**GAZİ UNIVERSITY**
**ENGINEERING FACULTY**
**CHEMICAL ENGINEERING DEPARTMENT**
**2018-19 SPRING SEMESTER**

***Course Code and Title*** : CHE482 Chemical Engıneering Laboratory III
***Section*** : ING-1
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***Laboratory Program*** : Monday (13.30-17.20) Unit Operation Lab.
***Laboratory Documents*** : Sources related to the laboratory are available at;
http://mf-km.gazi.edu.tr/posts/view/title/laboratuar-dersleri-30251

***Course Content:***
Laboratory applications of Physical chemistry, fluid mechanics and heat transfer principles. Evaluation of experimental data and results. Written presentation.

***Main Texbook and References***:
Handouts prepared by the instructors, related text books, library and internet facilities.

***Objective and Target of the Course:***
Achievements based on the content of the course
- Refreshment of knowledge of especially mass transfer and process control before graduation.
- Gain experience on subjects mentioned above by performingrelated experiments.
- Determination and planning of experiments by defining operational parameters and doing and experiment and evaluation of experimental results in the light of all learned things as a team.
- Improving of ability to operate experimental devices and laboratory tools safely as a team.
- To be able to switch the devices on and off safely, to present their work as a written report.
- Expression of knowledge and skillon experiment performedby means of poster presentation as a team.
- Teaching and encouraging group work.
- Gaining experience in the simulation of physical basic operations by controlling the calculation results using experimental data with simulation programs in some experiments.
- Analysis of the data obtained in the experiments, investigation of the reproducibility of experiments and error analysis.

Achievements of the course based on program outcomes
- Ability to apply engineering knowledge.
- Ability to design experiments and analyze the results.
- Ability to design an experiment.
- Grouping and working in groups
- Ability to define, formulate and solve engineering problems.
- Professional responsibility and ethical awareness.
- ritten communication with the test reports, the ability to communicate with the term experiment posters.
- Examining the problems of universal and social dimensions through the experiments.
- Awareness of the necessity of lifelong learning.
- Knowledge and experience on contemporary issues.
- Ability to use the techniques, skills and modern tools required for engineering applications.

***Tools Used to Achieve the Objectives***
Quizzes and experimental performances:Five main experiments will be carried out.
Experiment Reports:Original reports prepared for five main experiments.
Interm experiment:It is the report and poster study that the students have done as a result of the experimental study whose subject is going to be determined by the students.
Final Exam:Students areresponsible from the five main experiments.

**Group 01 – (Monday) 13.30-17.20**

| | Group A Experiments | | | | | Group B Experiments | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Date \ Gr** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
| **11.02.2019** | PLENARY MEETING OF INSTRUCTORS | | | | | | | | | |
| **18.02.2019** | PLENARY MEETING WITH STUDENTS | | | | | | | | | |
| **25.02.2019** | 1a | 2a | 3a | 4a | 5 | 1b | 2b | 3b | 4b | - |
| **04.03.2019** | 1a | 2a | 3a | 4a | - | 1b | 2b | 3b | 4b | 5 |
| **11.03.2019** | 2a | 3a | 4a | 5 | 1a | 2b | 3b | 4b | - | 1b |
| **18.03.2019** | 2a | 3a | 4a | - | 1a | 2b | 3b | 4b | 5 | 1b |
| **25.03.2019** | 3a | 4a | 5 | 1a | 2a | 3b | 4b | - | 1b | 2b |
| **01.04.2019** | 3a | 4a | - | 1a | 2a | 3b | 4b | 5 | 1b | 2b |
| **08.04.2019** | 4a | 5 | 1a | 2a | 3a | 4b | - | 1b | 2b | 3b |
| **15.04.2019** | 4a | - | 1a | 2a | 3a | 4b | 5 | 1b | 2b | 3b |
| **22.04.2019** | 5 | 1a | 2a | 3a | 4a | - | 1b | 2b | 3b | 4b |
| **29.04.2019** | - | 1a | 2a | 3a | 4a | 5 | 1b | 2b | 3b | 4b |
| **06.05.2019** | MAKE-UP +SEMESTER EXPERIMENT | | | | | | | | | |
| **13.05.2019** | MAKE-UP +SEMESTER EXPERIMENT | | | | | | | | | |
| **23.05.2019** | SEMESTER EXPERIMENTS' POSTERS PRESENTATION | | | | | | | | | |

**Group 01– (Thursday) 09.30-13.20**

| | Group A Experiments | | | | | Group B Experiments | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Date \ Gr** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
| **11.02.2019** | PLENARY MEETING OF INSTRUCTORS | | | | | | | | | |
| **18.02.2019** | PLENARY MEETING WITH STUDENTS | | | | | | | | | |
| **28.02.2019** | 1a | 2a | 3a | 4a | 5 | 1b | 2b | 3b | 4b | - |
| **07.03.2019** | 1a | 2a | 3a | 4a | - | 1b | 2b | 3b | 4b | 5 |
| **14.03.2019** | 2a | 3a | 4a | 5 | 1a | 2b | 3b | 4b | - | 1b |
| **21.03.2019** | 2a | 3a | 4a | - | 1a | 2b | 3b | 4b | 5 | 1b |
| **28.03.2019** | 3a | 4a | 5 | 1a | 2a | 3b | 4b | - | 1b | 2b |
| **04.04.2019** | 3a | 4a | - | 1a | 2a | 3b | 4b | 5 | 1b | 2b |
| **11.04.2019** | 4a | 5 | 1a | 2a | 3a | 4b | - | 1b | 2b | 3b |
| **18.04.2019** | 4a | - | 1a | 2a | 3a | 4b | 5 | 1b | 2b | 3b |
| **25.04.2019** | 5 | 1a | 2a | 3a | 4a | - | 1b | 2b | 3b | 4b |
| **02.05.2019** | - | 1a | 2a | 3a | 4a | 5 | 1b | 2b | 3b | 4b |
| **09.05.2019** | MAKE-UP +SEMESTER EXPERIMENT | | | | | | | | | |
| **16.05.2019** | MAKE-UP +SEMESTER EXPERIMENT | | | | | | | | | |
| **23.05.2019** | SEMESTER EXPERIMENTS' POSTERS PRESENTATION | | | | | | | | | |

**INSTRUCTORS RESPONSIBLE FOR EXPERIMENTS**

| Experiment No | Experiment Name | 01 / Monday 13.30 – 17.20 | 02 / Thursday 09.30 – 13.20 |
|---|---|---|---|
| 1a | Pressure Control | M. Oruç | M. Balbaşı |
| 1b | Temperature Control | S. Erdoğan | E. Ekinci |
| 2a | Liquid-liquid Extraction | S. F. Mutlu | S. F. Mutlu |
| 2b | Fractional Distillation | U. Gündüz | A. Şahin |
| 3a | Gas Absorption | F. Derekaya | D. Uysal Zıraman |
| 3b | Ion Exchange | K. Mürtezaoğlu | Ö. Yörük |
| 4a | Rotary Dryer | N. Oktar | A. Murathan |
| 4b | Spray Dryer | C. Haktanır | C. Haktanır |
| 5 | Size Reduction and Sieve Analysis | Ö.M.Doğan / M.Y. Doğan | M. Gördesel/A. Çalı |

**Rules:**

Each student is expected to make theoretical and practical preparation for the experiment within the week before the experiment. Each student must meet with the faculty member responsible for the experiment at least three days before the experiment. Otherwise, the performance score will be reduced by 5 points. It is the student's responsibility to conduct the related theoretical research, to go to the laboratory for the experimental system, to examine the method of the experiment, to learn how to obtain the experimental data required.

Five & 1 term experiment to be performed are shown in the Table. Only, "Dimension Reduction and Sieve analysis" is carried out by all groups. All experiments are performed under the supervision of the faculty member after determining the experimental parameters.

At the beginning of each experiment, the students will be evaluated with his / her preparation for the experiment. The students will not be allowed to do the experiment if they are not succesfull during this evaluation (written/oral quiz). Students who fail from three different experiments will automatically take a grade (D). Students who do not carry out the term experiment will also automatically take a grade (D). Students who fail twice in quizzes will perform this experiment in the complementary week.

**Term Experiment:**

Each group of students should plan an experiment or a simulation study using a computer in which the experimental systems in the laboratory may be used.They would carry out this study under the supervision of a faculty member.Students are expected to use the facilities of our laboratory, to make a preliminary research on the subject they are interested in, to plan an experimental study, to decide on what conditions and what kind of data should be collected, to perform experiments and to evaluate the experimental findings.

They should collect all these studies in a report and submit their reports to the faculty member until Friday 15.05.2019 at 15:30. Students should prepare a poster prepared about the term experiment. The posters would be presented to all faculty member & students in the Unit Operations Laboratory until 23.05.2019 on Thursday, 10:30 am.All group members should be ready for this poster session.

The grade of the student who does not participate in any part of the term experiment (experiment, report, poster) will be ZERO.

Report delivery date: One week after the experiment is completed.

Late report delivery: -5 points / day

The contribution of an experiment report to the total grade will be ZERO if it is not written properly.

**Grading:**

| | |
|---|---|
| **Small exam + Performance** | **15 %** |
| **Report** | **35 %** |
| **Term Experiment** | **20 %** |
| **Final exam** | **30 %** |

**REPORT WRITING FORMAT**

| |
|---|
| **Title Page** |
| **Abstract** |
| **Table of Contents** |
| **List of Figures** |
| **List of Tables** |
| **Theory** |
| **Experimental** (System, Method, Data) |
| **Calculations** |
| **Results** (Table and/or Graph) |
| **Discussions** |
| **Conclusions** |
| **Recommendations** |
| **Nomenclature** |
| **References** |
| **Appendix** |
| **Overview** |

**Title Page:** Experiment ID, names, numbers and groups of students, name of the responsible instructor, date of experiment and deadline should be given.

**Abstract:** The purpose of the experiment, characteristics of the devices, experimental conditions and parameters, the important results should be given. The summary should answer the following questions very briefly; What is done? How was it made? What has been found? What results have been achieved?

**Theory:** Theoretical information which directly related to your experiment that helps you in your calculations should be given.

**Experimental:** The system and expreimental method should be explained. The experimental data could be given in tabular form.

**Calculations:** In this section, one sample calculation should be given in detail. Each student in the group would also provide other calculations Appendix.

**Results:** The quantitative findings obtained from the calculations should be given in tabular and/or graphical forms.

**Discussions:** The results are discussed experimentally and theoretically. The changes of the results with experimental parameters are investigated. In case of any deviation from theoretical expectations, there reasons for such results should be explained in detail. The source of deviations are not always experimental errors.

**Conclusions:** The quantitative results should be mentioned and main conclusions should be stated. For example, the effect of an experimental or dimensionless parameter on the performance of the system should be specified clearly. Generally quantitative results are not given in this section, except for required situations.

**Recommendations:** Some suggestments, such as, how to run the experimental system better and more efficiently, what can be done to reduce experimental errors, what other work can be done with the current system, could be recommended.

Nomenclature: The meaning of all symbols and letters used in the report should be specified. Units in the SI system are listed alphabetically.

**References:** References should have the following format:


Book: Holman, J.P., Heat Transfer, 6th ed., McGraw-Hill Co., New York, 1986.

Article: Ergun, S., "Fluid flow through packed columns", Chem. Eng. Progr., 48, No.2, p.89, 1952.

Congress Paper: Sekhtira, A., Lee, Y.Y. and Genetti, W.E., "Heat Transfer in a Circulating Fluidized Bed", Proc. of the 25th National Heat Transfer Conf., Houston, Texas, 24-27 July, 1988.

Parts of a Book: Grace, J.R., "Fluidized Bed Heat Transfer", in Handbook of Multiphase Flow, G.Hestroni, Ed., McGraw-Hill, Hemisphere, Washington, pp. 9-70, 1982.

Thesis: Bucak, O., "Circulating Fludized Bed Combustor", M. Sc. Thesis, Gazi University, Ankara, 1996.


**Appendix**: Physicochemical properties used in calculations, nomograms and other calculations etc.