Fakulteit Ingenieurswese, Bou-omgewing & IT

Faculty of Engineering, Built Environment & IT

School of Engineering
Skool vir Ingenieurswese

Dept. EEC Engineering
Dept. EER Ingenieurswese

Energy Management 732

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UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

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ORGANISATIONAL COMPONENT

1. Introduction

Welcome to a brand new, bumper packed course in energy management, which is vastly different to its predecessor presented the past number of years. My name is Werner Badenhorst, full-time lecturer at the Department for the past 7 years, finally wrapping up my dissertation in Model Predictive Control of Deep Level Mine Rock Winders. Apart from doing contract work in Energy Management studies and audits in the mining environment, I have also recently successfully completed the Certified Energy Manager Course of the Energy Training Foundation of EnergyCybernetics. My undergraduate teaching includes(d): Microprocessors, Energy Management, Electrical Machines and Power System Analysis.

The objective of this course is to provide an introduction into the field of energy management in both electrical and thermal utilities encountered in industry. Due to the number of utilities used in industry it is not possible to do an in depth study of each. The idea is to become familiar with the basic concepts, terminologies and methodologies in a number of the primary utilities and also in the performance assessment of some.

As this is the first time the course will be presented in both format and content, I trust that this course will be a good and productive learning curve and experience for us all. Your continuous input and feedback will be much appreciated and the sooner it is given, the sooner the course can be adapted.

2. Lecturer and Secretary

	Name	Office	Telephone and Email
Lecturer	Mr. Werner Badenhorst	Eng I 14-14	Tel: 012 420 2587 Fax: 012 362 5000 werner.badenhorst@eng.up.ac.za
Secretary	Mrs. Heleen Gous	Eng I 14-6	Tel 012 420 2190 heleen.gous@eng.up.ac.za

3. The Big Picture

Energy Management (EM) has many definitions of which a good one can be found in the study material s1.3 p 54:

"The objective of Energy Management is to achieve and maintain optimum energy procurement and utilisation, throughout he organization and:

- To minimise energy costs / waste without affecting production & quality
- To minimise environmental effects."

To achieve the above one needs to:

- Know, understand and compare the various energy sources available.
- Understand energy and power billing.
- Understand the particular organization's structure and setup.
- Understand the production / manufacturing processes or utilities and how these affect the quality of the product.
- Be able to determine the impact on the environment of the various EM decisions.
- Bring it all back to a financial decision: Is this EM project financially viable?

4. Educational Approach

This course as most other post graduate courses follows in essence a self study approach with the lecturer as a facilitator in providing:

- A suggested schedule of study.
- Assignments to be completed during the semester.
- A brief discussion and summary of work covered up until the block week.
- A test to be written at the end of each block week.
- An exam assignment to be completed at the end of the course.
- Consultation by appointment.

Do not enter this course with an undergraduate mindset of memorising. This course should serve as a point of departure from where you can start looking for answers and methodologies for particular scenarios that will cross your path in your specific working environment. It also serves as a platform from where to further your postgraduate studies in either a Masters' Dissertation or Doctoral Thesis.

A complete class list with contact and residential details will be posted for those who would like to have group discussions.

5. Study Material

This study guide along with all study material, assignments, notices etc will be made available on the web. Go to www.ee.up.ac.za then follow the links: Postgraduate » Modules » EES732 Energy Management. I will however also communicate all notices and announcements via e-mail, so please provide me with your preferred email address should it be different than the one on the current class list.

You will notice that the material we will be using is from the Indian Bureau of Energy Efficiency's National Certificate Examination for Energy Managers and Energy Auditor. The content is however universal except for references made to standards and policies which are applicable in India but for which South African counterparts exist. We have however decided to exclude some of the content and re-arrange some of the content to better suite our needs and objectives.

6. Assessment Procedures

Assignments (30 %)

Ass. 1 on Sections: 1.1, 1.2, 1.3, 1.5, 1.6+4.11 and 1.8.	Due: Wed 12 August
Ass. 2 on Sections: 2.1, 2.2+4.5, 2.3+4.8 and 2.4+4.9.	Due: Wed 9 September
Ass. 3 on Sections: 2.6+4.7, 2.8+4.10, 2.9 and 2.10.	Due: Wed 30 September
Ass. 4 on Sections: 3.1, 3.2, 3.3, 3.5, 3.7 and 3.8.	Due: Wed 28 October

Tests (20 %)

Test 1 in Block Week 1 (10%):
Sections: 1.1, 1.2, 1.3, 1.5, 1.6 + 4.11, 1.8, 2.1 and 2.2 + 4.5.

Test 2 in Block Week 2 (10%):
Sections 2.3 + 4.8, 2.4 + 4.9, 2.6 + 4.7, 2.8 + 4.10, 2.9, 2.10, 3.1, 3.2 and 3.3

Examination Assignment (50%)
The examination assignment will be posted on Wednesday 11 November and will be due Friday 13 November. It must be typed and submitted in either Word or PDF format via e-mail to reach me by 23:00 on Friday 13 November.

Hence:

4x Assignments at 7.5% each	30%
2x Tests at 10 % each	20%
1x Exam Assignment	50%
TOTAL	100%

STUDY COMPONENT

1. Study Themes

Section 1: General Aspects of Energy Management and Energy Audit

S1.1: Energy Scenario (25 pages)
S1.2: Basics of Energy and its various forms (18 pages)
S1.3: Energy Management and Audit (25 pages)
S1.5: Energy Action Planning (28 pages)
S1.6, S4.11: Financial Management and Performing Financial Analysis (27 pages)
S1.8: Energy Monitoring and Targeting (12 pages)

Section 2: Energy Efficiency in Electrical Utilities

S2.1: Electrical Systems (24 pages)
S2.2, S4.5: Electric Motors and Variable Speed Drives (35 pages)
S2.3, S4.8: Compressed Air Systems (34 pages)
S2.4, S4.9: HVAC and Refrigeration Systems (30 pages)
S2.6, S4.7: Pumps and Pumping Systems (30 pages)
S2.8, S4.10: Lighting Systems (20 pages)
S2.9: Diesel Generating Systems (14 pages)
S2.10: Energy Efficient Technologies in Electrical Systems (11 pages)

Section 3: Energy Efficiency in Thermal Utilities

S3.1: Fuels and Combustion (26 pages)
S3.2: Boilers (28 pages)
S3.3: Steam Systems (34 pages)
S3.5: Insulation and Refractories (23 pages)
S3.7: Cogeneration (32 pages)
S3.8: Waste heat recovery (13 pages)

2. Proposed work and study schedule.

Week	Starting date	Sections	Assignment No and Due date
1 & 2	13 and 20 Jul	s1.1, s1.2, s1.3, s1.8 (80 pages)	
3 & 4	27 Jul and 3 Aug	s1.5, s1.6+4.11, s2.1 (79 pages)	
5	10 Aug	s2.2+4.5 (35 pages)	Ass. 1 Due
	17 Aug	Block Week 1	
6 & 7	24 and 31 Aug	s2.3+4.8, s2.4+4.9, s2.8+4.10 (84 pages)	
8 & 9	7 and 14 Sep	s2.6+4.7, s2.9, s2.10, s3.1 (71 pages)	Ass. 2 Due
10 & 11	21 and 28 Sep	s3.2, s3.3 (62 pages)	Ass. 3 Due
	5 October	Block Week 2	
12 - 13	12, 19 Oct	s3.5, s3.7, s3.8 (54 pages)	
14	26 Oct		Ass. 4 Due