

## Subject Description Form

<b>Subject Code</b>	BSE516
<b>Subject Title</b>	Building System Performance
<b>Credit Value</b>	3
<b>Level</b>	5
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	<p>This subject aims at:</p> <ol style="list-style-type: none"> <li>a. equipping students with the abilities required in evaluating key systems in high performance buildings, taking into consideration the updated research methodologies for performance characterization, system optimization and evaluation; and</li> <li>b. developing students' competence in making relevant decision on building system performance improvement and optimization.</li> </ol>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a. understand and interpret the results of building performance optimization and evaluation methods and models;</li> <li>b. evaluate new and existing building system performance for meeting a range of building performance objectives; and</li> <li>c. identify suitable performance improvement measures for building systems throughout the lifecycle with aid of concrete references.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b>Performance evaluation methods and models:</b> system lifecycle performance, energy and resource consumption, performance attributes and data analysis with statistical methods, mathematical modeling, correlations and regressions, Monte-Carol simulations, Bayesian analysis, cost-benefit analysis, index, benchmarks and ranks, optimization.</p> <p><b>Indoor environmental system performance evaluation:</b> performance indices for energy, quality and productivity, optimization functions and variables, optimal control for consumptions, performance and environmental quality, building automation system (BAS) assisted building lifecycle resource management, design options and case studies, web-based tools and apps.</p> <p><b>Water system performance evaluation:</b> System operations and control, water demands and performance demands, occupant loads, water supply systems and embedded energy of water use, heat recovery, water and energy efficiency and indicators, water saving measures, water conservation, design options and case studies.</p> <p><b>Facility Services system performance evaluation:</b> Provisions of services and demands, level of service, risk, reliability, availability, maintenance and replacement, occupant expectation, designs and case studies for transportation, evacuation, sanitation.</p>
<b>Teaching/Learning Methodology</b>	<ol style="list-style-type: none"> <li>a. Lectures will be delivered to introduce the system performance with methodologies and practical knowledge about optimization and evaluation in an interactive way;</li> </ol>

- b. Tutorials will be provided to supplement the lectures and to give students freedom in consultation and discussion with lecturers;
- c. Workshop, seminar and assignment will be organized to enable the students to apply what they learn in this subject to practical cases of building system performance evaluation and improvement;
- d. Students will be required to present their solutions and findings to their peers and lecturer(s);
- e. Terminal examination will be held to examine the learning outcomes of students.

**Assessment Methods in Alignment with Intended Learning Outcomes**

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a.	b.	c.			
a. In-class test, workshop & assignment	40%	✓	✓	✓			
b. Seminar	20%		✓	✓			
c. Written examination	40%	✓	✓	✓			
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

In-class test, workshop & assignment consisted of cases of various building systems and designs for performance evaluation against a range of system arrangements. They are used to assess the students the correct understanding and interpretation of building performance optimization and evaluation methods and models, and to determine appropriate measures for system improvements (outcome (a)), apply the results for system evaluation against the set range of performance objectives (outcomes (b) & (c)).

Seminar consisted of two assessment components: presentation and report. It allows students to present for selected building system(s) the investigation results and improvement proposal for holistic building performance in the building lifecycle (outcomes (b) and (c)).

Written examination is used to assess all outcomes (a), (b) & (c).

**Reading List and References**

Lal Jayamaha, Energy-efficient building systems: green strategies for operation and maintenance, New York: McGraw-Hill, 2007.

Pieter De Wilde, Building performance analysis, 1<sup>st</sup> Edition, Wiley, 2018.