



ChE 124

Chemical Engineering Thermodynamics Laboratory

Course Description: Experiments on the PVT behavior, phase & chemical reaction equilibria & thermodynamic properties of homogeneous mixtures.

Course Prerequisites: Chem 154, Chem 28, Chem 28.1, Chem 31.1

Course Credit: 2.0 units (6 h laboratory)

Program Educational Objectives (BS Chemical Engineering)

The program aims to educate students such that three to five years from graduation, they:

1. take leadership roles in their respective fields and/or effectively work in or manage a team;
2. are equipped with the extensive knowledge and relevant skills necessary to succeed in their chosen careers and to become responsive citizens;
3. are able to demonstrate strong research & innovative capability as they recognize and address opportunities and challenges in their respective spheres of influence;
4. have shown strong commitment to the ethical practice of their profession; to health, safety and environment; and service to society.

Course Outcomes

At the end of the course, the student should be able to:

1. Design an efficient, safe and cost-effective procedure and perform an experiment based entirely on a given objective and available materials and equipment in the laboratory.
2. Write a technical report that presents the theory behind the experiment, the analysis and interpretation of the results of the experiment, and the justification for any error or deviation of these results from theoretical data.
3. Perform statistical analysis on the results of a particular experiment;
4. Give an oral report on the findings in the experiment to the class.
5. Work in teams and evaluate the performance of the other group members.

Student Outcomes Satisfied by Course Outcomes

- [a] Ability to apply knowledge of mathematics and science to solve engineering problems
- [b] Ability to design and conduct experiments, as well as to analyze and interpret data
- [e] Ability to identify, formulate, and solve engineering problems
- [g] Ability to communicate effectively
- [k] Ability to use the techniques, skills, and modern tools for engineering practice

Course Purpose

ChE 124 provides the practical aspect of the lectures presented in ChE 122, ChE 123, Chem 154 and/or other Chemical Engineering Thermodynamics lecture courses. In this course, the students shall design an experiment based on a preliminary list of materials and procedure. This course prepares the students to simulate real situations by allowing them to make the necessary and appropriate decisions to achieve the objective of every experiment. The course also aims to improve the future chemical engineers' skills in the analysis and interpretation of data and in the presentation of results.

Course Content

Experiments

1. HOS Sulfuric Acid - Heat of Solution
2. RYM Latent Heat of Vaporization & Saturation Temperature (Ramsay-Young Method)
3. VLE Vapor-Liquid Equilibrium
4. SLE Solid-Liquid Equilibrium (Thermal Analysis Method)
5. PMV Partial Molar Volume of an Aqueous Solution
6. FPD Flash Point Determination of an Alcohol (Open Cup Method)
7. LLE Liquid-Liquid Equilibrium (Ternary System)
8. NEW New Experiment (To be designed at the start of the semester)

Schedule

Group	E1	E2	E3	E4	E5	E6	E7	E8	E9
1	HOS	RYM	VLE	SLE	PMV	FPD	LLE	NEW	
2	RYM	VLE	SLE	PMV	FPD	LLE	NEW		HOS
3	VLE	SLE	PMV	FPD	LLE	NEW		HOS	RYM
4	SLE	PMV	FPD	LLE	NEW		HOS	RYM	VLE
5	PMV	FPD	LLE	NEW		HOS	RYM	VLE	SLE
6	FPD	LLE	NEW		HOS	RYM	VLE	SLE	PMV
7	LLE	NEW		HOS	RYM	VLE	SLE	PMV	FPD
8	NEW		HOS	RYM	VLE	SLE	PMV	FPD	LLE
9		HOS	RYM	VLE	SLE	PMV	FPD	LLE	NEW

Course Assessment

Final Grade

Pre-Laboratory Report	5%
Laboratory Performance	10%
Written Formal Report	60%
Procedure for 1 st Experiment	10%
Final Oral Report	15%

Written Formal Report (150 points/experiment)

Absent students w/ valid excuse and proof of contribution will get 80% of group's grade

Title	10
Abstract	15
Introduction	15
Materials & Methods	10
Results & Discussion	
Presentation of Results	20
Explanation of Methods Used	30
Precision of Results (Explained)	15
Accuracy of Results (Explained)	15
Conclusion/Recommendation	10
Reference (minimum of 5)	5
Format	5

Experimental Design (100 points)

Materials, Equipment, Chemicals	10
Background Study	15
MSDS	5
Procedure	60
Waste Generated & Waste Disposal	10

Final Oral Report (250 points)

From the instructor (100 points)

Technical Content	15
Organization	15
Comprehension	15
Presentation	20
Voice and Communication	20
Layout of Visuals	15

From the class (100 points)

Technical Content	15
Organization	15
Comprehension	15
Presentation	20
Voice and Communication	20
Layout of Visuals	15

Written Report with Statistical Analysis (50 points)

Course Policies

1. Grouping

There must be at most 3 people in a group. Groupings will be permanent for the rest of the semester.

2. Attendance

Attendance will be checked. A grade of 5.00 will be given to a student with more than 3 absences (excused or unexcused). Excuses other than personal illness and bereavement are not valid. A formal excuse letter, accompanied by a medical certificate if excuse is due to personal illness, should be submitted within a week after the incurred absence. Failure to comply with this requirement shall result to the nullification of the excuse.

3. Pre-Laboratory Notebook

Pre-labs must be handwritten in a pre-lab notebook. Notebooks should be submitted in the instructor's pigeonhole before 5:00PM on the day before the experiment. Failure to submit will result to a grade of 0 for the Pre-laboratory Report. No pre-laboratory report, no experiment.

Note: During the experiment, you are required to record uncertainties due to measurements.

The following format should be followed in writing a pre-lab report.

Group Name	Group No.
Section	Experiment No.
Instructor	
Title of the Experiment	
Date Performed:	
Time Started:	
Time Ended:	
I. Objectives of the Experiment - <i>objectives and rationale of the experiment (at least 3)</i>	
II. Materials/Equipment/Chemicals - <i>include estimated amounts and diagrams for setups</i>	
III. Procedure - <i>step-by-step procedure in a flow chart form.</i>	
IV. MSDS & Waste Disposal - <i>list down type and amount of wastes that will be generated, their storage, treatment, and disposal methods. MSDS may be printed and pasted in the notebook. Incomplete MSDS will incur demerits.</i>	

V. Data Tables - *empty tables to be filled up with experimental data during the experiment.*

VI. Sample Calculations - *include sample calculations for solution preparation, standardization, instrument reading & data.*

4. Laboratory Kit

Each group must have a lab kit. It must contain 1 roll tissue paper, 1 small test tube brush (for pycnometer), 1 medium test tube brush (for flasks, beakers, etc), liquid detergent, 1 wash bottle for distilled water, 3 glass droppers, 1 rubber aspirator, rags, masking tape, and scissors.

**Label all your materials. Borrowing is prohibited. Buying of materials during class hours will get deductions unless you're buying ice or distilled water.*

5. Personal Protective Equipment

Everyone is required to wear the appropriate Personal Protective Equipment (PPE) while inside the laboratory. Basic PPE includes a laboratory gown, safety goggles, closed shoes (semi-closed flats are not allowed), full-length pants, face mask and rubber gloves. Slippers, sandals, shorts, skirts are not allowed. Wearing of contact lenses is strictly prohibited. When handling hazardous chemicals, face masks and gloves are required.

Students who fail to comply with the said guidelines will not be allowed to perform the experiment, and thus be given a grade of 0 for Lab Performance (this includes instances wherein a student is caught not following the guidelines anytime during the experiment).

6. Written Formal Report

A formal report is to be submitted **5 working days** after the experiment was performed (e.g. performed Oct. 1, due Oct. 8). Submissions **after 5:00PM** on the due date are considered late. Late reports will be given a **grade of 0**, but they should still be submitted to fulfill the requirements of the course. A sample formal report with the proper format will be given. Plagiarism of any kind will merit a grade of 0 for that particular experiment's Written Formal Report.

7. Missed Experiments

A student who misses an experiment with a valid excuse will get 0 for Lab Performance and 80% of the group's grade for the Written Formal Report; provided that his/her group mates vouch for his/her contribution. A student who missed an experiment without a valid excuse will get 0 for the entire experiment. **A student who arrives after 8:00AM is considered late and one who arrives after 9:00AM is considered absent.**

8. Final Oral Report w/ Written Report

Each group will report on the 1st experiment assigned to them at the end of the semester. The report shall focus on the theory, methods, and techniques involved in the experiment. Also included should be the necessary equations used and the appropriate statistical analysis of the data. The presentation should include the numerical data/results of the same experiment conducted by the other groups. A written report on the statistical analysis performed on the results of the entire class.

Grading System

1.00	1.25	1.50	1.75	2.00	2.25	2.5	2.75	3.00	5.00
[92,100]	[88,92)	[84,88)	[80,84)	[76,80)	[72,76)	[68,72)	[64,68)	[60,64)	[0,60)

List of Instructors

Dr. Jose Muñoz

Prof. Karl Ezra Pilario

Engr. Myron Alcanzare

Engr. Bemboy Niño Subosa