

## Cooperative Work (COOP)

In this course the student will spend a period of 28 weeks of industrial employment in industry. Students are required to write a detailed formal report on their experience and give technical presentation. Evaluation by the employer will be counted towards the grade given for this course.

### Objective:

The course is designed to meet the demand of engineering graduates who are more trained toward practice. The course provides students with intensive on-job training in which they can relate to the theoretical knowledge learned in the classrooms and laboratories. Upon graduation, the graduates can engage more rapidly in the design, construction and operation of chemical processes.

### Outcomes:

The outcomes of COOP training program is to help the students to:

1. Acquire on-job work experience before graduation
2. Recognize ethical and professional responsibilities in engineering situations and make informed judgments.
3. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
4. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
5. Identify, formulate, and solve real engineering problems by applying principles of chemical engineering, science, and mathematics.
6. Apply engineering design skills to design and simulate chemical and physical processes.
7. Communicate effectively with others in industry; and give presentations and write reports.
8. Write technical reports.

### Eligibility for COOP

1. Be currently enrolled in the university and not subjected to dismissal for any academic or disciplinary reasons.
2. Complete at least 85 credit hours (including the semester of COOP registration).
3. Maintain a major GPA of 2.000 (out of 4.000) or above.
4. Pass technical writing course, ENGL214.
5. Complete all the pre-requisite requirements identified by the department (check with the department COOP coordinator for such requirements).
6. Complete the COOP training before the last semester in the university.

## Registration COOP

The registration for COOP is conducted online through the registrar office during the pre-registration period. Students are divided into two groups, A and B. Group A starts the COOP training at the beginning of the spring semester, and group B starts at the beginning of the summer session. The following steps are usually involved in the registration process:

- The student registers CHE351 during preregistration week.
- The COOP coordinator ensures the eligibility of the student for the program and approves it.
- A list of approved students reaches the COOP office at the deanship of students affairs for final approval.
- The COOP office seeks appropriate job openings inside and outside Saudi Arabia for the candidates according to their academic majors.

The candidates shall contact the COOP office at the end of the registration period to finalize their training assignments. Students registering for COOP with eligibility problems are not assured acceptance and usually are included in a waiting list. The final decision for their acceptance is made at the end of the semester by the COOP office in consultation with their departments' COOP coordinators.

### COOP Coordinator

The COOP coordinator is a faculty member assigned by the department to coordinate activities related to the program. His duties are as follows:

- To administer the COOP registration process.
- To prepare a list of eligible students and send it to the COOP office.
- To assign a COOP advisor for each student.
- To assign an examination committee for each student.
- To follow up with the COOP advisors on the progress of the students at work.
- To receive students' evaluations from the employer, advisor and examiners.
- To assign a grade for each student based on the evaluations according to the departmental COOP grading policy.
- To send the COOP final grades to the university registrar through the department chairman.

### COOP Advisor

The COOP advisor is a faculty member from the department appointed by the COOP coordinator. His duties will be as follows:

- To provide a technical advice to the student during his COOP assignment.
- To follow the student's progress during training and suggest case studies.
- To correct and proof-read the first draft of the COOP report.
- To evaluate the final COOP report and presentation and report that to the COOP coordinator.

The evaluation of the final report and presentation is also performed by an examination committee that includes the COOP advisor and a second examiner.

## COOP Mentor

The mentor is a practicing engineer, or a senior staff assigned by the host organization to supervise the student during his COOP assignment. His duties are as follows:

- To set up a working plan for the student and forward it to the COOP advisor.
- To ensure adequate professional development for the student during his training.
- To guide the student in preparing his reports and ensures that the student is submitting his progress reports on time.
- To evaluate the student and fill up the employer evaluation form after the second and fourth months of training and send them to the COOP office at the deanship of students affairs.

## Role of the Student

The student is a pivotal part in the COOP program and the success of the overall program depends mostly on him. During the COOP program the student should maintain a desirable public image about KFUPM. Moreover, he should confirm to the ethics of his future profession and perform his duties as an employee who is working for the host organization. The responsibilities of the student before, during and after COOP can be summarized as follows:

### Before Leaving for COOP

- The student should familiarize himself with the university policies and regulations regarding the coop program.
- The student should contact the coop coordinator to discuss the coop assignment.

### During COOP

- The student should make sure that the host organization provides him with a coop training plan and send it immediately to his coop advisor not later than the second week of training.
- The student should make sure that the training plan is related to his major of study, and if not, should immediately clarify that with his field mentor to modify the plan according to the student's major of study.
- The student must learn as much as possible about the department or division he is assigned to and keep a record of his daily activities, such as specific jobs performed, field trips made, meetings attended, seminars attended, etc.
- The student should maintain regular contact with his coop advisor and sends him up-dates on his job assignments, experiences, etc.

## Upon Return to KFUPM

- The student should contact his coop advisor immediately to provide him with the first draft of the coop report **during the first week** of the semester.
- Complete the final coop report and submit it to his advisor and second examiner and schedule a time for his coop presentation **during the first month** of the semester.

## Final COOP Report

The COOP report is an extremely important element in the COOP program where the student describes thoroughly his accomplishments on the job. Since report writing is an essential skill that any engineering graduate must be equipped with, the COOP is an excellent opportunity for the student to develop and maintain such a skill. Here the student should follow the technical report writing guidelines learned in ENGL214 in preparing his COOP report. Although, the contents of the COOP report may vary depending on the nature of the assignment, the report may generally contain the following:

- Title page
- Summary
- Acknowledgements
- Table of Contents
- Introduction
- Job Description
- Case studies
  - Objective
  - Procedures
  - Unit Description
  - Technical description
  - Results and discussion
- Conclusions
- Recommendations
- References
- Appendices

Description of the above items is given at the end.

## Final COOP Presentation

The presentation of the COOP assignment is also an important part in the COOP program. After completing and submitting the final COOP report, the student will be requested to deliver an oral presentation before an examination committee. Here, the student will develop a very important communication skill, which is the ability to effectively present his results and findings in a professional manner. Such a skill will continually develop with the student over a lifetime and will be enhanced by practicing and listening to other presentations (both good and bad!).

The student will be allowed to present his work within a time frame as instructed by his examination committee, usually for 15 to 30 minutes. The student should present his work using transparencies or preferably use a computer presentation such as PowerPoint. The presentation should reflect the contents of

the COOP report; however, the means of delivery are totally different. In general, the presentation consists of:

- Title slide
- Talk outline
- Introduction
- Job description
- Case studies
  - Problem Statement
  - Objective
  - Procedures
  - Unit Description
  - Block/Process Flow Diagrams
  - Technical description
  - Results and discussion
- Conclusions
- Recommendations
- Acknowledgements

The presentation should be kept short and simple; hence, the details covered in the COOP report should be summarized here or skipped in some cases.

## COOP Grading

The evaluation of the COOP report and presentation is performed by the examination committee and the COOP advisor and it is reported to the COOP coordinator to assign a final letter grade for the student. The student should refer to the COOP coordinator of his department for details of the COOP grading policy and guidelines. The final grade for COOP is mainly based on the following four items:

1. Employer's evaluation
2. Progress reports
3. COOP report
4. Coop presentation

In general, more than 60 % of the grade is based on the COOP report and presentation. In the chemical engineering department, the following grading policy is implemented for COOP:

- |                        |           |
|------------------------|-----------|
| 1. Progress report # 1 | 5 points  |
| 2. Progress report # 2 | 5 points  |
| 3. Final COOP report   | 40 points |

4. Final presentation 25 points
5. Company's evaluation 25 points

Total 100 points

The following grading rubric will be considered in evaluating the COOP report:

Outcome		Professional Quality	Adequate	Needs Improvement	Inadequate	Score
		(4 points)	(3 points)	(2 points)	(1 points)	
1	Write a technical report	English writing and report format is professional	English writing and report format is very good	English writing and report format is satisfactory	English writing and report format is poor	
2	Apply chemical engineering process calculations such as mass and energy balances	Process calculations are used intensively and very accurately	Process calculations are used adequately and accurately	Process calculations are not clearly indicated	Process calculations are missing and/or wrongly applied	
3	Draw block / process flow diagrams and label equipment and stream information	Block / Process flow diagrams are drawn extensively and labeled very accurately	Block/ Process flow diagrams are adequately drawn and labeled	Block/ Process flow diagrams drawing and labeling is not clear or missing major information	Block/ Process flow diagrams are missing	
4	Determine / collect physical, chemical and transport properties of process fluids	All required fluid properties are determined / collected very accurately, and source or correlation is clearly indicated	Fluid properties are adequately determined / collected, and source or correlation is indicated	Some fluid properties are missing, or source may be missing	Fluid properties are missing or unrealistic	
5	Demonstrate design of chemical engineering equipment (such as pumps, heat exchanges, flash drums, reactor ... etc.)	Equipment design is clearly and very accurately demonstrated	Equipment design is adequately demonstrated	Equipment design is partially demonstrated	No evidence of equipment design	
6	Simulate / model / optimize chemical engineering processes	Process simulation / modeling / optimization is extensively used and presented accurately	Process simulation / modeling / optimization is used and presented adequately	Process simulation / modeling / optimization is not clearly used or contains errors	No evidence of process simulation / modeling / optimization	

Moreover, the following factors may also be considered in evaluating the COOP presentation:

- The ability of the student to clearly introduce the subject material.
- The ability of the student to state the objectives clearly.

- Presentation performance (language, clarity, style, illustrations, i.e. graphs, models, multimedia, etc.).
- The ability to summarize and explain results.
- The ability to conclude the presentation.
- Depth of knowledge and the ability to answer questions.

## Final COOP Report-Details

**The Student must consult his coop advisor about details and organization of his final report. He must maintain trust and honesty to ensure the integrity of his COOP report. Any cheating in the COOP report shall render the student subject to punishment in accordance with the university disciplinary rules.**

## TITLE PAGE

The title page serves as the first page the report. The main function of the title page is to identify the COOP report. It should contain the following:

- University, college and department names.
- Course title and number.
- Title of the report.
- Student's name and ID number.
- Coop advisor name.
- Name of the company.
- Date of submission.

The title of the report should be short but descriptive enough to distinguish it from other reports on similar subjects.

## SUMMARY

The summary of the report *appears first* and should be *written last*. The summary should be written concisely in such a way to deliver the message and state all the important aspects of the report. It may include an introductory statement to the subject matter and briefly describe what was done. Moreover, it may also include some selected key results.

## ACKNOWLEDGEMENTS

The acknowledgements consist of few sentences where the student thanks and appreciates those who have helped him during the COOP program. It is a matter of courtesy that the student gives credit to other people who have contributed to the success of his work.

## TABLE OF CONTENTS

The table of contents should list all chapters, sections and subsections of the report along with the corresponding page numbers to enable the reader to easily locate any information in the report. It should be clear and separate from the rest of the report.

## INTRODUCTION

The introduction of the report has two functions. First, it includes brief statements introducing the job description portion of the report. Second, it includes brief statements discussing the case studies portion of the report.

## JOB DESCRIPTION

The first main portion of the COOP report is the job description. The student may organize the job description as follows:

- A description of the whole organization.
- A description of the department that the student worked with.
- What did the student do there and for how long?
- The major projects the student was involved in.
- List the various experiences the student was connected with.
- If the student wrote letter reports during COOP, he should summarize them in this section and then give an example in an Appendix.

## CASE STUDIES

This is the most important portion of the COOP report. The student should have arranged with his mentor and his advisor on how to prepare this portion of the report. This portion of the report may be organized as follows:

### *Objectives*

The student should describe the objectives of his project in two or three sentences.

### *Procedures*

The student should explain what was done to accomplish the objectives. He should clearly explain if he has done these procedures by himself or by someone else.

### *Unit Description*

A description of the specific unit or operation of the industrial process should be provided in this section. Illustrations and photographs should also be provided if necessary. Block and/or process flow diagrams should be provided and labeled explaining all details of the process.

### *Technical Description*

The technical details of the selected topic should now be given, including calculations and basic theory. It should be shown how the technical background relates to the student's own study.

### *Results and Discussion*

All results should be summarized here in the form of tables and graphs. The student should interpret the results and discuss them both qualitatively and quantitatively and should state the accuracy and any possible sources of errors.

## CONCLUSIONS

This section is sometimes combined with the recommendation section, yet the function of each is distinct. The purpose of the conclusion section is to summarize any new information derived from the work described in the report. It is sometimes presented as numbered statements, each distinct and each stating facts alone.

## RECOMMENDATIONS

In contrast to the statement of facts in the conclusions, the recommendations present a course of action and reflect the opinion of the student. In the recommendations, the student can make suggestions about modifying the COOP program, methods of changing company policy and even changing the operation of a plant.

## REFERENCES

This section is the last before the appendix. The original sources of any literature referred to in the report should be listed here. This listing should be numerical and should be based on the order of appearance in the report. There is a standard format used for most scientific references. The information should be arranged as follows:

- Author's last name followed by his initials.
- The name of the book or article.
- If it is an article, the name of the journal where it appears.
- If it is a book the publisher and edition.
- The volume number of the journal.

- The date of publication.
- Page number.

## APPENDICES

In order to make any report more readable, all supporting data should be placed in the appendices of the report. This may include the following:

- Organization charts.
- Maps of areas worked in.
- Letters involving job assignments.
- Letter reports.
- Detailed drawings.
- Test run data.
- Tables, graphs, illustrations and photographs (when not an essential part of the report).
- Copy of the covering letter to the COOP report.
- Sample calculations.