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OFFICE OF THE SENATE COUNCIL

APPLICATION FOR NEW COURSE

1. Submitted by College of Engineering Date 1/20/2006

Department/Division offering course Chemical and Materials Engineering

2. Proposed designation and Bulletin description of this course

a. Prefix and Number CME 432 b. Title* Chemical Engineering Laboratory I

*NOTE: If the title is longer than 24 characters (including spaces), write
A sensible title (not exceeding 24 characters) for use on transcripts CME Engr. Lab I

c. Lecture/Discussion hours per week 1 d. Laboratory hours per week 3

e. Studio hours per week _____ f. Credits 2

g. Course description

A laboratory course emphasizing experimental work in fluid flow, separations, heat transfer, and mass transfer. A majority of this course will focus on lab report writing, statistics, experimental design and safety in the laboratory.

h. Prerequisites (if any)

Prereqs: CME 330, CHE 446G, CME 415, Concur: CME 425, CME 420, and engineering standing.

i. May be repeated to a maximum of _____ (if applicable)

4. To be cross-listed as

_____ Prefix and Number _____ Signature, Chairman, cross-listing department

5. Effective Date Spring 2007 (semester and year)

6. Course to be offered ☐ Fall ☒ Spring ☐ Summer

7. Will the course be offered each year? ☒ Yes ☐ No
(Explain if not annually)

8. Why is this course needed?

In response to feedback from constituencies, chemical engineers need more laboratory experience with more detail on experimental design, report writing and statistics.

9. a. By whom will the course be taught? Chemical Engineering Faculty

b. Are facilities for teaching the course now available? ☒ Yes ☐ No
If not, what plans have been made for providing them?

APPLICATION FOR NEW COURSE

10. What enrollment may be reasonably anticipated? 30

11. Will this course serve students in the Department primarily? ☒ Yes ☐ No

Will it be of service to a significant number of students outside the Department? ☐ Yes ☒ No
If so, explain.

Will the course serve as a University Studies Program course? ☐ Yes ☒ No

If yes, under what Area?

12. Check the category most applicable to this course

☒ traditional; offered in corresponding departments elsewhere;

☐ relatively new, now being widely established

☐ not yet to be found in many (or any) other universities

13. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky? ☒ Yes ☐ No

14. Is this course part of a proposed new program: ☐ Yes ☒ No
If yes, which?

15. Will adding this course change the degree requirements in one or more programs?* ☒ Yes ☐ No
If yes, explain the change(s) below

This course will be required for a BS degree in chemical engineering. Program change is attached.

16. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

17. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted. ☐ Check here if 100-200.

18. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate students in assignments, grading criteria, and grading scales. ☐ Check here if 400G-500.

19. Within the Department, who should be contacted for further information about the proposed course?

Name Kimberly W. Anderson, Director of Undergraduate Studies Phone Extension 7-4815

*NOTE: Approval of this course will constitute approval of the program change unless other program modifications are proposed.

APPLICATION FOR NEW COURSE

Signatures of Approval:

Department Chair	4/20/06 Date
Dean of the College	1/16/07 Date
	12/04/06 Date of Notice to the Faculty
*Undergraduate Council	Date
*University Studies	Date
*Graduate Council	Date
*Academic Council for the Medical Center	Date
*Senate Council (Chair)	Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

CME 432
CHEMICAL ENGINEERING LABORATORY
Spring, 2007

COURSE SYLLABUS

Course Coordinators:

R. I. Kermode
153 Anderson Hall

Sasha Veljkovic
162 Anderson Hall

Faculty Instructors:

*Faculty **	*Phone*	*Office*	*E Mail*
K. Anderson	7- 4815	163C FPAT	Anderson@engr.uky.edu
T. T. Tsang	7-8059	177A FPAT	tsang@engr.uky.edu
R. I. Kermode	7-2823	153 FPAT	kmode@engr.uky.edu
A. K. Ray	7-7990	165 FPAT	akray@engr.uky.edu
M. Keane	7-5857	155 FPAT	makeane@engr.uky.edu

Teaching Assistants:

*Staff assignments are subject to change if needed

Short Exp Type A .

Laminar Flow	M. Keane and T. Tsang
Technovate Press. Drop	K. Anderson
Condensation	K.. Anderson
Cross-flow Heat Exch.	R. Kermode

1. COURSE OUTCOMES AND STRUCTURE

Course Description: A laboratory course emphasizing experimental work in the areas of fluid flow, heat transfer, mass transfer, and separations. A majority of the course will focus on lab report writing, statistics, experimental design, and safety in the laboratory.

OUTCOMES:

Chemical Engineering 432 provides an opportunity for the application of fundamental chemical engineering concepts to a selected group of experiments that require the integration of sound scientific method, efficient project management, and effective presentation skills for ultimate success. Specifically, students should be able to:
understand the importance of safety in the laboratory
design and conduct experiments in the areas of fluid flow, heat transfer, mass transfer, and separations.
use modern data procurement and handling techniques.
Use statistics to interpret experimental results
function in a 3 or 4 person multidisciplinary team to carry out the above tasks.
use computer software to present the results individually in oral reports and technical abstracts.

PREREQUISITES:

The prerequisites for CME 433 are as follows: CME 330, CHE 446G, CME 415, Concu: CME 425, CME 420 and engineering standing. These prerequisites will be enforced, and those not meeting them will be dropped from the class automatically. Exceptions to these prerequisites will be granted only in special circumstances.

COURSE STRUCTURE:

Chemical Engineering 432 consists of four type A experiments.; each experiment is to be completed in teams of three or four assigned randomly by the instructor. All laboratory work, lectures, apparatus briefings, presentations, and planning conferences are set to take place during the regular laboratory time slot. There will be one special session devoted to team building given during an extended CME 006 class. In addition there will be several lectures as well as homework assignments on report writing, safety in the laboratory, experimental design and statistics.

Type A Experiments: All necessary data for Type A Experiments can be obtained over a single four-hour laboratory period. Emphasis is on data acquisition and appropriate analysis of results. Results are presented by team members, as an extended abstract, and in individual oral presentations to the instructor. Each team member will be responsible for two abstracts and one oral presentation.

Type A Sequence

- apparatus briefing
- laboratory period
- data analysis
- extended abstract (due at time of oral presentations)
- oral presentation (15 to 20 min.)

2. Descriptions of Course Elements

2.1 INTRODUCTORY LECTURES

In prior years, there have been many detailed rules and instructions relative to attendance in lab, preparation for the experiments, and participation in the collaborative team activities needed for successful experimental work. The purpose of the previous rules was to encourage students to participate equally in this laboratory, in short, to act as a team.

This year, each team will develop its own norms and agree on how it will function in the course. This activity will be held September 7 at 4:00 PM during CME 006 and will be facilitated by Dr. Derek Lane, an expert on teams from our Communications Department. The Session will last 2 hours. At the end of this course, students will score each other on how the team norms were adhered to by each member. In addition, the Team Project notebook is completed by all members. A multidisciplinary approach can provide an efficient and effective way for the team to perform the assignments in the time allotted. Each member will assume a specific role that can help the team complete the laboratory. Some ideas for roles will be provided in the team-training seminar. In addition, safety training will be provided for all students near the beginning of the class. At the end of the semester each team member will rate the other two members of the team relative to their performance, participation, and contributions to the team effort. This will become a part of each student's grade.

2.2 T.A. APPARATUS BRIEFING

Apparatus briefings prepare the team for effective and safe operation of the lab equipment, and efficient use of laboratory time. Teams are responsible for getting a specific experimental assignment from the instructor for their experiment. During the apparatus briefing, the team has the opportunity to ask questions on the experimental objectives, equipment operation, and experimental safety. Videotapes have been made for most experiments by faculty to show how they are operated. For these experiments, the T.A. must determine that the team is prepared to do an experiment before laboratory work can be performed..

2.3 LABORATORY PERIOD

1.) Safety Responsibilities

Laboratory SAFETY is of the highest priority. Each student has the responsibility to:

- be aware of the location of all exits, showers, eye washes, fire extinguishers etc.

- be aware of the activity of those working around you; this is particularly important
-if potentially hazardous materials or equipment are being transported in the
-laboratory.

- be familiar with the specific safety requirements of your apparatus, especially
-with regards to any necessary protective clothing (safety glasses, hardhats, gloves, etc.).

- not operate equipment outside of the procedures and limitations established by the T.A. and
-instructor responsible for that equipment. Ask for assistance if you are not sure how
-changing a particular control or parameter (i.e., opening or closing valves, knobs, etc.) will impact the experiment.

- **practice good housekeeping. Shut down the apparatus safely and leave the laboratory area**

- **clean and free of debris.**

2. Specific Safety Rules & Procedures

No experimental apparatus is to be operated without the presence of at least one T.A. or instructor in the laboratory. Equipment is only to be operated during designated laboratory periods. Operating equipment should <u>never</u> be left unattended, regardless of the stage of the experiment.

There will be NO SMOKING, DRINKING, or EATING anywhere in the environs of room 59 Anderson Hall at any time; this policy is in effect for all laboratory periods regardless of whether experimental work is being performed. The areas covered by this policy include 59 Anderson Hall, 63 Anderson Hall, and the computer room.

<u>Safety glasses are to be worn at ALL TIMES</u> by those actively performing experiments, and by any others moving about in the laboratory in the areas where experimental work is being performed. The only exceptions to this rule are for those working at the table in the middle of the laboratory (please use discretion), or those in the new computer room on the first floor of AH.

<u>Appropriate clothing should be worn when performing experimental work. Shorts and open-toed shoes do not provide adequate protection against possible spills or dropped equipment and can not be worn in the laboratory. Students improperly clothed may not work.</u>

Students are to act in a professional manner while in the laboratory. Loud conversations, horseplay, practical jokes, or such activity which endangers others in the laboratory or damages equipment will be not be tolerated.

<u>Serious safety violations may result in suspension from the lab, grade reduction, or additional penalties</u>.

3. Team Norms:

The preparation of oral and written reports is an individual activity. All other work associated with this course is a team activity. Teams will establish their own internal procedures on matters relative to attendance, equipment operation, information gathering, project notebook entries, and all other work. Lab work for specific experiments must be completed during the scheduled times for each team. Acquisition of experimental data is part of the laboratory learning experience, and everyone must be present when data is being taken.

2.4 DATA ANALYSIS PERIODS

Teams are responsible for the completion of data analysis.

2.5 ORAL REPORT

Oral Presentations will be presented to the individual instructors on those days designated in the schedule matrix; a detailed schedule of oral presentations (including times, locations) is provided in the appendix. Each student will give two oral presentations based on two of four type A projects completed by the team. Students should prepare a 15 minute presentation. Use of Powerpoint is encouraged; however, presentations comprised of overhead transparencies will be acceptable. Handouts, as appropriate, should be prepared prior to the presentation. Five minutes will be allowed for questions by the audience.

2.6 EXTENDED ABSTRACT

A four-page extended abstract (approximately 1000 words, double-spaced, plus up to two *additional* pages for figures) will be required from each team member for each experiment performed; details on the layout & structure of the extended abstract can be found in the appendix. The abstract provides a concise and informative summary of the project work, and it should detail the motivation behind the work, primary objectives and scope, essential methods, key experimental results and their importance, and major conclusions. Detailed descriptions of the experimental set-up, raw data values, data reduction methods may be included in the Project Notebook.

2.7 TEAM PROJECT NOTEBOOK:

The project notebook is a record of teamwork for CME 432. In addition to acting as the permanent record for raw experimental data, the project notebook forms the basis for project planning and organization. It should be the primary record for the development of data reduction methods, sample calculations, error analysis, and preliminary design calculations. The project notebook will be a formal, bound "Laboratory Research Notebook" (available at the U.K. Bookstore) complete with page numbering, and tear-out duplicate (yellow) pages; each team should obtain (one) project notebook before their first scheduled laboratory period. Team project notebooks are to initialed by the T.A. on the days assigned for lab experimentation and data reduction.

The notebook will document the team assignments for each project, and all common work. One project notebook per team is to be handed in at the same time written reports are submitted. Written reports will not be logged in as received unless they are accompanied by the project notebook. The Project Notebook will be graded and returned at the start of the next class period. Grading will be based on content, organization, technical accuracy, and completeness; each team will receive a single project notebook grade.

3. COURSE GRADING POLICIES

The grading for the course will be as follows:

Type A Experiments:

Extended Abstract for Experiment S1	100
Extended Abstract for Experiment S2	100
Extended Abstract for Experiment S3	100
Extended Abstract for Experiment S4	100
Oral Presentation (2)	200
Miscellaneous Teamwork, Quizzes, Attendance, Homework etc.	100
Total	700

The various criteria upon which each grade will be based are indicated in the instructor grading sheets, copies of which are provided in the appendix.

While no specific penalties are listed for course infractions such as arriving late to the laboratory (after 8:00 AM), this type of unprofessional attitude will result in lowering of the teamwork evaluation grade, and if persistent, the grade for individual experiments as well.

3.1 TEAM PERFORMANCE / PARTICIPATION

Teams will develop their own norms with respect to work in this lab. At the end of the lab, team members will assess team and individual member performance. This evaluation will be worth 100 points. As a result, there will be no laboratory performance penalties as in prior years.

3.2 MINIMUM COURSE REQUIREMENTS

The overall grade for the course will be based on the maximum points above. **Each element, the four abstracts and oral reports, must receive a passing grade in the course in order for the individual to pass this course.**

If your composite percentage score is in the following ranges, you will receive *at least* the corresponding grade.

Score	Letter Grade
Greater than 90	A
80-90	B
70-80	C
60-70	D
Below 60	E

3.3 PLAGIARISM / CHEATING

Plagiarism or the falsification of data will not be tolerated in CME 433. Any data and information presented in the team project notebook is common property of the team, and should be the data appearing in the final abstracts and report. Plagiarism is the copying or verbatim use of the written work of another without proper citation; this includes figures, tables, lists of references, etc. The verbatim copying of even one sentence or one data point in any work submitted or presented in this course without proper attribution will be considered plagiarism. Any students found guilty of plagiarism will receive an "E" for the assignment.

The distinction of individual work can sometimes be difficult in this course, owing to the emphasis on team effort in the laboratory. The basic guidelines are as follows: the acquisition of data, data analysis, and the calculation / solution of the design component are considered to be team activities, which should be documented in the team's project notebook. Material in the team's project notebook is considered the property of the team. The presentation of data (creation of plots, tables) and the interpretation of data in orals and written work are considered to be individual activities. If you have any questions with regards to this policy, please check with the instructors prior to the submission of assignments.