



## UNSW Course Outline

# ARCH7218 Urban Climate Change - Mitigation and Adaptation in the Urban Built Environment - 2024

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## General Course Information

**Course Code :** ARCH7218

**Year :** 2024

**Term :** Term 3

**Teaching Period :** T3

**Is a multi-term course? :** No

**Faculty :** Faculty of Arts, Design and Architecture

**Academic Unit :** School of Built Environment

**Delivery Mode :** In Person

**Delivery Format :** Standard

**Delivery Location :** Kensington

**Campus :** Sydney

**Study Level :** Postgraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

In this course, you will learn about urban climate problems together with the relevant mitigation

and adaptation design techniques and technologies to counterbalance the temperature increase in the urban built environment. The first part of the course, will explore the major issues around the climate of cities, will offer advanced knowledge on the interaction between the urban climate, buildings, and open spaces, and will analyse the main impact of local climate change on energy, indoor and outdoor thermal comfort, health, and economy. The second part of the course will explore, analyse, and present in detail the major mitigation and adaptation design techniques and technologies to counterbalance the urban temperature increase. It will investigate and present issues related to the appropriate use of materials in cities, new advanced and cutting edge materials for open spaces and buildings, heat dissipation and amortization technologies for buildings and open spaces based on the use of low temperature environmental sinks, smart energy and environmental management technologies for cities, Anthropogenic heat avoidance technologies and all aspects related to the proper use of urban greenery in the urban built environment. Examples from successful real case studies will be presented. You will present and analyse modelling techniques to simulate the thermal characteristics of cities and evaluate the impact of the main mitigation technologies.

## **Relationship to Other Courses**

Energy and Environmental performance in the built environment. Environmental quality, Landscape Architecture, Urban design

# Course Learning Outcomes

Course Learning Outcomes
CLO1 : Analyse the major climatic phenomena and mechanisms in the urban environment affecting the performance of urban buildings and open spaces
CLO2 : Analyse the specific impact of the urban climate on the energy consumption of buildings, thermal comfort and the global environmental performance of the urban built environment
CLO3 : Apply advanced mitigation and adaptation techniques and technologies to design and enhance the performance of urban buildings and urban structures counterbalancing the urban climate change
CLO4 : Apply advanced computational methods to optimise the environmental design of urban buildings and open spaces and minimize their environmental impact

Course Learning Outcomes	Assessment Item
CLO1 : Analyse the major climatic phenomena and mechanisms in the urban environment affecting the performance of urban buildings and open spaces	<ul style="list-style-type: none"><li>• Preliminary analysis of site and climate</li><li>• A report of field monitoring and measurement</li><li>• Report and simulations outcome</li></ul>
CLO2 : Analyse the specific impact of the urban climate on the energy consumption of buildings, thermal comfort and the global environmental performance of the urban built environment	<ul style="list-style-type: none"><li>• Preliminary analysis of site and climate</li><li>• A report of field monitoring and measurement</li><li>• Report and simulations outcome</li></ul>
CLO3 : Apply advanced mitigation and adaptation techniques and technologies to design and enhance the performance of urban buildings and urban structures counterbalancing the urban climate change	<ul style="list-style-type: none"><li>• Report and simulations outcome</li></ul>
CLO4 : Apply advanced computational methods to optimise the environmental design of urban buildings and open spaces and minimize their environmental impact	<ul style="list-style-type: none"><li>• Report and simulations outcome</li></ul>

## Learning and Teaching Technologies

Moodle - Learning Management System

## Learning and Teaching in this course

- Regional Climate Change

- Urban Overheating

- Impact of Urban Overheating on Energy, Health, Environment, Economy
- Heat Mitigation Techniques
- How to decrease the temperature in cities

## Additional Course Information

The course will introduce the students to issues related to regional climate change, overheating of cities, heat mitigation technologies and adaptation to climate change

## Assessments

### Assessment Structure

Assessment Item	Weight	Relevant Dates
Preliminary analysis of site and climate Assessment Format: Individual	10%	
A report of field monitoring and measurement Assessment Format: Individual	30%	
Report and simulations outcome Assessment Format: Individual	60%	

### Assessment Details

#### Preliminary analysis of site and climate

##### Assessment Overview

You will perform an analysis of the existing condition in relation to the site and climate, presented in a report format. Marking will be done against assessment criteria with written feedback provided.

##### Course Learning Outcomes

- CLO1 : Analyse the major climatic phenomena and mechanisms in the urban environment affecting the performance of urban buildings and open spaces
- CLO2 : Analyse the specific impact of the urban climate on the energy consumption of buildings, thermal comfort and the global environmental performance of the urban built environment

##### Generative AI Permission Level

##### Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing

functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see [here](#).

## A report of field monitoring and measurement

### Assessment Overview

You will perform a field measurement on UNSW campus and report your findings and results of monitoring. Marking will be done against assessment criteria with written feedback provided.

### Course Learning Outcomes

- CLO1 : Analyse the major climatic phenomena and mechanisms in the urban environment affecting the performance of urban buildings and open spaces
- CLO2 : Analyse the specific impact of the urban climate on the energy consumption of buildings, thermal comfort and the global environmental performance of the urban built environment

### Generative AI Permission Level

#### Simple Editing Assistance

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## Report and simulations outcome

### Assessment Overview

You will perform microclimate simulations and apply mitigation technologies, interpret the

results and communicate the outcomes, which will include an oral presentation. Marking will be done against assessment criteria with written feedback provided together with peer review.

### Course Learning Outcomes

- CLO1 : Analyse the major climatic phenomena and mechanisms in the urban environment affecting the performance of urban buildings and open spaces
- CLO2 : Analyse the specific impact of the urban climate on the energy consumption of buildings, thermal comfort and the global environmental performance of the urban built environment
- CLO3 : Apply advanced mitigation and adaptation techniques and technologies to design and enhance the performance of urban buildings and urban structures counterbalancing the urban climate change
- CLO4 : Apply advanced computational methods to optimise the environmental design of urban buildings and open spaces and minimize their environmental impact

### Generative AI Permission Level

#### Simple Editing Assistance

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## General Assessment Information

Students have to work on an experimental and theoretical study aiming to propose and simulate heat mitigation technologies to improve the environmental quality in the urban environment. Students will be assisted, supervised and evaluated by experts

### Grading Basis

Standard

### Requirements to pass course

A successful completion of the study.

# Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Impact of Urban overheating on Energy and Environmental Quality by Prof. Mattheos Santamouris
	Tutorial	Introduction to measurements of thermal environment
Week 2 : 16 September - 22 September	Lecture	Introduction to Cool Materials for Heat Mitigation by A/Prof. Riccardo Paolini
	Tutorial	Introduction to urban environment modeling and/or in-field monitoring campaign
Week 3 : 23 September - 29 September	Lecture	Impact of Urban Overheating on Human Health, Productivity and Low-income Population by Prof. Mattheos Santamouris
	Tutorial	Introduction to urban environment modeling and/or in-field monitoring campaign
Week 4 : 30 September - 6 October	Lecture	Introduction to Urban Greenery Mitigation Technologies by A/ Prof. Sebastian Phauthch
	Tutorial	Discussion of site measurements report and simulations training
Week 6 : 14 October - 20 October	Lecture	Introduction to Thermal Comfort in Outdoor Spaces by Dr. Negin Nazarian
	Tutorial	Modeling base case and performing simulation of the urban environment
Week 7 : 21 October - 27 October	Lecture	Impact of Heat Mitigation on Energy, Environmental Quality and Human Health by Prof. Mattheos Santamouris
	Tutorial	Discussion of simulation models and mitigation technologies. Modelling mitigated scenarios
Week 8 : 28 October - 3 November	Lecture	Introduction to Urban Overheating and Heat Mitigation by Ass/Prof. Lan Ding
	Tutorial	Modelling mitigated scenarios and discussion of simulation results
Week 9 : 4 November - 10 November	Lecture	Case Studies of Heat Mitigation Technologies by Dr. Ioannis Kousis and Khan R. Ullah
	Tutorial	Discussion of simulation results
Week 10 : 11 November - 17 November	Lecture	The future of Global and Regional Climate Change in Cities by Prof. Mattheos Santamouris
	Tutorial	Final discussion of simulation results

## Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

## General Schedule Information

A lecture and a tutorial per week

## Course Resources

### Prescribed Resources

Educational slides and several articles

### Recommended Resources

[Nasrin Aghamohammadi, Mat Santamouris](#): Mitigation and Adaptation of Urban Overheating.

Elsevier, 2024

Nasrin Aghamohammadi, Mat Santamouris: Urban Overheating: Heat Mitigation and the Impact on Health, Springer, 2022, <https://doi.org/10.1007/978-981-19-4707-0>

R. Paolini and M. Santamouris

N. Enteria, H. Awbi, M. Santamouris: Building in Hot and Humid Regions Historical Perspective and Technological Advances, Springer, 2020, <https://doi.org/10.1007/978-981-13-7519-4>

N. Enteria, M. Santamouris, U. Eicker: Urban Heat Island (UHI) Mitigation, Hot and Humid Regions, 2019, Springer, <https://doi.org/10.1007/978-981-33-4050-3>

## Additional Costs

none

## Course Evaluation and Development

Students have to perform an experimental and theoretical exercise aiming to decrease the magnitude of urban overheating. All studies will be supervised and evaluated by expert personnel.

In addition:

We encourage and support students to maintain regular contact with the course convenor to provide informal feedback throughout the course. For specific issues or detailed feedback, please arrange a meeting with the course convenor via email.

In this course there is an option for students to provide anonymous feedback via the course's Moodle page, which is directly sent to the convenor. As a final step, students are invited to share their insights and experiences by completing the MyExperience survey. The feedback gathered each year is integral to the continuous enhancement and development of the course.

# Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Mattheos S antamouris		UNSW Kensington Campus ABL	0404134975	EMAIL FOR APPOINTMENT	Yes	Yes
Lecturer	Gloria Pignatta		UNSW Kensington ABL	0424282106	EMAIL FOR APPOINTMENT	Yes	No
Tutor	Khan Rahmat Ullah		UNSW Kensington Campus ABL		By appointment – organise via email.	No	No
	Ioannis Koussis		UNSW Kensington Campus ABL		By appointment – organise via email.	No	No
	Xue Zhang		UNSW Kensington Campus ABL		By appointment – organise during the tutorial sessions	No	No

## Other Useful Information

### Academic Information

For essential student information relating to:

- UNSW and Faculty policies and procedures;
- Student Support Services;
- Student equity and disability;
- Special Consideration in the event of illness or misadventure;
- Examination information;
- Review of results;

Please see: <https://www.unsw.edu.au/arts-design-architecture/student-life/resources-support/protocols-guidelines>

### Academic Honesty and Plagiarism

Plagiarism is using the words or ideas of others and presenting them as your own. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement.

UNSW groups plagiarism into the following categories:

- Copying: Using the same or very similar words to the original text or idea without acknowledging the source or using quotation marks. This includes copying materials, ideas or concepts from a book, article, report or other written document, presentation, composition,

- artwork, design, drawing, circuitry, computer program or software, website, internet, other electronic resource, or another person's assignment without appropriate acknowledgement.
- Inappropriate paraphrasing: Changing a few words and phrases while mostly retaining the original information, structure and/or progression of ideas of the original without acknowledgement. This also applies in presentations where someone paraphrases another's ideas or words without credit and to piecing together quotes and paraphrases into a new whole, without appropriate referencing.
  - Collusion: Working with others but passing off the work as a person's individual work. Collusion also includes providing your work to another student for the purpose of them plagiarising, paying another person to perform an academic task, stealing or acquiring another person's academic work and copying it, offering to complete another person's work or seeking payment for completing academic work.
  - Inappropriate citation: Citing sources which have not been read, without acknowledging the "secondary" source from which knowledge of them has been obtained.
  - Duplication ("self-plagiarism"): Submitting your own work, in whole or in part, where it has previously been prepared or submitted for another assessment or course at UNSW or another university.

The UNSW Academic Skills support offers resources and individual consultations. Students are also reminded that careful time management is an important part of study. One of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and proper referencing of sources in preparing all assessment items. UNSW Library has the ELISE tool available to assist you with your study at UNSW. ELISE is designed to introduce new students to studying at UNSW, but it can also be a great refresher during your study.

Completing the ELISE tutorial and quiz will enable you to:

- analyse topics, plan responses and organise research for academic writing and other assessment tasks
- effectively and efficiently find appropriate information sources and evaluate relevance to your needs
- use and manage information effectively to accomplish a specific purpose
- better manage your time
- understand your rights and responsibilities as a student at UNSW
- be aware of plagiarism, copyright, UNSW Student Code of Conduct and Acceptable Use of UNSW ICT Resources Policy
- be aware of the standards of behaviour expected of everyone in the UNSW community
- locate services and information about UNSW and UNSW Library

## Use of AI for assessments

As AI applications continue to develop, and technology rapidly progresses around us, we remain

committed to our values around academic integrity at UNSW. Where the use of AI tools, such as ChatGPT, has been permitted by your course convener, they must be properly credited and your submissions must be substantially your own work.

In cases where the use of AI has been prohibited, please respect this and be aware that where unauthorised use is detected, penalties will apply.

## [Use of AI for assessments | UNSW Current Students](#)

### **Submission of Assessment Tasks**

Assessment tasks must be submitted electronically via either Turnitin or a Moodle assignment. In instances where this is not possible, alternative submission details will be stated on your course's Moodle site. For information on how to submit assignments online via Moodle: <https://student.unsw.edu.au/how-submit-assignment-moodle>

### **Late Submission Penalty**

UNSW has a standard late submission penalty of:

- 5% per calendar day,
- for all assessments where a penalty applies,
- capped at five calendar days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Students are expected to manage their time to meet deadlines and to request [Special Consideration](#) as early as possible before the deadline. Support with [Time Management is available here](#).

**Important note:** UNSW has a “fit to sit/submit” rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

## School Contact Information

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