ESE-833: Industrial Energy Management

Background

1. Industry energy management has become a widely accepted practice in various developed and developing world. It enables the industries and the economies to reduce their energy costs and associated greenhouse emissions while increasing the profits and market competitiveness. Industrial sector of Pakistan needs to adopt best practices in the field of energy management. It will help the country in reducing its reliance on imported energy resources e.g. oil and gas and increase its exports.

2. **Rationale**

   a. To equip the students with knowledge and expertise in the field of industry energy management

   b. To enable USPCASE to become leading educational institute with expertise in the field of industrial energy management

3. **Educational Objectives**

   a. Elaborate the fundamental concepts of energy management

   b. Discuss the best practices adopted in industry to achieve energy efficiency

   c. To prepare students to carryout research in the field of energy efficiency and management

   d. To develop necessary expertise and infrastructure in USCPASE to undertake industrial projects to improve energy efficiency and energy management

Input Obtained from Industry/Corporate Sector/Subject Specialists/Academia

4. The working paper has been sent to the following personals for their valuable feedback.

   a. Dr. Rene Villalobos, Director Industrial Assessment Center (IAC), Arizona State University (ASU).

   b. Dr. Irfan Mufti, Professor, Mechanical Engineering Department, UET Peshawar.

   c. Muhammad Farooq, CEO Energy Saving Solutions, Lahore.

International Practice

4. Specify the universities of repute where the proposed course is being conducted.

a. University of Maryland, USA

b. New York Institute of Technology – Vancouver Campus, Canada

c. Royal Institute of Technology (KTH), Sweden

Proposed Timeframe of Commencement

6. Spring Semester 2019 (Elective course in MS degree programs in ESE, TEE and EP)

Course Contents

7. Give details of the course, on the following lines:

a. Course Code ESE-833

b. Title Industrial Energy Management

c. Credit Hours 3

d. Objectives

8. The objectives of this course are:

a. Elaborate the fundamental concepts of energy management

b. Learn the best practices adopted in industry to achieve energy efficiency

c. To prepare students to carryout research in the field of energy efficiency and management

d. To develop necessary expertise and infrastructure in USCPASE to undertake industrial projects to improve energy efficiency and energy management.

Outcomes

9. The course should enable students to:

a. Understand the importance of energy efficiency and energy management

b. Perform Industrial energy audits and identify energy conservation measures

c. Develop comprehensive energy management plan for an industry

10. **Contents with suggested contact hours:**

No.	Topics	Semester Weeks	Contact Hours
	Fundamentals of Energy Management • Introduction to Energy Management	1 Week	3

1.	• Economic and Environmental Benefits		
2.	Energy Auditing 3. Types and Procedures of Energy Audits 4. Energy Audit Instruments	2 Weeks	6
3.	Economic Analysis and Life Cycle Costing 6. Present Value (PV), Future Value (FV) and Annual Value (AV) 7. Net Present Worth (NPV) 8. Internal Rate of Return (IRR) 9. Life Cycle Costing (LCC)	2 Weeks	6
4.	Electrical Systems, Electric Motors and Drives 11. Single Phase and Three Phase AC Systems 12. Power Factor, Power Quality, Harmonics 13. Types of Electric Motors 14. Electric Motors Energy Management	2 Weeks	9
5.	Energy Efficient Buildings: 15. Building Envelope 16. HVAC Systems 17. Thermal Energy Storage 18. Maintenance and Building Commissioning 19. Building Automation and Controls	2 Weeks	6
6.	Boilers and Steam Systems • Boiler Rating Systems, Boiler Controls, Key Efficiency Issues • Combustion Nomograms • Common Energy Measures • Steam Distribution Systems • Energy Conservation Measures	1 Week	3
7	Compressed Air and Pump Systems	2 Weeks	6

	• Compressed Air Usage and Major Areas of Waste • Leak Tables • Compressor Control Strategies and Energy Saving Ideas • Pump and System Curves • Energy Conservation Measures		
8.	CHP Systems and Renewable Energy • Distributed Generation • Combined Heat and Power (CHP) Design • RE Technologies relevant to Industrial Applications • Net Metering	1 Week	3
9.	Financing, Performance Contracting, Measurement and Verification • Options for Financing • Performance Contracting and ESCOs • Measurement and Verification (Baseline and Savings) • ASHRAE, US DoE and IPMVP Guidelines	1 Week	3
10	Case Studies	1 Week	3
	Total	15 Weeks	45

11. Details of lab work, workshops practice (if applicable).

No lab is required.

No	Title	Author	Type
1.	Guide to Energy Management, 8th Edition - International Version , ISBN: 0-88173-773-9	Barney L. Capehart , William J. Kennedy, Wayne C. Turner	Reference Book
2.	Energy Management Handbook, 8th	Steve Doty, Wayne C. Turner	Reference

	Edition ISBN: 0-88173-707-0		Book
3.	Handbook of Energy Engineering, 7th Edition ISBN: 0-88173-695-3	Albert Thumann, P.E., C.E.M. and D. Paul Mehta, Ph.D.	Reference Book
4.	Energy Calculations & Problem Solving Sourcebook: A Practical Guide for the Certified Energy Manager Exam. ISBN: 0-88173-763-1	Scott Dunning, Ph.D., P.E., C.E.M., and Larry Katz, C.E.M., C.M.V.P.	Reference Book