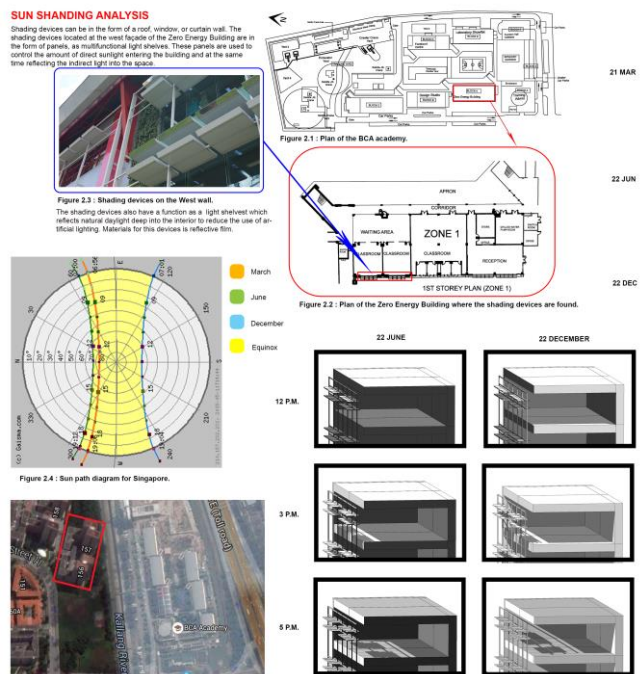


**BACHELOR OF SCIENCE (HONOURS) IN ARCHITECTURE**

**Building Science 1  
(BLD60803/ARC2413)**

**MODULE OUTLINE**

**March 2017**



<b>Programme</b>	Bachelor of Science (Honours) in Architecture
<b>Module</b>	BUILDING SCIENCE 1 (BLDD60803/ARC2413/ARC2412)
<b>Prerequisite</b>	None
<b>Credit Hours</b>	3
<b>Classification</b>	
<b>Instructor</b>	Dr. Sujatavani Gunasagaran (603-56295624; <a href="mailto:sujatavani.g@taylors.edu.my">sujatavani.g@taylors.edu.my</a> ) Ar. Edwin Chan (cedwinyl@gmail.com) Dr. M Tamil Salvi (TamilSalvi.Mari@taylors.edu.my )

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## Module Synopsis

The module is an introduction to the factors that affect the thermal performance of buildings. Its aim is to facilitate students to create acceptable designs which are sustainable (minimizing the use of mechanical cooling systems) and comfortable. The emphasis is on creating acceptable indoor thermal conditions thus minimizing the use of space heating and cooling. Students will also be introduced to MS1525 which provides guidelines to creating a more sustainable design in Malaysia.

## Module Teaching Objectives

The teaching objectives of the module are to:

1. Create awareness and understanding of designing buildings that respond to local climatic conditions that reduce the energy load of mechanical air-conditioning systems.
2. Introduce thermal mechanisms such as solar radiation, heat conduction, heat resistance and heat convection that determine indoor temperatures, including how building elements respond to thermal mechanisms as well as various design strategies to reduce heat gain of interior spaces through control of variables.

## Module Learning Outcomes (MLO)

The objectives of the module are translated into a number of Module Learning Outcomes (MLO), mapped to Programme Learning Outcomes (PLO) and Taylor's Graduate Capabilities (TGC).

No.	MLO	PLO	TGC
1	Identify environmental conditions related to site conditions, climate, etc.		
2	Explain the effects of the sun on the thermal performance of buildings		1.1
3	Explain the effect of insulation, thermal mass and air movement on thermal performance of buildings.	4	2.2
4	Infer how different building material (K-value, U-value, R-value) has different effect on heat gain or thermal environment in a given space.		7.1

5	Estimate heat gain in a space and to provide passive solutions for it.	4	1.1
6	Evaluate control of variables such as heat and ventilation.		3.1
			3.2
7	Judge the limits of acceptable or desirable conditions (thermal environment) and recommend designs that control the effects of sun on the thermal performance of buildings (shading devices).	3	1.1
			2.1
			3.1
			3.2

### Modes of Delivery and TIMeS

This is a 3 credit hour module conducted over a period of 12 weeks. The modes of delivery will be in the form of lectures, discussion/tutorials, and self-directed study. The breakdown of the contact hours is as follows:

- Lecture: 2 hours per week
- Discussion/Tutorial: 2 hours per week
- Self-directed study: 4 hours per week

TIMeS will be used as a communication tool and information portal for students to access module materials, project briefs, assignments and announcements.

### Programme Learning Outcomes (PLO)\*









The Bachelor of Science (Honours) in Architecture programme has as its objectives that graduates exemplify the following Programme Learning Outcomes (PLO) that will enable them to:

No.	Programme Learning Outcomes (PLO)
1	Produce designs at appropriate complexity and scales up to the schematic level using appropriate communication tools
2	Demonstrate understanding of cultural, historical and established architectural theories, philosophies and context
3	Demonstrate creativity, innovation and imagination and translate these into an architectural design solution
4	Develop design to a level for regulatory application for Building Plan submission that complies to the requirements of local authorities, including understanding of building regulations, basic building construction and materials, environmental considerations and building services
5	Translate design into construction drawings with appropriate construction details and use established architectural drawing convention
6	Work in a team and participate in the design process

*\*Source: The Manual of Accreditation for Architecture Programmes, Board of Architects Malaysia, 2013*

## Taylor's Graduate Capabilities (TGC)

The teaching and learning approach at Taylor's University is focused on developing the Taylor's Graduate Capabilities (TGC) in its students; capabilities that encompass the knowledge, cognitive capabilities and soft skills of its graduates.

Taylor's Graduate Capabilities (TGC)	
	<b>1. Discipline Specific Knowledge</b> 1.1 Able to put theories into practice 1.2 Understand ethical issues in the context of the field of study 1.3 Understand professional practice within the field of study
	<b>2. Lifelong Learning</b> 2.1 Learn independently 2.2 Locate, extract, synthesize and utilize information effectively 2.3 Be intellectual engaged
	<b>3. Thinking and Problem Solving skills</b> 3.1 Think critically and creatively 3.2 Define and analyze problems to arrive at effective solutions
	<b>4. Communication Skills</b> 4.1 Communicate appropriately in various settings and modes
	<b>5. Interpersonal Skills</b> 5.1 Understand team dynamics and mobilize the power of teams 5.2 Understand and assume leadership
	<b>6. Intrapersonal Skills</b> 6.1 Manage oneself and be self-reliant 6.2 Reflection one's action and learning 6.3 Embody Taylor's core values
	<b>7. Citizenship and Global Perspectives</b> 7.1 Be aware of and form opinions from diverse perspectives 7.2 Understand the value of civic responsibility and community engagement
	<b>8. Digital Literacy</b> 8.1 Effective use of ICT and related technology

## Types of Assessments and Feedback

You will be graded in the form of formative and summative assessments. Formative assessment involves participation in discussions and feedback sessions. Summative assessment will inform you about the level of understanding and performance capabilities achieved at the end of the module.

No.	Assessment Components	Type	MLO	Weightage
1	Mid Term Test	Summative	1	30%
2	Project	Summative	2,3,4	40%
3	Final Exam	Summative	5,6,7	30%
4	Taylor's Graduate Capabilities Portfolio	Summative	All	Pass/Fail
Total				100%

## Assessment Components

### 1. Project

Group work with maximum 6 students is required to:

- A space is chosen to improve the passive building design for thermal comfort. Record and analyze the existing condition in terms of thermal comfort.
- Explain how the thermal environment of your case study is affected from natural and man-made factors.
- Have a thorough research on the basic design strategies (2), the principles and details needed for these basic design strategies to perform best in tropical climate and to achieve thermal comfort in this building/space.
- Identify two (2) basic design strategies (sun shading & passive ventilation) that have been designed for this building. And photograph the interior ambiances and outline the thermal comfort.
- Explicitly detail visuals and narrate strategies that accompany these basic building designs and ways to improve the thermal comfort of this building.
- Research should contain the following:
  - a. Building Introduction (images, pictures, diagrams, drawings and description)
  - b. Site analysis; micro (wind, sun, topography, etc.)
  - c. Thermal Analysis
  - d. Concept and analysis of building's basic design strategies. Design features used in each building and elaborate the effect and importance of it.
  - e. Appropriate visuals and diagrams (tables, charts, etc.) with appropriate referencing and citation where applicable.

A thorough analysis is to be printed in 2A3 paper designed as Research Boards. All components must be presented in a well-organized and logical manner visually.

## 2. Taylor's Graduate Capabilities Portfolio (TGCP)

The Taylor's Graduate Capabilities Portfolio is a document that collates all assessments produced in a module and reflects a student's acquisition of the Module Learning Outcomes and Taylor's Graduate Capabilities. Each student is to develop an ePortfolio, a web-based portfolio in the form of a personal academic blog. The ePortfolio is developed progressively for all modules taken throughout Semesters 1 to 5, and culminates with a final Portfolio in printed form produced in the final semester. The printed Portfolio must encapsulate the acquisition of Programme Learning Outcomes and Taylor's Graduate Capabilities, and showcase the distinctiveness and identity of the student as a graduate of the programme.

### Marks and Grading Table

Assessments and grades will be returned within two weeks of your submission. You will be given grades and necessary feedback for each submission. The grading system is shown below:

Grade	Marks	Grade Points	Definition	Description
A	80 – 100	4.00	Excellent	Evidence of original thinking; demonstrated outstanding capacity to analyze and synthesize; outstanding grasp of module matter; evidence of extensive knowledge base.
A-	75 – 79	3.67	Very Good	Evidence of good grasp of module matter; critical capacity and analytical ability; understanding of relevant issues; evidence of familiarity with the literature.
B+	70 – 74	3.33	Good	Evidence of grasp of module matter; critical capacity and analytical ability, reasonable understanding of relevant issues; evidence of familiarity with the literature.
B	65 – 69	3.00		
B-	60 – 64	2.67	Pass	Evidence of some understanding of the module matter; ability to develop solutions to simple problems; benefitting from his/her university experience.
C+	55 – 59	2.33		
C	50 – 54	2.00		
D+	47 – 49	1.67	Marginal Fail	Evidence of nearly but not quite acceptable familiarity with module matter, weak in critical and analytical skills.
D	44 – 46	1.33		
D-	40 – 43	1.00		
F	0 – 39	0.00	Fail	Insufficient evidence of understanding of the module matter; weakness in critical and analytical skills; limited or irrelevant use of the literature.

WD	-	-	Withdrawn	Withdrawn from a module before census date, typically mid-semester [refer to Description 1 below].
F(W)	0	0.00	Fail	Withdrawn after census date, typically mid-semester [refer to Description 2 below].
IN	-	-	Incomplete	An interim notation given for a module where a student has not completed certain requirements with valid reason or it is not possible to finalise the grade by the published deadline.
P	-	-	Pass	Given for satisfactory completion of practicum.
AU	-	-	Audit	Given for a module where attendance is for information only without earning academic credit.

Description 1: Week 3 to week 7 (inclusive) for long semester, or week 3 to week 5 (inclusive) for short semester. A short semester is less than 14 weeks. Not applicable for audit and internship.

Description 2: After week 7 for long semester, or after week 5 for short semester. A short semester is less than 14 weeks. Not applicable for audit and internship.

### **Coursework Assessments and Final Examination**

A student who fails to attempt all assessment components worth 20% or more, including final exam and final presentation, will result in failing the module irrespective of the marks earned, even though he/she has achieved 50% or more in the overall assessment. Student will not be allowed to resit the examination (or resubmit an assessment).

**Module Schedule** (subject to change at short notice)

Date/Week	Lecture/Presentation	Discussion/Tutorial	Self-directed Study
	Hours	Hours	Hours
<b>30 Mar</b>	<b>General introduction: Module Outline and Project Brief</b> Readers: MS1525 & other doc	Project	Readers
Week 1	2	2	4
<b>06 Apr</b> (Last day to add/drop a module)	<b>Climate: An Introduction</b> <ul style="list-style-type: none"> <li>▪ Macro/micro climate, elements of climate.</li> <li>▪ Local Climate: Malaysian context</li> </ul>	Project	Readers
Week 2	2	2	4
<b>13 Apr</b>	<b>Thermal Behaviour of Buildings:</b> <ul style="list-style-type: none"> <li>▪ Intro: Solar control/protection</li> <li>▪ Sun movement</li> <li>▪ Shading devices</li> <li>▪ Azimuth and altitude</li> <li>▪ HSA &amp; VSA</li> <li>▪ Study of sun path diagram for Malaysia – Latitude 4 deg North</li> </ul>	Project	Project
Week 3	2	2	4
<b>20 Apr</b>	<b>Thermal Comfort:</b> <ul style="list-style-type: none"> <li>▪ Basic principles of heat</li> <li>▪ Thermal balance and comfort</li> <li>▪ Factor of comfort</li> <li>▪ Human body&amp; its response to heat</li> <li>▪ Adjustment mechanisms</li> <li>Comfort condition</li> </ul>	Project	Site visit
Week 4	2	2	4
<b>27 Apr</b>	<b>Basic Building Design</b> <ul style="list-style-type: none"> <li>▪ Basic building design</li> <li>▪ Introduction to: UBBL compliances &amp; MS 1525</li> </ul>	Project	Project
Week 5	2	2	4
<b>04 May</b>	<b>Ventilation</b> <ul style="list-style-type: none"> <li>▪ Openings</li> <li>▪ Cross ventilation, one sided, stack ventilation</li> </ul>	Project	Project
Week 6	2	2	4



Date/Week	Lecture/Presentation	Discussion/Tutorial	Self-directed Study
	Hours	Hours	Hours
<b>11 May</b> (Last day for subject/module withdrawal with WD grade)	<b>Passive Cooling Design</b> <ul style="list-style-type: none"> <li>Comfort and Design Strategies – Passive cooling strategies principles and application in different climates</li> </ul>	Project	Mid-term test preparation
Week 7	2	2	4
<b>15-19 May</b> (Online Student Registration) Non-contact Week	Mid-semester Break	-	-
<b>25 May</b> (Last day for Online Student Registration (OSR))	<b>Mid-term test (30%)</b>	Tutorial	Project
Week 8	2	2	4
<b>01 June</b> (Last day for Online Student Registration (OSR))	<b>Heat Gain in Buildings</b> <ul style="list-style-type: none"> <li>Heat flow via air movement</li> <li>Heat flow transparent /translucent elements.</li> </ul>	Tutorial	Project
Week 9	2	2	4
<b>08 June</b>	<b>Heat Gain in Buildings</b> <ul style="list-style-type: none"> <li>Calculating OTTV</li> <li>Envelope heat flow (roof and wall)</li> <li>Internal heat gain calculation</li> </ul>	Tutorial	Project
Week 10	2	2	4
<b>15 June</b> (Online Course Evaluation and last day for Subject/Module Withdrawal with F(W) grade)	<b>(Submission Project)</b>	Project Submission	Preparation for final exam
Week 11	2	2	4
<b>22 June</b> (Last day of Online Course Evaluation)	<ul style="list-style-type: none"> <li><b>Portfolio briefing</b></li> </ul>	-	TGC Portfolio
Week 12	2	2	4

<b>26-30 June</b> Non-contact Week	Hari Raya Break	-	-
<b>06 July</b>	<b>Work-in Progress: TGC Portfolio</b>	-	TGC Portfolio
Week 13	-	-	7
<b>13 July</b>	<b>Submission: TGC Portfolio</b>	-	-
Week 14	-	-	-

### Main References:

1. Stein, Benjamin and Reynolds, John S. 2000. Mechanical and Electrical Equipment for Buildings. New York. John Wiley.
2. Lechner, N. Heating Lighting and Cooling, Sustainable Design Methods for Architects 3rd edition. John Wiley & Sons.

### Recommended References:

1. McMullan, R. 1998. Environmental Science in Buildings, 4th. ed. Basingstoke: McMillan.
2. Olgay, V. 1963. Design with Climate. Princeton, New Jersey. Princeton University Press.
3. Szokolay, S.V. 2004. Introduction to Architectural Science: The Basis of Sustainable Design. Oxford. Architectural Press.
4. Givoni, B. 1994. Passive and Low Energy Cooling of Buildings. New York. Van Nostrand Reinhold.

## GENERAL RULES AND REGULATIONS

### Student-centered Learning

The module uses the Student-centered Learning (SCL) approach. Utilization of SCL embodies most of the principles known to improve learning and to encourage student's participation. SCL requires students to be active, responsible participants in their own learning and instructors are to facilitate the learning process. Various teaching and learning strategies such as experiential learning, problem-based learning, site visits, group discussions, presentations, working in group and etc. can be employed to facilitate the learning process. In SCL, students are expected to be:

- active in their own learning;
- self-directed to be responsible to enhance their learning abilities;
- able to cultivate skills that are useful in today's workplace;
- active knowledge seekers;
- active players in a team.

## **Attendance and Student Participation**

Attendance is compulsory. Any student who arrives late after the first half-hour of class will be considered as absent. The lectures and tutorials will assist you in expanding your ideas and your assessments. A minimum of 80% attendance is required to pass the module and/or be eligible for the final examination and/or presentation.

Students will be assessed based on their performance throughout the semester. Students are expected to attend and participate actively in class. Class participation is an important component of every module. Your participation in the module is encouraged. You have the opportunity to participate in the following ways:

- Your ideas and questions are welcomed, valued and encouraged.
- Your input is sought to understand your perspectives, ideas and needs in planning module revision.
- You have opportunities to give feedback and issues will be addressed in response to that feedback.
- Do reflect on your performance in Portfolios.
- Student evaluation on your views and experiences about the module are actively sought and used as an integral part of improvement in teaching and continuous improvement.

## **Late Submission Penalty**

The School imposes a late submission penalty for work submitted late without a valid reason e.g. a medical certificate. Any work submitted after the deadline (which may have been extended) shall have the percentage grade assigned to the work on face value reduced by 10% for the first day and 5% for each subsequent day late. A weekend counts as one (1) day.

Individual members of staff shall be permitted to grant extensions for assessed work that they have set if they are satisfied that a student has given good reasons.

Absenteeism at intermediate or final presentation will result in zero mark for that presentation.

The Board of Examiners may overrule any penalty imposed and allow the actual mark achieved to be used if the late submission was for a good reason.

## **Plagiarism**

Plagiarism, which is an attempt to present another person's work as your own by not acknowledging the source, is a serious case of misconduct which is deemed unacceptable by the University.

"Work" includes written materials such as books, journals and magazine articles or other papers and also includes films and computer programs. The two most common types of plagiarism are from published materials and other students' works.

## 1. Published Materials

In general, whenever anything from someone else's work is used, whether it is an idea, an opinion or the results of a study or review, a standard system of referencing should be used. Examples of plagiarism may include a sentence or two, or a table or a diagram from a book or an article used without acknowledgement.

Serious cases of plagiarism can be seen in cases where the entire paper presented by the student is copied from another book, with an addition of only a sentence or two by the student.

While the former can be treated as a simple failure to cite references, the latter is likely to be viewed as cheating in an examination.

Though most assignments require the need for reference to other peoples' works, in order to avoid plagiarism, students should keep a detailed record of the sources of ideas and findings and ensure that these sources are clearly quoted in their assignment. Note that plagiarism also refers to materials obtained from the Internet too.

## 2. Other Students' Works

Circulating relevant articles and discussing ideas before writing an assignment is a common practice. However, with the exception of group assignments, students should write their own papers. Plagiarising the work of other students into assignments includes using identical or very similar sentences, paragraphs or sections. When two students submit papers that are very similar in tone and content, both are likely to be penalised.

### **Guide for Writing References:**

- [http://taylorslibrary.taylors.edu.my/user\\_skills/user\\_support\\_students](http://taylorslibrary.taylors.edu.my/user_skills/user_support_students)

**Prepared by:**

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Office Location: Academic Suite C5

**Approved by:**

Name of PD/DD

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Date:

Deputy Dean

**Remarks:**

1. The Module Outline is to be distributed to the students in the first week of the semester.
2. Any changes to the Module Outline shall be communicated (in writing) to the Programme Director and the approved revised version must be communicated to the students