A- Basic Information

Course Title: Power Electronics (1) **Code**: EP313
Lecture: 4 **Tutorial**: 2 **Practical**: - **Total: 6**
Program on which the course is given: B.Sc. Electrical Engineering (Electrical Power and Machines)
Major or minor element of program: N. A.
Department offering the program: Electrical Engineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: **Third** Year / **First** Semester
Date of specifications approval: 10/5/2006

B- Professional Information

1. Overall aims of course:

By the end of the course the students will be able to:

- Understand the broad classifications of power electronics converters and its applications
- Understand types and the behaviour of power electronics switches
- Understand electric power computations techniques in power electronics circuits.
- Analyze the different single-phase and three-phase rectifier circuits
- Analyze single-phase and three-phase voltage-source inverter circuits

2. Intended learning outcomes of course (ILOs)

a. Knowledge and Understanding:

a.1) Concepts and theories of mathematics and sciences, appropriate to the discipline.
a.3) Characteristics of engineering materials related to the discipline.

a.4) Principles of design including elements design, process and/or a system related to specific disciplines.
a.5) Methodologies of solving engineering problems, data collection and interpretation.

b. Intellectual Skills

b.1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems.
b.2) Select appropriate solutions for engineering problems based on analytical thinking.
b.4) Combine, exchange, and assess different ideas, views, and knowledge from a range of sources.
b.5) Assess and evaluate the characteristics and performance of components, systems and processes.

c. Professional and practical skills

c.1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
c.7) Apply numerical modeling methods to engineering problems.

d. General and transferable Skills

d.1) Collaborate effectively within multidisciplinary team.
d.3) Communicate effectively.
d.7) Search for information and engage in life-long self learning discipline.

3. Contents

Week No.	Topic	No. of hours	ILOs	Teaching/learning methods and strategies	Assessment method
1	Classification of power electronics converters	6	a1,b5	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
2	Power semiconductors switches	6	a1,a3,b5	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
3	Power semiconductors switches	6	a1,a3,b5	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
4	Analysis of single-phase half-wave rectifier circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
5	Analysis of single-phase half-wave rectifier circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
6	Analysis of single-phase full-wave rectifier circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
7	Analysis of single-phase full-wave rectifier circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
8	Mid-term exam				
9	Analysis of rectifier circuits with non-ideal AC supply	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam

10	Analysis of three-phase rectifier circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
11	Analysis of three-phase rectifier circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
12	Analysis of three-phase rectifier circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam

13	Analysis of inverter circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
14	Analysis of inverter circuits	6	a3,a4,a5,b1,b2, c1,c7,d1,d3,d7	Lectures, Practical training / laboratory, Class activity, Case study, Assignments / homework	Home Assignments, Quizzes, Oral Exam
15	Final exam				
16					

4. Teaching and Learning Methods

Lectures
Practical training / laboratory
Class activity
Case study
Assignments / homework

5. Student Assessment Methods

Assignments to assess knowledge and intellectual skills.
Quiz/Reports to assess knowledge, intellectual and professional and practical skills.
Mid-term exam to assess knowledge, intellectual skills and professional and practical skills.

Final exam to assess knowledge, intellectual skills and professional and practical skills.

6. Assessment Schedule

Assessment 1 Biweekly assignments
Assessment 2 Quizes/Reports on week 4, 6, 10, 12
Assessment 3 Mid-term exam on week 8
Assessment 4 Final exam on week 15

7. Weighting of Assessments

Mid-term examination	20%
Home assignments	10%
Quizzes/report	10%
Final-term examination	60%
Total	100%

8. List of References

8.1 Course Notes

Handout prepared by instructors.

8.2 Essential books Text Books)

- D. W. Hart, Introduction to power electronics, John Wiley sons, 1997.
- M. H. Rashid, Power Electronics: Circuits, Devices, and Applications, 3rd Ed., Prentice Hall, 2004

8.3 Recommended books

- P.C Sen, Principles of Electric Machines & Power Electronics, John Wiley sons, 1997.

8.4 Web sites

- Interactive Power Electronics Seminar by Swiss Federal Institute of Technology Zurich: http://www.ipes.ethz.ch/ipes/e_index.html

- Interactive Power Electronics online text by University of Technology Sydney, Australia
- http://services.eng.uts.edu.au/~venkat/pe_html/contents.htm
- Interactive Power Electronics Online Course by Power Designers, USA
  http://www.powerdesigners.com/InfoWeb/resources/pe_html/contents.htm

9. Facilities Required for Teaching and Learning

Presentation board
Computer and data show
Laboratory setups

Course coordinator: Prof. Dr. Hamed Galal Hamed
Course instructors: Prof. Dr. Hamed Galal Hamed and Assoc. Prof. Hassan Abdel-Aziz
Head of Department: Prof. Dr. Mousa Abd-Allah **Date: 8 / 12 / 2011**