**COURSE TITLE – SYMBOL**

**INSTRUCTOR**

**Professor:** Assistant Prof. Dr. Yasmen A. Mustafa

**Office:** Environmental Engineering Department

**Phone:**

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**COURSE DESCRIPTION (OR CATALOG DATA)**

**Course title:** Air pollution

**Course Syllabus:**

-Introduction to air pollution

-Air pollution meteorology

-Air pollution dispersion

-Air pollution sampling and measurement

-Air pollution control and equipment

**GOALS/OBJECTIVES**

 The main objectives of the course are:

- To cover the fundamental knowledge about air pollution issues that an environmental engineer should be aware of.

-The students have to gain the ability to identify and classify air pollutants.

- To know the effect of air pollutants on humans, vegetation, animals and property.

-The students have to learn fundamentals of meteorology as well as its effects on air pollution.

- To know the dispersion of air pollutant in atmosphere and its mechanisms.

-To know how to sample and measure the air pollutants.

-To gain ability to control air pollution and how to design the air pollution controllers.

**STUDENT LEARNING OUTCOMES**

1. To know the types and scale of air pollution problems.
2. To know what is the component of air pollution problems.
3. To know what are the sources of air pollution.
4. To comprehend the meaning of criteria and non-criteria pollutants and AAQS.
5. To understanding the behavior and fat of air pollutant and photochemical reactions.
6. To know the meteorological scale, planetary boundary layer, temperature profile through atmosphere.
7. To understand the adiabatic and pseudo adiabatic lapse rate and typical atmospheric lapse rate.
8. To understand the plume behavior and the topographical effects on air pollution dispersion.
9. To construct wind rose and to understand the effects of wind on dispersion of pollutants.
10. To estimate the maximum mixing depth and ventilation coefficient.
11. To understand the mechanisms of the transport of pollutant through the atmosphere.
12. To understand the Gaussian dispersion model and how to apply it and to understand the effect of inversion layer and line source dispersion.
13. To know how to estimate the plume rise.
14. To know how to utilize sampling devices and how to analyze the air pollutants.
15. To know how to design particulate and gas control equipment.

**COURSE SCHEDULE**

|  |  |  |
| --- | --- | --- |
| Hours per week | Title | week |
| 3hours | Introduction | 1 |
| 3hours | Properties of air pollutants | 2 |
| 3hours | Properties of air pollutants | 3 |
| 3hours | Sources of air pollutants | 4 |
| 3hours | Effect of air pollution  | 5 |
| 3hours | Meteorology | 6 |
| 3hours | Meteorology | 7 |
| 3hours | Meteorology | 8 |
| 3hours | Quiz | 9 |
| 3hours | Dispersion of point source pollutants | 10 |
| 3hours | Gaussian model for ground source pollutants | 11 |
| 3hours | Gaussian model for elevated source pollutants | 12 |
| 3hours | Line source dispersion model | 13 |
| 3hours | Effect of inversion layer | 14 |
| 3hours | Mid. Exam. | 15 |
|  | Half-year Break | 16 |
|  | Half-year Break | 17 |
| 3hours | Sampling | 18 |
| 3hours | Analysis equipments | 19 |
| 3hours | Film for sampling and analysis equipment | 20 |
| 3hours | Quiz | 21 |
| 3hours | Control equipments for particulate mater | 22 |
| 3hours | Settling chamber | 23 |
| 3hours | Cyclone | 24 |
| 3hours | Filters | 25 |
| 3hours | Control equipments for gases | 26 |
| 3hours | scrubbers | 27 |
| 3hours | scrubbers | 28 |
| 3hours | incinerators | 29 |
| 3hours | Applications | 30 |
| 3hours | Film about advanced equipments for air control | 31 |
| 3hours | Mid Exam. | 32 |

**COURSE MATERIALS**

1- Environmental Pollution and Control Engineering by C.S Rao

2- Environmental Engineering by G. Kiely.

3- Air Pollution, Meteorology and Dispersion by S.Pal Arya.

4- Air Pollution by H.C. Perkins.

**GRADING UNITS**

|  |  |
| --- | --- |
| Mid Course Exam  | 20% |
| Quizzes and Homework | 10% |
| Final Course Exam | 70% |
| Total | 100% |

**GRADING POLICY**

**1. Homework:**

- There will be a minimum of five sets of homework during the academic year.

- The homework will count 5% of the total course grade.

**2. Quizzes:**

- There will be four closed books and notes quizzes during the academic year

- The quizzes will count 5% of the total course grade.

**3. Exams:**

 - There will be two closed books and notes exam during the academic year

 -The mid-term exams will count 20% of the total course grade.

**4. Final Exam:**

- The final exam will be comprehensive, closed books and notes.

- The final exam will count 70% of the total course grade.

**Table (1): Strategies for Achieving Outcomes and Assessment Methods**

|  |  |
| --- | --- |
| Learning outcome | Strategies for Achieving Outcomes andAssessment Methods |
| 1- To know the types and scale of air pollution problems | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 2- To know what is the component of air pollution problems | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 3- To know what are the sources of air pollution | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 4- To comprehend the meaning of criteria and non-criteria pollutants and AAQS. | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 5- To understanding the behavior and fat of air pollutant and photochemical reactions | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 6- To know the meteorological scale, planetary boundary layer, temperature profile through atmosphere. | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 7- To understand the adiabatic and pseudo adiabatic lapse rate and typical atmospheric lapse rate. | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 8- To understand the plume behavior and the topographical effects on air pollution dispersion. | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 9- To construct wind rose and to understand the effects of wind on dispersion of pollutants. | A problem about a contraction of wind rose will be given to solve it in groups manually and by using WRPLOT program. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 10- To estimate the maximum mixing depth and ventilation coefficient**.** | Problems will be given to be solved in-class by either all students individually or in groups. All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 11- To understand the mechanisms of the transport of pollutant through the atmosphere. | All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 12- To understand the Gaussian dispersion model and how to apply it and to understand the effect of inversion layer and line source dispersion. | Problems will be given to be solved in-class by either all students individually or in groups. All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 13- To know how to estimate the plume rise. | Problems will be given to be solved in-class by either all students individually or in groups. All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |
| 14- To know how to utilize sampling devices and how to analyze the air pollutants | All students actively participating in class discussion and activities. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. Film for sampling and analysis equipment will be shown. The students will be visit the Ambient Air Quality Station in the backyard of the college.  |
| 15- To know how to design particulate and gas control equipment.  | Problems will be given to be solved in-class by either all students individually or in groups. All students actively participating in class discussion and activities. Class assignments will be reviewed and discussed. The opportunity to ask question will be allowed and required assistance will be given. Question will be asked and responses will be used to evaluate the students understanding. |