

University of Macau
Department of Electromechanical Engineering
MECH487 – Electrical Services
Syllabus
2nd Semester 2010/2011
Part A – Course Outline

Required elective course in Electromechanical Engineering

Course description:

3 credits. Electrical service is one of the major parts in building services. The aim of this course is to introduce the fundamental principles and design applications of electrical services in buildings. The course will cover the followings. Overview of electrical services in building, introduction of the IEE Wiring Regulations and Code of Practice for the Electricity (wiring) Regulations, fundamental principles and design applications of electrical installations, electricity distribution in buildings, interconnection facilities, protective devices, protection against direct & indirect contacts, cable management, lightning protection, metering, earthing, bonding and reliability of electricity supply.

Prerequisite:

MECH205 – Electrical Engineering

Textbook:

- *Requirement for Electrical Installations*, Latest Edition, The IET

Reference:

- Code of Practice for the Electricity (Wiring) Regulations, Latest Edition, HKSAR Government

Course objectives:

1. Introduce to students some components of building electrical systems. [c, k]
2. Introduce to students design of building electrical systems. [a, b, e]

Topics covered:

1. Overview of electrical services in buildings
2. Introduction of the IEE Wiring Regulations
3. Introduction of the Code of Practice for the Electricity (wiring) Regulations
4. Fundamental principles and design applications of electrical installations
5. Electricity distribution in buildings
6. Interconnection facilities
7. Protective devices
8. Protection against direct & indirect contacts
9. Cable management
10. Lightning protection
11. Metering
12. Earthing
13. Bonding
14. Reliability of electricity supply

Class/practice schedule:

Two hours lecture and two hours practice per week (14 weeks)

Contribution of course to meet the professional component:

This course prepares students to work professionally in the area of **Building Services Engineering**.

Relationship to EME program objectives and outcomes:

This course primarily contributes to Electromechanical Engineering Program outcomes that develop student abilities to:

- (a) an ability to apply knowledge of mathematics, science, and engineering.
- (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.

The course secondarily contributes to Electromechanical Engineering program outcomes that develop student abilities to:

- (b) an ability to design and conduct experiments, as well as to analyze and interpret data.
- (e) an ability to identify, formulate, and solve engineering problems.
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course content:

30% Maths & Basic Science; 30% Engineering Science; 40% Design

Course coordinator:

Mr. Seng Kin Lao

Persons who prepared this description:

Dr. Tze Wood Ching, Mr. Seng Kin Lao, Prof. Pak Kin Wong, 14 July 2010

Part B General Course Information and Policies

2nd Semester 2010/2011

Instructor: Dr. Tze Wood Ching
Office Hour: By appointment
Email: twching@umac.mo

Office: N302
Phone: (853) 8397-4352

Time/Venue:

TBA

Assessment:

Final assessment will be determined on the basis of:

Homework: 10 %
Mini Project/Lab Report: 10%
Mid-term I: 20%
Mid – term II: 20%
Final Exam (Comprehensive) : 40%

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

Comment:

The objectives of the lectures are to explain and to supplement the text material. Students are responsible for the assigned material whether or not it is covered in the lecture. Students who wish to succeed in this course should read the assignments prior to the lecture and should work all homework and lab assignments. You are encouraged to look at other sources (other texts, etc.) to complement the lectures and text.

Homework Policy:

The completion and correction of homework is a powerful learning experience; therefore:

- There will be approximately 5 homework assignments.
- Homework is due one week after assignment unless otherwise noted, no late homework is accepted.
- Possible revision of homework grades may be discussed with the grader within one week from the return of the marked homework
- The course grade will be based on the average of the homework grades.

Quizzes/Mid-terms Exams:

Two mid-term exams will be held during the semester.

Note:

- Replaced by “*Electrical Services-Wiring and Installations*” in new system, i.e. last course will be offer in 2nd Semester 2013/2014.
- Recitation session is important part of this course and attendance is strongly recommended.
- Check UMMoodle (webcourse.umac.mo) or email for announcement, homework and lectures.
- No make-up exam is give except for CLEAR medical proof.
- No exam is given if you are 15 minutes late in the midterm exams and 30 minutes late in the final exam. Even if you are late in the exam, you must turn in at the due time.
- Cheating is absolutely prohibited by the university.

Appendix - Rubric for Program Outcomes (a) to (l)

Rubric for (a)	5 (Excellent)	3 (Average)	1 (Poor)
Understand the theoretic background	Students understand theoretic background and the limitations of the respective applications.	Students have some confusion on some background or do not understand theoretic background completely	Students do not understand the background or do not study at all
Use a correct model and formulation correctly	Students choose a model correctly and properly apply correct techniques	Students choose a wrong model sometime, use a wrong formula, or a different technique	Students use a wrong model and wrong formula, or do not know how to model
Compute the problem correctly	Students use correct techniques, analyze the problems, and compute them correctly	Students sometime solve problem mistakenly using wrong techniques	Students do not know how to solve problems or use wrong techniques completely

Rubric for (b)	5 (Excellent)	3 (Average)	1 (Poor)
Conduct experiments	Student successfully completes the experiment, records the data, analyzes the experiment's main topics, and explains the experiment concisely and well.	Student successfully completes the experiment, records the data, and analyzes the experiment's main topics.	Student either does not complete the experiment successfully, or completes it successfully but does not record the correct data.
Design 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 process of the design	Student understands what the needs of the process design, but may not fully understand the limitations of the design constraints	Student does not understand the 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.
Multi-disciplinary teams	Team consists of members from two or more different engineering/science/business fields (this could contain some members not actually enrolled in the course but interacting as part of a competition, collaboration, etc.)	Team consists of members from two or more concentrations within the Department of Electromechanical Engineering	Team consists of members from the same concentration within the Department of Electromechanical Engineering

Rubric for (e)	5 (Excellent)	3 (Average)	1 (Poor)
Identify applications in engineering systems	Students understand problem and can identify fundamental formulation	Students understand problem but cannot apply formulation.	Students cannot identify correct terms for engineering applications
Modeling, problem formulation and problem solving	Students choose and properly apply the correct techniques	Students model correctly but cannot select proper technique or model incorrectly but solve correctly accordingly	Students at loss as to how to solve a problem

Rubric for (f)	5 (Excellent)	3 (Average)	1 (Poor)
Design	Understand how to critique and analyze design tradeoffs and constraints with respect to safety, liability, and integrity of data, and context of use	Have knowledge of safety, liability, and integrity of data, and context of use but cannot analyze thoroughly	No awareness of importance of safety, liability, and integrity of data, and context of use
Professional Engineering Practice	Understand how to critique 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 practical	No awareness of credit and authorship, integrity of data, and informed consent
Group Relations	Understand how to critique and analyze tradeoffs and constraints with respect to conflict of interest, bribery, professional dissent, authorship, and discrimination	Have partial knowledge of conflict of interest, bribery, professional dissent, authorship, discrimination but cannot apply it in practice correctly	No awareness of conflict of interest, bribery, professional dissent, authorship, and discrimination

Rubric for (g)	5 (Excellent)	3 (Average)	1 (Poor)
Professional Impact	Student's/Team's/Group's document(s)/presentation(s) is/are considered to be of professional quality	Student's/Team's/Group's document(s)/presentation(s) is/are considered acceptable for college level work	Student's/Team's/Group's document(s)/presentation(s) is/are considered unacceptable for college level work
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. Document would be considered unacceptable.
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. Would be considered unacceptable

Rubric for (h)	5 (Excellent)	3 (Average)	1 (Poor)
Scope of Content	Students will demonstrate material, items, or topics characterized by a sophisticated array of information, insight, and understanding.	Students demonstrate significance reflecting an acceptable degree of perception and thoughts.	Students have limited abilities to relate, incorporate, or demonstrate knowledge of subject with a dynamic breadth.
Impact of Process	Students will employ techniques, designs, ideas, and knowledge demonstrating a profound ability to improve and possess broad applications with a keen a series of actions, changes, or functions	Techniques, designs, ideas, and knowledge present some understanding and ability to demonstrate progression, significance, and influence.	Techniques, designs, ideas, and knowledge present limited progression, significance, and influence

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, conclusions are well supported	Some analysis done but somewhat shallow; some supporting evidence	Analysis simply involves restating gathered information; claims not supported by evidence

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 designs, and understands the limitations of the software.	Student uses the computer and software to correctly analyze engineering problems and/or create engineering designs.	Student does not use the computer and software to correctly create engineering designs and/or does not correctly interpret the results.