

Hong Kong Baptist University
Faculty of Science – Department of Physics

Title (Units): **PHYS 4056 ENERGY MANAGEMENT I (3,3,1)**

Course Aims: This course explores the basic energy management strategy to streamline energy flow and maximize energy usage efficiency in daily life. Complementary to supply-side management topics covered in PHYS 2025/2026 Renewable Energy Sources and Technologies I/II, this course will focus on demand-side management, including economics models, energy audit procedure, and energy management related scientific and engineering foundations.

Pre-requisites: Year 4 standing or consent of instructor.

Course Reviewed by: Dr. Junxue Fu & Dr. Jue Shi

Course Intended Learning Outcomes (CILOs):

No.	Upon successful completion of this course, students should be able to:
1	Discuss the complex relationship between various components of energy management from both the supply-side and the demand-side.
2	Apply the economics method in energy management applications so as to make high efficiency and low risk decisions.
3	Explain the principle and practice of energy auditing.
4	Explain energy management related engineering topics such as lighting system, electric motor etc..

Teaching & Learning Activities (TLAs)

CILOs	TLAs will include the following:
1-3	Lectures will highlight the scientific and economic principles of various energy management processes.
4	Lectures will highlight the scientific and engineering principles of various energy usage elements in buildings.

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Assessment Methods (AMs):

Type of Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
Continuous Assessment	25%	1-4	Midterm exam and assignments are designed to guide the student learning process.
Term paper & Presentation	25%	1-4	A term paper of 5-25 pages and a 15min group oral presentation for the project is required to examine how extensively the students have understood the relevant areas and to evaluate their scientific and technological presentation skills.
Final Examination	50%	1-4	Final Examination questions are designed to test how far students have achieved their intended learning outcomes. Questions will primarily be analysis and skills-based in order to assess the students' problem-solving capability in real-life situations.

Learning Outcomes and Weighting:

Content	CILO No.	Teaching (in hours)
I. Basic topics in energy management and their inter-relationships	1	3
II. Economics method, decision making and risk assessment.	2	6
III. Energy Audit process	3	6
IV. Engineering topics in Energy Audit	4	21

Textbook:

1. Frank Kreith, D. Yogi Goswami, editor: *Energy Management and Conservation Handbook*, CRC Press, 2008.

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References:

1. B.L. Capehart, W.C. Turner, and W.J. Kennedy; Guide to Energy Management; 7th Ed., The Fairmont Press Inc. 2011

1. Andrew D. Althouse, Carl H. Turnquist, et al. : Modern Refrigeration and Air Conditioning (Modern Refridgeration and Air Conditioning), Goodheart-Willcox; Twentieth Edition, Textbook edition (January 29, 2016) .
2. James E. Brumbaugh: Audel HVAC Fundamentals, Volume 1: Heating Systems, Furnaces and Boilers, All New 4th Edition, Audel; 4 edition (February 27, 2004)
3. Susan M. Winchip: Fundamentals of Lighting: Studio Instant Access 3rd Edition, Fairchild Books; 3 edition (January 12, 2017)
4. Austin Hughes: Electric Motors and Drives: Fundamentals, Types and Applications 5th Edition, Newnes; 5 edition (August 18, 2019)
5. B.L. Capehart, W.C. Turner, and W.J. Kennedy; Guide to Energy Management; 7th Ed., The Fairmont Press Inc. 2011

Course Content in Outline:

	Topic	Hours
I.	Basic topics in energy management and their inter-relationships	3
II	Economics method, decision making and risk assessment.	6
	A. Economic decision analysis	
	B. Cost and benefit analysis	
	C. Rate of return	
III	Energy audit process	6
	A. Energy audit process	
	B. Energy cost structures	
IV	Engineering topics in Energy Audit	21
	A. Vapor-compression cycle	
	B. Lighting basics	
	C. Electric motors	