonstration - Assignment	AB
12	4 Nov 2022	Weather Monitoring and forecasting	8.3, 8.4	- Lecture - Weather map reading - Assignment	AB
13	11 Nov 2021	Climate Change	8.1	- Lecture - VDO - Assignment	AB
14	18 Nov 2022	Group Work	8.3, 8.4	- Learning by experimenting/doing/observing	AB

Week	Date	Contents	CLOs	Teaching & Learning	Instructor's Names
15	25 Nov 2022	Group Work	8.3, 8.4	- Learning by experimenting/doing/observing	AB
16	2 Dec 2022	Term Presentation	8.3, 8.4, 8.5,	- Exhibition - Share Knowledge - Q & A	AB, student
17	6 - 16 December 2022 Final Examination				

11. Course Assessment

No.	Methods / Activities	CLOs	Week	Weight Distribution (%)
11.1	Class participation - Rubric	8.2, 8.3	1-16	15
11.2	Final exam	8.1	17	25
11.3	Term Assignment*	8.1, 8.2, 8.3	16	25
11.4	Individual Assignment	8.1	2-16	35
			Total	100

*** Group project**

1. Group and name the group according to the student **ID suffix** (0 to 9)

2. Research, design an experiment, experiment, draw conclusions, and criticize results in accordance with the scientific research methodology under the following topics:

3. **Repeat** the experiment until being confident in the result

4. **Exhibit** the project in class in December 2nd, 2022

Student ID code ending 0, 1

การประเมินความเร็วลมจากรูปแบบการเคลื่อนไหวของต้นไม้ท้องถิ่นประเทศไทย (อธิบายปรากฏการณ์ที่เกิดขึ้นและวิจารณ์การนำไปใช้เพื่อประเมินความเร็วลมในระดับ 10 เมตรในพื้นที่ที่ไม่มีสถานีตรวจวัด)

Wind speed assessment from local tree movement patterns in Thailand (Describe the phenomenon and critiques its use to estimate wind speeds at 10 meters in areas without monitoring stations)

Student ID code ending 2, 3

ความแตกต่างกันของ surface reflectance ของดิน (ตรวจสอบเนื้อดิน สีดิน และความชื้นด้วย) แต่ละประเภทแตกต่างกัน (อธิบายปรากฏการณ์ที่เกิดขึ้นด้วย และวิจารณ์ความเป็นไปได้ในการนำ surface reflectance ไปใช้ตรวจสอบดินในภาคการเกษตร)

Differences in surface reflectance for different soil types (check soil texture, color, and moisture). Describe the phenomenon that happened and criticize the possibility of applying surface reflectance to inspect agricultural soil.

Student ID code ending 4, 5

surface reflectance for different type of roof. Explain the phenomenon and criticize its use reduce indoor temperature.

Student ID code ending 6, 7

การเปลี่ยนแปลง soil-air heat flux ในรอบวันในพื้นที่ที่มีพืชพรรณต่างกัน (อธิบายปรากฏการณ์ที่เกิดขึ้น วิจารณ์ความเชื่อมโยงกับการเปลี่ยนแปลงสภาพภูมิอากาศระดับท้องถิ่น และวิจารณ์ประสิทธิผลของพื้นที่สีเขียวในการบรรเทาปัญหาโลกร้อน)

Changes in soil heat flux in different vegetation covers. Describe the phenomenon, critique its connection to local climate change, and criticize the effectiveness of green spaces in mitigating global warming.

Student ID code ending 8, 9

การพัฒนา Power Law เพื่อคาดการณ์ความเร็วลม ณ ความสูง 10 เมตร จากการตรวจวัดที่ระดับ 2-5 เมตร ในพื้นที่ที่มีสิ่งปกคลุมดินแตกต่างกัน

Developing a Power Law to forecast wind speeds at a height of 10 meters from measurements at 2-5 meters in areas with different ground cover.

Rubric for assessing term assignment

Accurately explain scientific theories (CLO1)	Be able to relate the theories with the findings (CLO1)	Be able to discuss the uncertainty of the experiment results (CLO3)	Express ideas and use appropriated media for non-engineer (CLO2)	Be able to encourage the audience to ask or learn more in detail (CLO2)
5	5	5	5	5

12. Grading System

／Criterion-referenced evaluation

Grade	Score
O	≥ 80 %
S	≥ 50 %
U	< 50 %

13. References

13.1 . C. Donald Ahrens, Essentials of Meteorology: An Invitation to Atmosphere, 5th Edition, Belmont, CA, Engage Learning, 2008

13.2 .บัญชา ธนบุญสมบัติ 2558 คู่มือเมฆ และปรากฏการณ์บนท้องฟ้า, สำนักพิมพ์สารคดี.

13.3 ..อุตุนิยมวิทยาทั่วไป, พิมพ์ครั้งที่ 2, กรุงเทพ, มหาวิทยาลัยเกษตรศาสตร์, 2544