

Subject Description Form

Subject Code	BSE542
Subject Title	Energy Efficient Buildings
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Students who had previously taken the subject of BSE4417 are excluded.
Objectives	<p>To provide students with an overall view of energy use patterns in buildings, particularly large air-conditioned buildings, taking into account of environmental and economic factors.</p> <p>To enable students to understand the processes of energy audit and survey, including the use of appropriate instrumentation, in order to identify opportunities for energy conservation and demand limitation in existing buildings and in new designs.</p> <p>To enable students to integrate and to apply their knowledge of efficient operation of building services systems, to upgrade existing buildings and improve designs for new buildings.</p>
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. understand the energy use patterns in various types of buildings and the major energy end-uses; b. carry out energy audits and surveys based on established guideline, identifying energy management opportunities (EMO) and implementing them in priority order; c. predict the energy consumption of building HVAC systems using simplified steady-state model and evaluate the amount of energy that may be recovered from HVAC systems; d. apply building energy management principle to achieve highest possible building energy use performance; e. apply demand side management principle to achieve both energy and cost saving in operating buildings
Subject Synopsis/ Indicative Syllabus	<p>Overall building energy use: Overall view of energy use, energy source, supply and distribution; energy requirement and consumption in buildings, source, energy tariffs, usage pattern, maximum demand, seasonal variation; Hong Kong energy use data and statistics in building sector.</p> <p>Building energy audit and survey: Objectives and methodologies, preliminary audit and site survey, analysis of utility records, identification of areas for potential energy saving, detailed auditing and monitoring, instrumentation for energy audit in buildings and for major plant, building energy performance line.</p> <p>Building energy management: Energy management approaches, good housekeeping practice, plan for energy conservation programme, barriers to achieving building energy efficient operation, energy policies.</p>

	<p>Retrofitting and upgrading buildings for energy conservation: Identifying opportunity for retrofitting, building structure and services systems upgrade for energy conservation, projection of results of proposed retrofitting programme using modelling and computer simulation, economic analysis. 'Energy Star', 'Green Lights'.</p>																																												
<p>Teaching/Learning Methodology</p>	<p>The subject teaching will be realized through lecture, student based seminar and tutorial sessions. The intended subject outcomes will be mostly covered in lecture sessions, and reinforced by seminar sessions and tutorial sessions. For student seminar sessions, they will be required to prepare course work around these intended learning outcomes, although individual students may select a specific topic which is only relevant to one of the intended learning objectives.</p> <p>Industrial speakers who are experienced in improving energy efficiency in buildings will be invited to deliver special talks, presenting case studies and highlighting both the technical and managerial approaches to solving a practical problem.</p>																																												
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a.</th> <th>b.</th> <th>c.</th> <th>d.</th> <th>e.</th> <th></th> </tr> </thead> <tbody> <tr> <td>1. Coursework</td> <td>40%</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>2. Examination</td> <td>60%</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td colspan="6"></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <ul style="list-style-type: none"> • Open book examination format is adopted. Therefore students are expected to place efforts more on analysis and problem solving. This is preferable for Level 5 subjects; The intended learning outcomes will be embedded in setting examination questions. • Course work will be assessed via student presentation during seminar sessions and report submission. Students will have to go through Q and A sessions to test their understandings of fundamentals and demonstrate their masters of the intended learning outcomes. 							Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						a.	b.	c.	d.	e.		1. Coursework	40%	√	√	√	√	√		2. Examination	60%	√	√	√	√	√		Total	100%						
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<p>Reading List and References</p>	<p>A World Energy Council (1993). <i>Energy for Tomorrow's World</i>, A World Energy Council, St. Martins Press.</p> <p>ASHRAE (1989). <i>Handbooks and Standards</i>, e.g. Standard 90.</p> <p>Census and Statistics Department (1981 – 1995). <i>Hong Kong Energy Statistics</i>, Census and Statistics Department, Hong Kong.</p> <p>CIBSE (1991). <i>Energy Audits and Surveys</i>, CIBSE Application Manual AM5.</p> <p>Eastop, T. D. & Croft, D. R. (1990). <i>Energy Efficiency for Engineers and Technologists</i>, Longman Scientific & Technical.</p> <p>Electrical and Mechanical Services Department (2000). <i>Code of Practice for Energy Efficiency of Air-conditioning Installation</i>, Hong Kong: Electrical and</p>																																												

Mechanical Services Department, HKSAR Government.

Electrical and Mechanical Services Department (2000). *Code of Practice for Energy Efficiency of Lighting Installation*, Electrical and Mechanical Services Department, HKSAR Government.

Hong Kong Building Authority (1995). *Code of Practice on Overall Thermal Transfer Value (OTTV) in Buildings*, Hong Kong Building Authority, HKSAR Government.

Kreider, J. & Rabl, A. (1994). *Heating and Cooling of Buildings -- Design for Efficiency*, McGraw-Hill, Inc.

Meckler, M. (1994). *Retrofitting Buildings for Energy Conservation*, The Fairmont Press Inc.

Roaf, S & Hancock, M. (1992). *Energy Efficient Buildings*, Blackwell Scientific Publication Ltd.

Selected papers from CIBSE Journal, ASHRAE publications, etc.