University of Macau

Department of Electromechanical Engineering
MECH415 Project
Syllabus
2nd Semester 2012/2013
Part A – Course Outline

Compulsory course in Electromechanical Engineering

Course description:
An independent study under the supervision of one or more faculty members. Professional ethics, health, safety and environmental considerations in the engineering project.

Prerequisite:
Final year level

Reading list and references
1. Statement of Ethical Principles, Engineering Council, UK
2. HKIE Rule of Conduct
3. Conduct of Public Servants, The Commission against Corruption of Macao SAR
4. Project materials advised by supervisor(s)

Course objectives:
1. To provide students with an excellent opportunity of in-depth exploration of a particular topic/design in electromechanical engineering. (a,b,c,e,i,j,k,l)
2. To teach students how to apply the general knowledge of engineering & sciences and the emerging technology to solve an open-ended real-world engineering technical problem with a critical manner. (a,i,j)
3. To further develop student's creativity and overall skills of problem formulation, development of appropriate solution methods, design and implementation of a final chosen solution. (b,c,e)
4. To practice data collection and analysis using different measurement equipment and software packages. (b,h,k,l)
5. To complete an engineering project via a team work or contribution from the peers. (d)
6. To teach how to make good oral presentation of the project findings and write a technical report. (g)
7. To let students understand the professional engineering ethics and the importance of health, safety and environmental considerations in the engineering project. (f,h)

Indicative syllabus:
A project group consisting normally of 2~3 students will be expected to complete a substantial project of a major electromechanical engineering task. The task can be an analytical study, experimental investigation, numerical simulation for an engineering problem, experiment design, algorithm design or engineering design project. The students are expected to go through the following stages of work:

Problem identification
Literature review
Development of solution
Project execution
Report writing
Project presentation

Besides, all final year project students are also required to attend and pass two training courses offered by the Department. These two courses are (1) Engineering Ethical Principles, and (2) Health, Safety and the Environment. The lecture and assessment hours of Engineering Ethical Principles are 2.5 and 2 respectively. The assessment is done by group presentation based on some case studies. The lecture and written exam hours of Health, Safety and the Environment are totally 6. The exemption of the course of Health, Safety and the Environment is allowed, if an accredited industrial safety certificate can be presented. Each student is individually assessed in both courses.

Syllabus of Engineering Ethical Principles

- Rules of Conduct of HKIE
- Ethics in Practice by ICAC of Hong Kong SAR
- Guidelines on the Professional Ethics and Conduct of Public Servants
- Commission against Corruption of Macao SAR
- Case studies in Macau, Hong Kong and China

Syllabus of Health, Safety and the Environment

- Occupational safety & health ordinance
- Basic construction site safety
- Site accident prevention
- Safety measures
- Personal protective equipment with practice

Guided study hours and credits:

Timetabled work in hours per week			No of teaching weeks	Total hours	Total credits	No / Duration of exam papers
Lecture	Tutorial	Practice				
0.6	NIL	13.4	14	196	10.5	Nil

Contribution of course to meet the professional component:

This course prepares students to work professionally in the area of **electromechanical engineering**.

Relationship to EME programme objectives and outcomes:

This course primarily contributes to electromechanical engineering programme outcomes that develop student abilities to:

(a) An ability to apply knowledge of mathematics, science, and engineering.
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(e) An ability to identify, formulate, and solve engineering problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice appropriate to the degree discipline.
(l) An ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations.

The course secondarily contributes to electromechanical engineering programme outcomes that develop student abilities to:

(d) An ability to function on multidisciplinary teams.
(i) An ability to recognize the need for, and to engage in life-long learning.
(j) A knowledge of contemporary issues.

Internal examiners:

Department head and programme leader

Persons who prepared this description:

Department head and final project coordinator

Part B – Guideline for Assessment of Project

The assessment of a final project will be based on six components:

1. 5% on progress to be assessed by the project supervisor(s);
2. 10% on course work in Health, Safety and the Environment to be assessed by the course instructor;
3. 10% on course work in Engineering Ethical Principles to be assessed by the course instructor, EME academic staff and one professional engineer from local industry;
4. 25% on the report to be assessed by the project supervisor(s);
5. 25% on the report to be assessed by the second assessor; and
6. 25% on project presentation to be assessed by the project presentation panel.

Total: 100%.

Project Report:
The students will be required to submit a group report at least one week before the project presentation.

Project Assessment:
The project supervisor(s) will assess the progress of individual student and the whole group. Moreover, the project supervisor(s) and the second assessor will assess the report of individual student and the whole group, based on the contents of the report.

In terms of individual student assessment of the project report and progress, student will be assessed based on group achievement on the following components: For example, if the group achievement is 24 marks, the mark for the student would be $24 \times N$, where N is a contribution factor which is assigned by the project supervisor(s) and the second assessor based on their evaluation of the contribution of individual student. The value of N ranges from 0 to 1. 0 means 0% contribution, while 1 represents 100% contribution. There should be at least one student in the group to get 1 for the value of N. If $N = 0.75$ for a student, then the final mark of the student would be $24 \times 0.75 = 18$.

Normally, students have to work in a group with almost equally shared responsibilities. In normal case, N should be equal to 1. Only if there is a particular imbalance of contribution, the supervisor(s) and the second assessor may assign a lower value of N to a student(s) with relatively low contribution. The supervisor(s) and the assessor are reminded to exercise particular care in assignment values of N lower than 1.

Moreover, if an extremely high score (i.e. > 23/25) in Component 4 or 5 of the above six assessment components occurs, those who give such high score have to submit a written justification to the Chairman of Board of Examiners and the Programme Leader to review and comment. The Area Leaders will also be invited to review and comment, if necessary.

Finally, the project presentation panel will assess the students individually based on their performance during the oral presentation only, without reference to the progress and the report.

Project Presentation:

The project presentation will be assessed by the project presentation panel with department head or programme leader or assigned representative as chairman. All EME teaching members are invited to join the project presentation panel, external examiners will also be invited to join the panel, if necessary. All the panel members are requested to evaluate and score every single presentation. After all students in the same group have completed their presentation, there will be a question and answer session. The second assessor and the supervisor(s) will mainly ask questions, the other panel members are also welcome to ask questions, if time is allowed. **All students should answer at least one question.** The panel members may ask a specific student to answer a question or leave the students to decide who will answer the question. Each student will be assessed on her/his knowledge of the whole project. The maximum presentation time is 20 minutes and no more than 10 minutes for question and answer. The score of this part is the average from the examiners, but the highest and the lowest scores are removed while calculating the average.

Grading System:

The credit is earned by the achievement of a grade from 'A' to 'D'; 'F' carries zero credit.

Grades are awarded according to the following system:

Letter Grades	Grade Points	Percentage
A	4.0 (Excellent)	93-100
A-	3.7 (Very good)	88-92
B+	3.3	83-87
B	3.0 (Good)	78-82
B-	2.7	73-77
C+	2.3	68-72
C	2.0 (Average)	63-67
C-	1.7	58-62
D+	1.3	53-57
D	1.0 (Pass)	50-52
F	0 (Fail)	Below 50

Appendix - Rubric for Programme Outcomes

Rubric for (a)	5 (Excellent)	3 (Average)	1 (Poor)
Understand the theoretic background	Student understands theoretic background and the limitations of the respective applications.	Student has some confusion on some background or does not understand theoretic background completely.	Student does not understand the background or does not study at all.
Use a correct model and formulation correctly	Student chooses a model correctly and properly applies correct techniques.	Student chooses a wrong model sometime, uses a wrong formula, or a different technique.	Student uses a wrong model and wrong formula, or does not know how to model.
Compute the problem correctly	Student uses correct techniques, analyzes the problems, and computes them correctly.	Student sometime solves problem mistakenly using wrong techniques.	Student does not know how to solve problems or uses wrong techniques completely.

Rubric for (b)	5 (Excellent)	3 (Average)	1 (Poor)
Implementation of experiments	Student successfully completes the experiments, records the data, and analyzes the experimental results precisely.	Student completes the experiments, records the data, and analyzes the experimental results.	Student either does not complete the experiments successfully, or completes it successfully but does not record the correct data.
Design of experiments	Student understands what needs to be tested and designs an appropriate experiment that takes into account the limitations of the equipment and measurement accuracy.	Student understands what needs to be tested and designs an appropriate experiment, but may not fully understand the limitations of the measurements.	Student does not understand what needs to be tested and/or does not design an appropriate experiment.

Rubric for (c)	5 (Excellent)	3 (Average)	1 (Poor)
Design capability and design constraints	Student understands very clearly what needs to be designed and the realistic design constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	Student understands what needs to be designed and the design constraints, but may not fully understand the limitations of the design constraints.	Student does not understand what needs to be designed and the design constraints.
Process to meet desired needs	Student understands very clearly the design process.	Student understands what the needs of the design process, but may not fully understand the limitations of the design constraints.	Student does not understand the design process.

Rubric for (d)	5 (Excellent)	3 (Average)	1 (Poor)
Ability to work in teams	Performance on teams is excellent with clear evidence of equal distribution of tasks and effort as well as frequent meetings of the team members.	Performance on teams is acceptable with one or more members carrying a larger amount of the effort as well as infrequent meetings of the members or one or more members being absent from several meetings.	Performance on teams is poor to unacceptable with one or two members clearly carrying the majority of the effort as well as inadequate team meeting or one or more members missing the majority of the meetings.

Rubric for (e)	5 (Excellent)	3 (Average)	1 (Poor)
Identify problems in engineering systems	Student understands problem and can identify fundamental formulation.	Student understands problem but cannot apply formulation.	Student cannot identify problems.
Modeling, problem formulation and problem solving	Student chooses and properly applies the correct techniques.	Student models correctly but cannot select proper technique or models incorrectly but solves correctly accordingly.	Student does not know how to solve a problem.

Rubric for (f)	5 (Excellent)	3 (Average)	1 (Poor)
Professional engineering practice	Understand how to criticize and analyze tradeoffs and constraints with respect to research issues of credit and authorship, integrity of data, and informed consent.	Have knowledge of credit and authorship, integrity of data, and informed consent but cannot completely identify ownership in practice.	No awareness of credit and authorship, integrity of data, and informed consent.
Group relations	Understand how to criticize and analyze tradeoffs and constraints with respect to conflict of interests, bribery, professional dissent, authorship, and discrimination.	Have partial knowledge of conflict of interests, bribery, professional dissent, authorship, discrimination but cannot apply it in practice correctly.	No awareness of conflict of interests, bribery, professional dissent, authorship, and discrimination.

Rubric for (g)	5 (Excellent)	3 (Average)	1 (Poor)
Illustration component	Students can properly use engineering drawings or graphics to present their ideas and technical contents clearly, and all the illustrations are nearly error free.	Students can demonstrate the use of engineering drawings or graphics to present their ideas and technical contents, and some illustrations have minor mistakes.	Students cannot properly use engineering drawings or graphics to present their ideas and technical contents.
Written component	Document is nearly error free with sophisticated use of vocabulary, formatted properly, with well-developed concise sentences and paragraphs.	Document contains some errors with a somewhat colloquial vocabulary, minor formatting issues, with some organizational issues that do not interfere with communication.	Document contains many errors, very colloquial vocabulary, with severe organizational issues that interfere with communication.
Oral component	Presentation is consistent, uniform, clear, direct, complete and captivating with very clear fonts and graphics with an excellent layout that clearly presents the technical content.	Presentation is somewhat inconsistent between speakers, occasionally difficult to hear, with an acceptable layout containing acceptable fonts and graphics that adequately presents the technical content.	Presentation is very inconsistent between speakers, difficult to hear with a poor layout containing illegible fonts and graphics that poorly presents the technical content.

Rubric for (h)	5 (Excellent)	3 (Average)	1 (Poor)
Workshop, workplace or lab safety	Demonstrate a good understanding of workshop, workplace or lab safety in practice.	Demonstrate a little knowledge of workshop, workplace or lab safety in practice.	No awareness of workshop, workplace or lab safety.
Board consideration in engineering project	The design/process considers the aspect of environmental protection, health and safety issues.	The design/process demonstrates a minor consideration of environmental protection, health and safety issues.	No health, safety and environmental consideration at all.

Rubric for (i)	5 (Excellent)	3 (Average)	1 (Poor)
Research/ gathering information	Comprehensive collection of information on a subject, including state-of-the-art and background.	Collects adequate information on a subject.	Collects minimal information on a subject.
Analysis/ evaluation	Detailed analysis accounting for all the information; the conclusions are well-supported.	Some analyses are done but somewhat shallow; some supporting evidences are available.	Analysis simply involves restating gathered information; the claims are not supported by evidences.

Rubric for (j)	5 (Excellent)	3 (Average)	1 (Poor)
Relevance to the present time	Student displays an understanding of the theoretical or practical impact and an ability to correlate a subject, perception, communication, association and reasoning from a global and societal perspective.	Student is able to display an understanding of current topics and issues with some knowledge regarding their impact in a bigger global and societal sense.	Student has difficulty demonstrating an awareness or familiarity with current topics and issues relevant to most current global and societal affairs.

Rubric for (k)	5 (Excellent)	3 (Average)	1 (Poor)
Use modern hardware tools in engineering practice	Student uses the hardware to measure and/or build engineering systems/designs correctly, and understands the limitations of the hardware.	Student uses the hardware to measure and/or build engineering systems/designs correctly.	Student does not use the hardware correctly.

Rubric for (l)	5 (Excellent)	3 (Average)	1 (Poor)
Use modern computer and software tools in engineering practice	Student uses the computer and software to correctly analyze engineering problems and/or create engineering solutions, and understands the limitations of the software.	Student uses the computer and software to correctly analyze engineering problems and/or create engineering solutions.	Student does not use the computer and software to correctly create engineering solutions and/or does not correctly interpret the results.