



ENERGY SYSTEMS ANALYSIS (MJ2415)

PROJECT -GRAND CHALLENGE 2018-19 – FOR CHALLENGE DRIVEN EDUCATION

COURSE INTRODUCTION AND GOALS:

Energy system analysis course is conducted in the way of Challenge Driven Education (CDE) project based active learning exercise. Students are formed into groups and given a task of handling a real life energy engineering problem which is of a practical importance. Solutions proposing for the given project should be technically through, economically, environmentally and socially acceptable solutions by the interested parties. The course is conducted collaboratively by the academic Institute (KTH –Royal Institute of Technology, Sweden), partners (Sweco AB, Sweden and EPPEI, Republic of South Africa) and facilitated by InnoEnergy AB Sweden. Industrial problems are provided as learning tasks and students are supported and empowered to find and deliver solutions which are of practically justifiable.

Students are assigned to work in this course as project teams, and each team is responsible for the delivery of solutions to the given project. Projects are presented to students by the academic/industrial partners.

Specific goals of the course are to provide students a possibility to realize the problem solving experiences under real life requirements. Students are promoted to apply theoretical and technical knowledge in solving specific problems in most optimized ways by taking collective decisions as project teams.

Highlights are:

- Applying theoretical knowledge in solving real life problems

- Enable for finding most practical and optimized solutions

- Work in a team by leading and sharing responsibilities

- Reaching collaborative and collective decisions



COURSE STRUCTURE AND ORIENTATION

Course is given as a project based learning and development activity which has customer interest and value. Learning and skill development activities are organized collectively by the coordinating academic institute and professional industrial partners. The academic institute takes initiatives on organizing student groups, to provide selected industrial projects and facilitate learning. Each student group is comprised of around five students during the fall semester. Two student groups are assigned to work on a same industrial project and each group should work independently from the other (During phase 1 – autumn term of the year). Requirement here is to promote, collaboration among the partners of the group while enabling competition among the two groups as they are working on the same industrial question. Alternative solutions are expected be encouraged as final outcomes and solutions should be well argued and justified. At the end of the autumn term, students complete the PRO1 (Pro1 is described later in the document) of the course and deliver results for the phase 1 as a project proposal.

Each project proposal is assessed at the end of the autumn semester (though the final project report and the oral presentation of the phase 1) by an academic and industrial evaluation committee to select the winner of the two groups competing among each other. Thereafter, two groups in each project will be re-organized, and will continue to work on a redesigned/evaluated project to deliver final results (phase 2).

There will be number of projects and correspondingly a number of student groups working within the course.

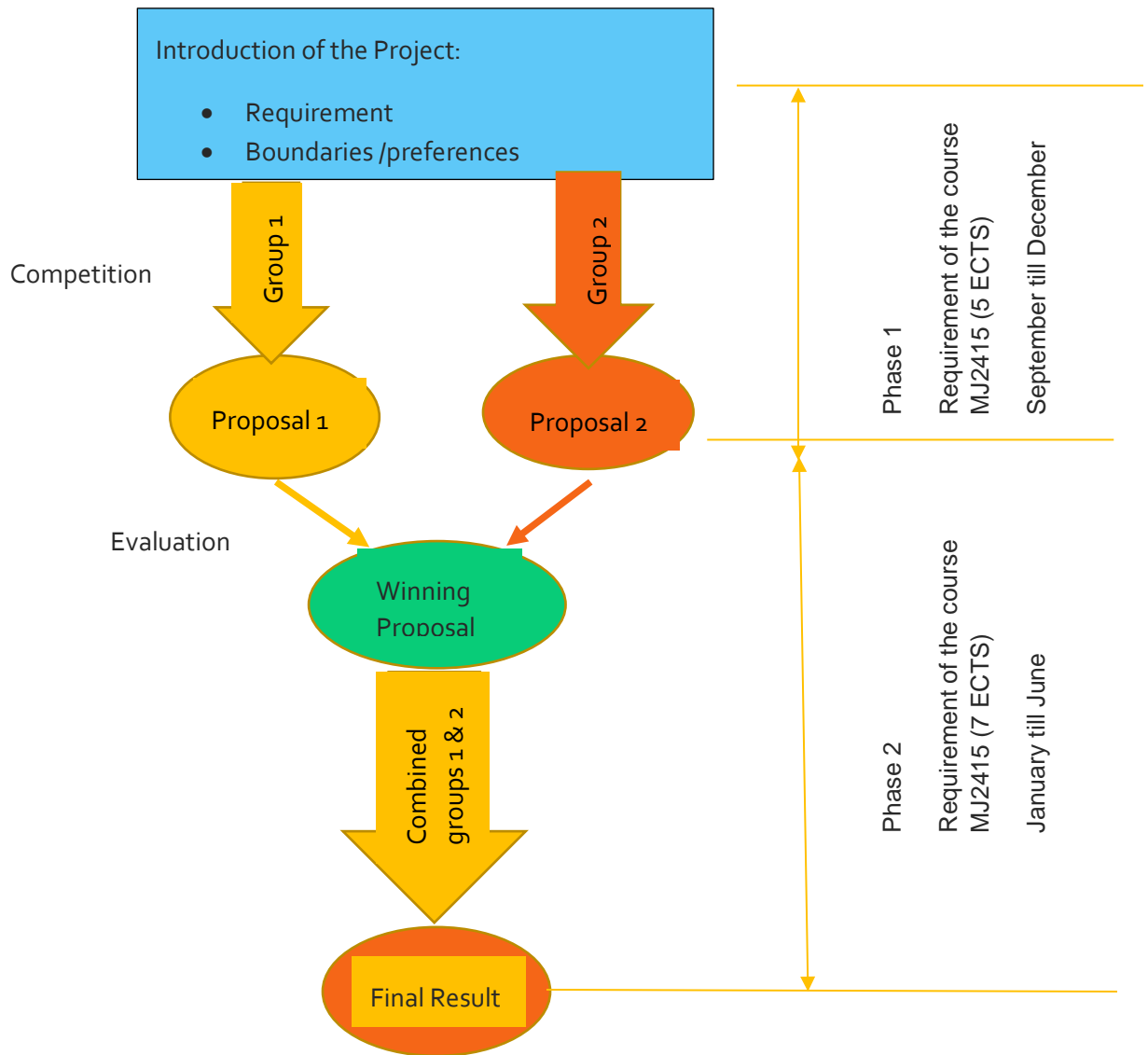


Figure 1: Process flow of the project activities

INTENDED LEARNING OUTCOMES (ILOS) OF THE COURSE:

Overarching intended learning outcomes:

- Students should be able to detail, describe, analyze a practically important industrial challenge (on the given task and requirement) and to provide well evaluated (technical, economical,



socially acceptable, environmentally sound) practically feasible and justifiable solution for the challenge presented in the field of their specialization.

- Students should be able to demonstrate the knowledge and ability in the particular subject by proper theoretical and technical evaluations and by justifying their solutions.
- Students should be able to put their work in a sustainability context, in terms of both environmental, economic and social aspects.
- Students should be able to justify their solution by comparing with various other alternatives and possible solution pathways.
- Students should be able to further evaluate and confirm their solutions by analyzing most critical factors holding on to the solution (sensitivity analysis) and estimate the risks associated with their provided solution.
- Students should be able to present in more general framework connecting to the specific customer oriented exercised analyzed by them and explore innovative ideas and pathways for business creations related in the field of their specialization.

Associated intended learning outcomes:

- Students should be able to develop and demonstrate team building and team working skills by evaluating and documenting strengths and capabilities of the teams.
- Students should be able to evaluate and document the capabilities of available resources and to identify the development and resource needs.
- Students should be able to practice and demonstrate the capability of being working in a team working environments and to be responsible for individual and collective deliverables.
- Students should be able to demonstrate the leadership qualities and handling responsibilities through continues engagement with course examiners/supervisors.
- Students should be able to demonstrate skills of good organization practices, proper handling of group meetings, collaborations with industrial, academic partners as well as with clients.
- Students should be able to practice and demonstrate the skills of writing project reports, executive summaries and oral presentations.

LEARNING MATERIALS, TEACHING AIDS AND ASSISTANCE:

Main learning materials are the teaching and learning provided through SELECT program related regular courses.

Workshops and lectures on specific topics will be organized by academic and industrial partners.



Assistance and continues assessment of the work is provided by specific project supervisors/industrial partners and directed to any specific documentations/tools if it is needed and appropriate.

Students are highly encouraged to go deep into learning by their own though provided materials (through SELECT courses) and any other open source learning materials of their selection.

ACHIEVED LEARNING OUTCOMES (ALOS):

PRO 1 - Project report: Presentation of the project proposal at the end of the autumn term. Proposal containing, an Executive Summary, through analysis of the problem, well justifiable solution criteria addressing the scopes of ILOs specified for the course.

PRO1 – Oral presentation: Presentation of the project proposal orally to a specific audience and be able to justify the proposal.

PRO2 - Project report: Presentation of the final project at the end of the spring term. Project report containing, an Executive Summary, complete description of the problem, selection presentation of the solution, sensitivity and risk analysis, generalizations and exploring the possibilities of business creations; basically covering the scopes of ILOs specified for the course.

PRO2 – Oral presentation: Presentation of the project results orally to a specific audience at the MSc SELECT Spring seminar, and be able to justify achievements according with ILOs of the course.

ASSESSMENT CRITERIA AND GRADING:

Continuous formative assessment:

Project progress and learning are continuously assessed by assigned project supervisors, by attending (physically or remotely) formal project group meetings, reviewing documentations (agendas of the meetings, meeting minutes, lists of action items and deliverables related to action items) created by the project groups.



Final Summative assessments:

Part 1:

At the end of the autumn term, PRO₁ credits (5 ECTS) are completed by evaluating the deliveries of PRO 1 - Project report, PRO₁ – Oral presentation and the individual deliverables. Students are graded in a scale A, B, C, D, E, Fx, F (A-E are passing grades, while Fx is a conditional pass grade and F is fail).

Winners of the group competition are also declared in the beginning of the spring term.

Part 2:

At the end of the spring term, PRO₂ credits (7 ECTS) are completed by evaluating the deliveries of PRO 2 - Project report, PRO₂ – Oral presentation and the individual deliverables. Students are graded in a scale A, B, C, D, E, Fx, F (A-E are passing grades, while Fx is a conditional pass grade and F is fail).

Final Grade of the course is decided as weighted average of PRO₁ and PRO₂ grades.

COURSE RESPONSIBLE TEACHERS/SUPERVISORS AND CONTACTS:

| Name | Function | Affiliation | Contacts |
|-------------------------|--|--------------------------------------|---|
| Dr. Peter Hagström | Course responsible for MJ2415 and examiner | KTH/SELECT | Tel: +46-(0)73-765 23 70 E-mail: pethag@kth.se |
| Mr. Magnus Linden | Project supervisor and evaluator | SWECO | Tel: +46-(0)70-994 13 58 E-mail: Magnus.Linden@sweco.se |
| Ms. Linda Schumacher | Project supervisor and evaluator | SWECO | Tel: +46-(0)8-6956000 |
| Ms. Klara Sahlén | Project supervisor and evaluator | SWECO | Tel: +46-(0)8-6956000 |
| Hab. Prof. Louis Jestin | Project supervisor and evaluator | EPPEI | Tel: +27-21-650 3239 Cell: +27-765 865 869 E-mail: louis.jestin@uct.ac.za |
| Prof. Stuart Piketh | Project supervisor and evaluator | North-West University, Potchefstroom | Tel: +27-18-299 1582 Cell: +27-828 063 026 E-mail: Stuart.Piketh@nwu.ac.za |

SCHEDULE FOR THE AUTUMN TERM:

| Activity | Location | Date |
|---|------------------------|---|
| Introduction of Project Management | KTH and UPC (remotely) | September |
| Inauguration of the project | UPC, Barcelona | October 5 th 2018 (During the MSc SELECT Fall seminar) |
| <p>Project progress – phase 1: Each team should make a draft project plan (including time schedule) to be submitted in Canvas within a week after the project groups have been announced. (At least) bi-weekly project meetings organized formally by the project teams. Scheduling up to the convenience of the team members and supervisors.</p> | | |
| Submission of PRO1 draft report | In CANVAS | Nov-Dec 2018 (date to be announced) |
| Oral presentation PRO 1 | KTH and UPC (remotely) | To be decided (Dec 2018) |
| Submission of PRO1 final report | In CANVAS | Dec 2018 – Jan 2019 (date to be announced) |

SCHEDULE FOR THE SPRING TERM:

| Activity | Location | Date |
|--|---------------------|-----------------------------------|
| <p>Project progress – phase 2: Each team should make a draft project plan (including time schedule) to be submitted in Canvas within a week after the announcement of the winning proposals. (At least) bi-weekly project meetings organized formally by project teams. Scheduling up to the convenience of the team members and supervisors.</p> | | |
| Field trips | Site of the project | Jan - April 2019 |
| Submission of PRO2 midterm report | In CANVAS | April 2019 (date to be announced) |
| Oral presentation PRO 2 | AGH, Krakow | Spring seminar, May 2019 |
| Submission of PRO2 final report | In CANVAS | June 2019 (date to be announced) |



Examination and Grading

Project – PRO1 and PRO2

PRO1 - Project, 5.0 credits, grade scale: A, B, C, D, E, FX, F (autumn term)

PRO2 - Project, 7.0 credits, grade scale: A, B, C, D, E, FX, F (spring term)

The final grade will be a weighted grade of PRO1 and PRO2 respectively.

The following criterias are utilized:

| Grade | Relation to learning outcomes |
|-------|---|
| A | Excellent performance showing a high level of ambition, initiative, and attention to detail. |
| B | Very good performance showing clear efforts to go beyond minimum requirements. |
| C | Good performance where requirements are met sufficiently and in some cases are exceeded. |
| D | Adequate performance. |
| E | Marginally adequate performance requiring significant efforts from supervisor and/or examiner to see project to completion. |

Project – 100 points of which:

A: 90-100

$76 \leq B < 90$

$62 \leq C < 76$

$55 \leq D < 62$

$50 \leq E < 55$

$49 \leq FX < 50$

The individual performance of each student will be assessed by the examiner, in close collaboration with the evaluators. The basis for this assessment will for PRO1 include:

- Overall group score of the project reports (70%)
- Peer-grading within each group (everyone within a group anonymously assigns a grade to their peers, including a motivation). An averaged "peer grade" weighs 10% towards the final grade.
- Time sheet on weekly basis and individual statements of contributions to work (10% of grade).
- Assessment by the supervisors and MSc SELECT faculty of each student's oral presentation (10% of grade).



The basis for this assessment will for PRO2 include:

- Overall group score of the project reports (70%)
- Peer-grading within each group (everyone within a group anonymously assigns a grade to their peers, including a motivation). An averaged "peer grade" weighs 10% towards the final grade.
- Time sheet on weekly basis and individual statements of contributions to work (10% of grade).
- Assessment by the supervisors and MSc SELECT faculty of each student's oral presentation (10% of grade).

ADDITIONAL LITERATURE /TOOLS (SUGGESTIONS)

The web-based KTH platform Canvas will be used for distributing documents to the students, and for submission of documents by the students. The name of the Canvas event is "MJ2415 HT18-1 Project in Energy Systems Analysis".

DESCRIPTIONS OF CDE PROJECTS – AVAILABLE FOR THE 2018/2019 STUDY PERIOD:

As presented at the MSc SELECT Fall Seminar at UPC on October 5th 2018 (the presentation also found in "Files" in Canvas).