

Subject Description Form

Subject Code	ARCH382
Subject Title	Sustainable Building Systems and Technology for Architects
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	BRE265 Introductory Construction Technology and Materials BSE2290 Introduction to Building Science and Engineering
Objectives	1. Introduce advanced and innovative building materials, design forms and construction technologies for high-rise buildings. 2. Channel the ideas of buildability in architectural design, and the possibility of wider adoption of modular design concepts and cutting construction technologies for buildings. 3. Foster understandings and adoption of cutting-edge technologies to enhance the performance of built environment on functional and users requirements.
Intended Learning Outcomes <i>(Note 1)</i>	Upon completion of the subject, students will be able to: a. Identify and understand advanced building materials and advanced building forms appropriate for high-rise and non-standard buildings. b. Compare and evaluate design options on building forms and building envelopes. c. Possess the knowledge and design principles on designing buildings with extensive adoption of modular design concepts. d. Identify the opportunities and solutions for environmental management and sustainable develop of building and built environment e. Evaluate the impacts of latest technology on sustainable building development.
Subject Synopsis/ Indicative Syllabus <i>(Note 2)</i>	Advanced construction materials – high strength/performance concrete, high strength/performance steel, sustainable timber for structural applications, 3-D printing in construction (2 weeks) Sub-structure – deep foundations and basement (21 weeks) Super-structure for high rise buildings (3 weeks) – - Typical structural systems for high-rise buildings – steel structures vs reinforced concrete structures, skeletons with core, outrigger structures, diagrid structures, composite structures, etc. - Long-span structures – space frame, surface structures, etc. - Building envelope systems for high rise buildings - claddings and curtain walls Modular / Industrialized buildings (2 weeks) – design principles & special issues, e.g., design for buildability, loading distribution, on site assembly, weather proofing at building envelope, coordination and integration with building services systems (MiC & MiMEP), etc.

	Sustainable Buildings (2 weeks) – functional and performance requirements, business opportunity and innovative sustainable solutions for built environment Sustainable Systems for Built Environment (2 weeks) – optimization of built environment, interactive response to outdoor environmental changes, energy conservation, carbon emission, carbon footprint control Assessment and monitoring of the performance of Built Environment (1 week) – BEAM plus assessment system, sensors and IoT devices for real-time monitoring and control																																																						
Teaching/Learning Methodology (Note 3)	The learning and teaching approaches for the subject comprises lectures, seminars/tutorials, and project in studio. Lectures aim at delivering core concepts and knowledges of respective topics whilst design details and special issues will be elaborated and discussed in the seminars / tutorials. Presentations by students on selected topics will also be arranged at tutorials. The inclusion of project work in studio facilitates students to apply theories and concepts to practical issues on design and construction of buildings. Teaching and Learning will be jointly provided by the Department of Building and Real Estate and the Department of Building Environment and Energy Engineering.																																																						
Assessment Methods in Alignment with Intended Learning Outcomes (Note 4)	<table><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><tr><td>1. Presentation</td><td>15%</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td></tr><tr><td>2. Project</td><td>20%</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td></tr><tr><td>3. Quiz / Test</td><td>15%</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td></tr><tr><td>4. Examination</td><td>50%</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></table> Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: Assessment for the subject comprises quiz/test, presentation, project and end-of-semester written examination. The overall split between continuous assessment and examinations is set at 50/50. Students must pass both the continuous assessment elements and the end-of-semester examination to pass the subject. Quiz/Test is for measuring the performance of students on grasping general principles and knowledges of the subject.	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						a	b	c	d	e		1. Presentation	15%	√	√	√	√	√		2. Project	20%	√	√	√	√	√		3. Quiz / Test	15%	√	√	√	√	√		4. Examination	50%	√	√	√	√	√		Total	100 %						
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	Oral presentations on specific topics on building systems serve to assess students' understanding on selected topics. Project intends to reinforcement and integrate students' learning from lectures and tutorials. Written examination aims to assess students' ability to apply concepts learned on solving issues.	
Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs.
	▪ Seminar / Tutorial	13 Hrs.
	Other student study effort:	
	▪ Project works in studio	21 Hrs.
	▪ Self-study	60 Hrs.
	Total student study effort	120 Hrs.
Reading List and References	<u>Recommended</u> Al-Kodmany & Al-Kodmany, (editor) (2022), <i>Sustainable high-rise buildings : design, technology, and innovation</i>, The Institution of Engineering and Technology, London. Brookes A.J. & Meijs M. (2008), <i>Cladding of Buildings</i>, 4th Edition, Taylor & Francis Building Construction Authority, Singapore, <i>Design for Manufacturing and Assembly – Prefabricated Prefinished Volumetric Construction</i>, Singapore. Buildings Department (2004/2023), <i>Code of Practice for Demolition of Buildings</i>, Hong Kong SAR Government Buildings Department (2016/2020), <i>Code of Practice for Precast Concrete Construction</i>, Hong Kong SAR Government Caldarone M. (2009). <i>High Strength Concrete: a Practical Guide</i>. Taylor & Francis Chew M. Y. L. (2018), <i>Construction Technology for Tall Buildings</i>, 5th edition, World Scientific. Choi H. S., Ho G., Joseph L. & Mathias N. (2017), <i>Outrigger design for high-rise buildings: an output of the CTBUH Outrigger Working Group</i>, Council on Tall Buildings and Urban Habitat Knaack U., Koenders E. & Alexandrakis E., (editors) (2018), <i>Building physics of the envelope: principles of construction</i>, Birkhauser, Basel	

	Marriage G. (editor) (2020), <i>Tall: The Design and Construction of High-Rise Architecture</i>, Routledge. Parker D. & Wood A. (editor) (2015), <i>The Tall Buildings Reference Book</i>, Routledge & Council on Tall Buildings and Urban Habitat Pyo S. (2022), <i>High Performance Concrete</i>, MDPI, Basel. <u>Supplementary</u> Ascher K. (2011), <i>The Heights – Anatomy of a Skyscraper</i>, Penguin. Buildings Department, <i>Various PNAP, PNRC, Circular Letters</i>, HKSAR Government Council on Tall Buildings and Urban Habitat (1995), <i>Architecture of Tall Buildings</i>, America: McGraw Hill. Crotty (2012), <i>The impact of Building Information Modelling: Transforming Practices</i>, Spon. Development Bureau, (2018), <i>Constriction 2.0 – Time to Change</i>, Development Bureau, Hong Kong SAR Government. Green M. & Taggart J., author. (2021), <i>Tall Wood Buildings: design, construction and performances</i>, Birkhauser, Basel. MacAlevy (2020), <i>Preliminary Design of High-Rise Buildings in Non-Seismic Regions</i>. Mamlouk, M.S. (2011) <i>Materials for civil and construction engineers</i>. 3rd Edition. Prentice Hall Nunnally, S.W. (2011) <i>Construction Methods and Management</i>. 8th Edition. Prentice Watts A., (2007), <i>Facades – Technical Review</i>, RIBA Publishing Zaera, Alejandro Z. & Jeffrey S. A. (2021), <i>The ecologies of the building envelope: a material history and theory of architectural surfaces</i>, Actar, New York
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Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.