

Annual Winter School

Atmosphere and Ocean Dynamics

Welcome

Thank you for participating in the ARC Centre of Excellence for Climate Extremes [Annual Winter School](#). The theme of the 2022 Winter School is Atmosphere and Ocean Dynamics.

The 2022 Winter School is a week-long high-level education program for graduate students and consists of a series of lectures and lab sessions delivered by Annie Foppert (UTAS), Callum Shakespeare (ANU), Martin Singh (Monash), and Kial Stewart (ANU).

This winter school will cover atmosphere and ocean dynamics with the help of the ANU Research School of Earth Sciences Geophysical Fluid Dynamics lab. Participants will also visit the National Computational Infrastructure (NCI) to learn more about Gadi and the data visualisation support that NCI provides.

Dr Melissa Hart
Graduate Director

Table of Contents

.....	1
Welcome	1
Introduction	3
Our Commitment to Diversity	3
Covid safety	3
Transport	4
What is the best way to get from Canberra Airport to BreakFree?	4
Winter School to Airport Friday May 27 th	4
Local transportation in Canberra	4
Accommodation	5
BreakFree Capital Tower Canberra	5
Breakfast	5
Important information	5
Winter School Venue	6
The Australian National University	6
Food and retail on campus	6
Winter School teaching and breakout spaces	7
Registration	7
Lectures and Labs.....	7
Directions from BreakFree to the Anthony Low building are shown below:.....	7
Social Event	8
Monday night dinner and stargazing.....	8
Supplementary Material	8
IT and Wi-Fi details	8
Food	8
Food and entertainment near Acton campus	9
Campus security	9
Winter School 2022 Staff and Speakers	10
Who can help.....	10
Speakers and lab demonstrators	10
Winter School 2022 Schedule	11
Australian National University Campus map	12

Introduction

The [ARC Centre of Excellence for Climate Extremes \(CLEX\)](#) is a research consortium of five Australian universities and a suite of outstanding national and international partner organisations. An important strategic objective of the centre is to transform graduate education in climate science at the national scale. This is where our graduate program, led by graduate director, [Melissa Hart](#), comes in. The graduate program reaches beyond a single university and aims to develop the technical and intellectual capacity of Australian graduate students engaged in climate science.

An integral component of our Graduate Program is [our annual winter school](#). The winter schools are highly competitive, week-long, graduate-level courses. This year we are happy to welcome you to our 11th Annual Winter School, *Atmosphere and Ocean Dynamics*, hosted by [The Research School of Earth Sciences](#), Australian National University, Canberra.

Our Commitment to Diversity

Gender, ethnicity, sexuality, age, disability, and other personal characteristics should not be impediments to your full engagement and enjoyment of the Winter School. Nor should such personal traits be grounds for language or actions from any Winter School participants that are discriminatory or intimidating. By attending the Winter School, you agree to abide by standards that are ethical, respectful, and considerate of all other attendees and venue staff at all times.

We also acknowledge and celebrate the traditional custodians of the land we are meeting on – the Ngunnawal people and pay our respects to elders past and present.

Covid safety

While we are very excited to be able to meet in person again, we have had to adopt several procedures to safeguard the health and well-being of all winter school participants and staff.

Please ensure you read through and adhere to the following points; if you have any questions or need further information, please contact Melissa Hart.

1. If you move seats in the lecture rooms, please wipe down your space with the cleaning products provided in each room. Remember to wash and sanitise your hands frequently.
2. Please bring your own face masks. Wearing a mask while indoors is currently compulsory on ANU campus while indoors, except if eating or drinking. You will be required to wear masks on public transport in Canberra, and on flights if you are travelling by air.

3. Maintain physical distance between yourself and others where possible.
4. If you experience **any** cold or flu symptoms prior to travelling to the winter school, please contact Melissa immediately as you will not be able to travel.
5. If you experience **any** cold or flu symptoms during the winter school, please inform Melissa immediately.
6. Please read through the ANU covid guidelines here: <https://www.anu.edu.au/covid-19-advice>

Transport

Upon arrival in Canberra, please make your own way to your accommodation at BreakFree Capital Tower at 2 Marcus Clarke Street.

What is the best way to get from Canberra Airport to BreakFree?

A taxi, uber or bus is the most convenient mode of transport from the airport.

Bus route 3 will take you from the airport to the Canberra national Convention Centre, from where it is a short walk to the BreakFree Capital Tower.

If taking a taxi or uber please share your ride with other students where possible.

Winter School to Airport Friday May 27th

For students and staff leaving Canberra on the afternoon on Friday the 27th, we are providing a complimentary bus service to the airport at 4.00pm. Students should ensure their return flight is booked to depart after 6.00pm. Students wishing to leave for the airport earlier or later will need to make their own way to the airport.

Local transportation in Canberra

If you wish to catch a bus locally during your stay in Canberra, please visit the ANU bus information page for the best option for your destination:

<https://services.anu.edu.au/campus-environment/transport-parking/catching-the-bus>

A list of taxi services can be found below:

- ACT Cabs (02) 6280 0077
- Cabxpress (02) 6181 2700
- Canberra Elite Taxis (02) 6126 1600

Accommodation

BreakFree Capital Tower Canberra

Participants who have requested accommodation will be staying at BreakFree Capital Tower Canberra, located on 2 Marcus Clarke Street. BreakFree is located on the shores of Lake Burley Griffin and within walking distance from ANU main campus. The city centre is a 10-minute walk away.

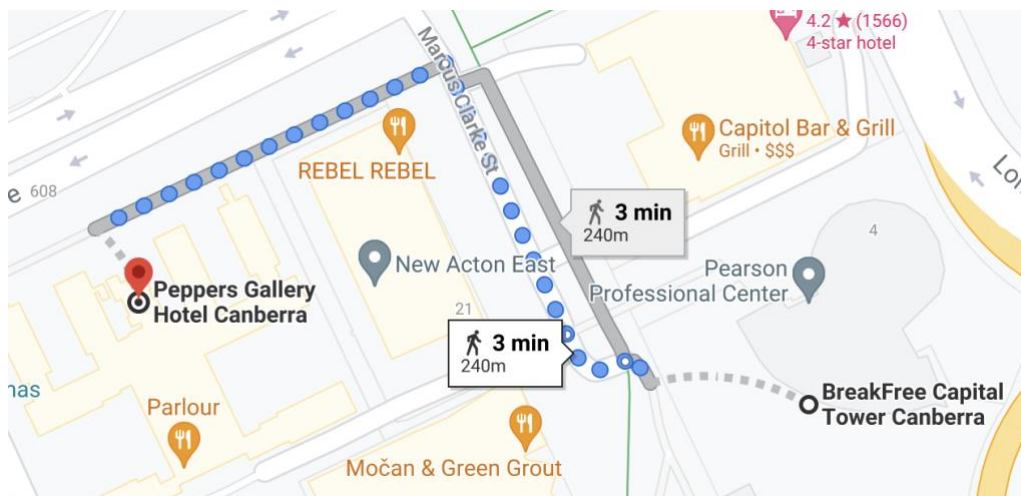
Apartments will be shared with one or two other students, but each person will have their separate bedroom. Apartment facilities include air-conditioning, fully equipped kitchen, living and dining areas, tea and coffee making facilities, hair dryer, iron and ironing board. Wi-Fi is included, with login details provided upon check-in.

Note, rooms are serviced once a week, so the room will not be cleaned during your stay.

Breakfast

Breakfast will be provided daily at the nearby [Peppers Gallery](#) for students staying at the BreakFree. Peppers Gallery Hotel is located 250 meters from BreakFree. Students will be asked to provide their room numbers upon arrival.

Breakfast will be a “grab and go” option, rather than eat-in, so you will be able to collect your breakfast and find somewhere on campus to eat it.



Important information

Check in from 2.00pm on Sunday May the 22nd and check out by 11.00am on Friday the 27th. You will be able to leave your luggage at the reception on the Friday for collection in the afternoon.

Contact details:

BreakFree Capital Tower
2 Marcus Clarke
Canberra ACT 2601
Australia

61-7-56654408

Website: <https://www.breakfree.com.au/capital-tower/>

Winter School Venue

The Australian National University

The [Australian National University](#)'s Acton campus, the main campus of the university, is located within walking distance from Canberra's central business district.



The winter school venue will be the Research School of Earth Sciences for labs and the Anthony Low Building, Innovations Lecture Theatre (Mon-Thurs) and ANU Law Theatre (Fri) for lectures.

Food and retail on campus

ANU Acton campus is home to a wide range of services and food options.

<http://about.anu.edu.au/campus/services>

Winter School teaching and breakout spaces

Registration

Registration will start from 8:30am on Monday May 23rd in the foyer of the Anthony Low Building, Innovations Lecture Theatre.

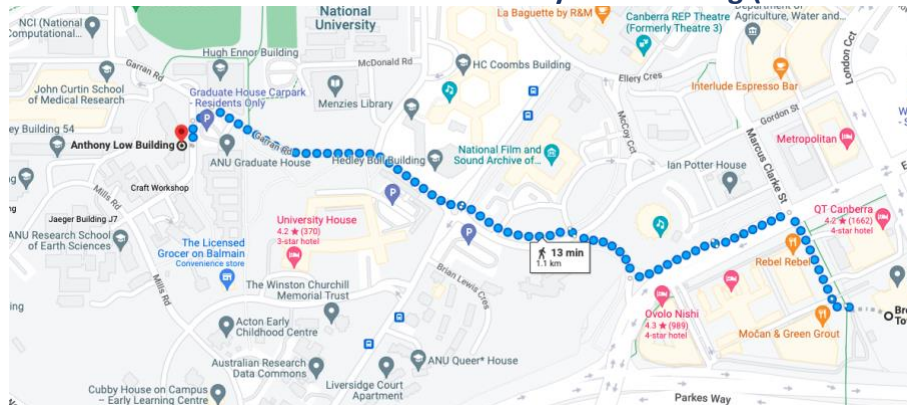
Lectures and Labs

All the Winter School's lectures will take place in the Innovations Lecture Theatre, Anthony Low building from Monday to Thursday, and the ANU Law Theatre, Law School Building 5, Fellows Road on Friday.

Labs will be held in the Geophysical Fluid Dynamics (GFD) lab or the Hales Seminar Room in the Research School of Earth Sciences Building 142, also known as the Jaeger 7 building.

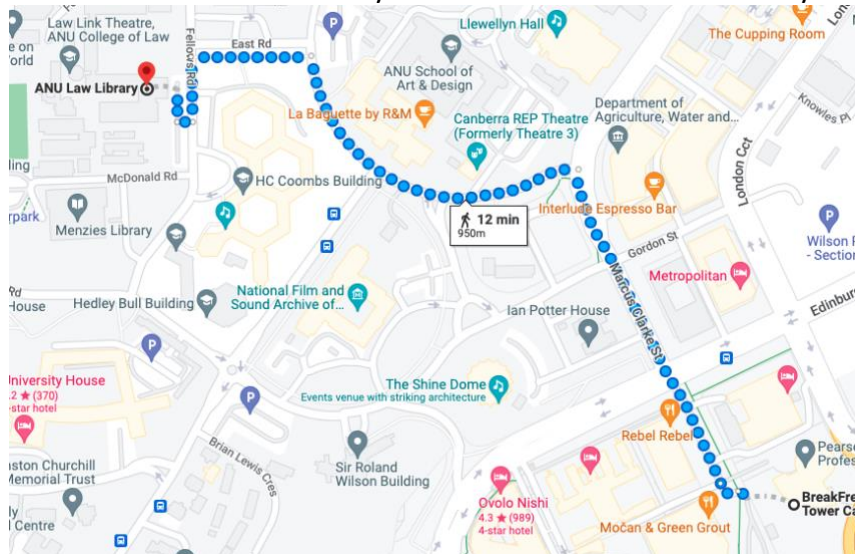
Please ensure you bring closed shoes for the lab sessions.

Directions from BreakFree to the Anthony Low building (Mon- Thurs) are shown below:



Directions from BreakFree to the ANU Law Theatre (Fri) are shown below:

Ground Floor, South Wing. Enter through the ANU College of Law foyer in building 5, and head towards the Law library. The Law Theatre is located on your left.



Social Event

Monday night dinner and stargazing

On Tuesday May 24th we will all meet at the restaurant [Bicicletta](#) (1/15 Edinburgh Avenue) for dinner at 5.00pm. Following dinner, we will travel by bus to the [Mount Stromlo Observatory](#), which is part of the ANU Research School of Astronomy and Astrophysics, for a stargazing session.

Please be reminded that Canberra can get quite cold at night – so make sure you bring appropriate clothing – including a warm jacket.

Supplementary Material

Supporting material including the schedule, recommended readings, presentation slides, and instructions for the labs will be made available on the [Winter School website](#).

Please note that this site will be continuously updated up to and during the Winter School week so be sure to keep checking it for new material.

IT and Wi-Fi details

Please note that all students are required to bring their own laptops. You will need to have Python, or some other means to read NetCDF data.

You should be able to access wifi via eduroam.

Food

Morning tea and lunch will be provided throughout the week for Winter School attendees. This will be served in the foyer of the Anthony Low building.

Students and staff staying at BreakFree will also receive a complimentary breakfast that can be picked up from Peppers Gallery.

During the 'free' nights in Canberra, students are expected to make their own dinner arrangements. There is an array of food options located on and around the campus.

Food and entertainment near Acton campus

Novotel

Dinner available 5:30 - 9:30pm, seven days a week

<http://novotelcanberra.com.au/Restaurant-Bar/one-restaurant-at-novotel-canberra.html>

Bicicletta

1/15 Edinburgh Ave

Sun 5pm - 11pm

<http://www.bicicletta.com.au/>

Happy's Chinese Restaurant

1/17 Garema Pl

Sun 5pm - 9:30pm

<http://www.happys.com.au/>

City Labor Club

16 Petrie Plaza

Sun 6.00 - 9.00pm

<http://www.laborclub.com.au/city-labor-club/dining/>

Zen Yai Thai

111 London Circuit

Sun 5.00 - 9.45pm

<http://zenyaithai.com.au/>

Flavours of India

70 Bunda St Canberra

Sun 5.30 - 10.00pm

<http://flavoursofindia.com.au/>

Hog's Breath

143 London Circuit

Sun 11.30am - 9.00pm

<https://www.hogsbreath.com.au/location/canberra/>




Campus security

For ANU campus safety and security information, please visit



<https://services.anu.edu.au/campus-environment/safety-security>



Winter School 2022 Staff and Speakers

Who can help

	<p>Melissa Hart <i>CLEX Graduate Director</i></p> <p>Phone: (02) 9385 6263 / 0409 224 033 Email: melissa.hart@unsw.edu.au</p>
	<p>Carmen Tucker <i>ANU Node Administrator</i></p> <p>Phone: (02) 6125 0610 / 0432 989 085 Email: carmen.tucker@anu.edu.au</p>
	<p>Sarah Jackson <i>PhD student</i></p> <p>ANU Email: sarah.jackson@anu.edu.au</p>

Speakers and lab demonstrators

	<p>Annie Foppert <i>Research Associate, Physical Oceanographer Australian Antarctic Program Partnership</i></p> <p>UTAS annie.foppert@utas.edu.au</p>
	<p>Martin Singh <i>Lecturer, School of Earth, Atmosphere and Environment</i></p> <p>Monash University martin.singh@monash.edu</p>

	<p>Callum Shakespeare Fellow/ Senior Lecturer Research School of Earth Sciences</p> <p>ANU Callum.shakespeare@anu.edu.au</p>
	<p>Kial Stewart Research Fellow Research School of Earth Sciences</p> <p>ANU kial.stewart@anu.edu.au</p>

Winter School 2022 Schedule



Winter (Autumn) School 2022- Atmosphere and Ocean Dynamics

	Monday May 23	Tuesday May 24	Wednesday May 25	Thursday May 26	Friday May 27
8:30 - 9:00	Registration				
9:00 - 9:15	Introduction and Welcome				
9:15 - 10:00	Introduction to GFD + demo rotating vs non-rotating	Why is there a circulation?	Shallow water dynamics and gravity waves	Wave energy and momentum	Large-scale ocean circulation
10:00 - 10:30	Morning tea (provided)				
10:30 - 11:30	Governing equations	Moist convection, Radiative-convection	Quasigeostrophy	Wave (and eddy) driven circulation	The Meridional overturning circulations
11:30 - 11:40	Stretch break				
11:40 - 12:40	Effects of rotation	The circulation under axisymmetry: The Held & Hou model	Rossby waves and baroclinic/barotropic instabilities	Wave mean flow interactions in the atmosphere	Wrap up
12:40 - 13:30	Lunch (provided)				
Groups will alternate each afternoon					
13:30 - 15:00	GROUP 1: Hands on Lab exercises at the GFD Lab	GROUP 2: Visit to NCI Supercomputer Facility + COSIMA	GROUP 3: Hands on Lab on analysing observational data	Time available to work on lab presentations	Play Frisbee
15:00 - 15:30	Break				
15:30 - 17:00	GROUP 1: Hands on Lab exercises at the GFD Lab	GROUP 2: Visit to NCI Supercomputer Facility + COSIMA	GROUP 3: Hands on Lab on analysing observational data	Lab presentations (~5 mins each)	The End
Evening		Social event: star gazing			

Lectures (Mon-Thurs)	Innovations lecture theatre, Anthony Low building
Lectures (Fri)	ANU Law Theatre, Law School building 5
Group 1	GFD lab- RSES, Jaeger 7
Group 2	NCI- Building 143, Corner of Ward Road and Garran Road
Group 3	Hales Seminar Room- RSES, Jaeger 7, 224

Australian National University Campus map



POINTS OF INTEREST

Accommodation	Grid	Blg No.
Student Residences		
Burton Hill	5F	162
Burton & Gorman Hill	45C	52
Davey Lodge	5E	49
Graduate House	2G	X001
John VIII College	3C	118
Kellyn Lodge	4D	51
Laura House	2D	X002
Lena Karmal Lodge	2D-2F	X004
Toad Hill	3G	30
Usula Hall	4D	50
Warburton	5E	150
Watson Lodge	2G	X003
Wright Hall	2F	163
Visitor and Staff Accommodation		
ANU Apartments	1C	77
Hotel at University House	2C	1
Childcare Facilities		
Acton Early Childhood Centre	2B	72
Cubby House on Campus-Early Learning Centre	2B	67
Goodstart ANU	4G	147
Heritage Early Childhood Centre	1A	75
University Pre-School and Child Care Centre	1A	75
Colleges		
ANU College of Arts and Social Sciences	2F	15
ANU College of Asia and the Pacific	2D	9
ANU College of Business and Economics	3G	28C
ANU College of Engineering and Computer Science	4G	115
ANU College of Law	3D	5
ANU College of Medicine, Ecology and Environment	3F	42
ANU College of Physical and Mathematical Sciences	2F	42
National Security College	2B	103A
National Centre for Indigenous Studies	5A	45
Eating Places		
Alma Coffee	3G	29C
Biggles School of Music	2F	100
Coffee Grounds	3G	19
Good's Healthy Bull	2D	120
Ivy & the Fox Cafe	2A	73
Karori (Kororia/Lesku/La)	3F	151
La Squore Cafe	2D	115
Lake Park	4E	48
Licensed Concess on Balmain	3C	64B
University House	2C	1
(Offices Bar and Restaurant, Fellows Bar and Cafe)		
Verde Bean	4C	54E
Wig & Pen	2F	100
Retail and Entertainment		
Karori (Kororia/Lesku/La)	3F	151
Cultural Centre	3F	153
University Hall (School of Music)	2F	100
Lecture Theatres		
511 Barry Drive Teaching Centre	2H	C007
Acad Theatre	2A	12E
Alma-Bales Lecture Theatre	2E	107
Australian Centre on China in the World Lecture Theatre	3D	109A
Bio Douglas Lecture Theatre	3C	62A
Coopland Lecture Theatre	2F	25
DNF Under Physics Lecture Theatre	4F	38A
Engineering Lecture Theatre	4F	3E
Fellows-Royal Lecture Theatres	2E	6A
Final Theatre, ACSNH	4C	131
Frosty Lecture Theatre	4E	48
HW Amal Lecture Theatres 1 & 2	2G	25A
Haydon-War Lecture Theatre (The Barn)	3F	23
HC Coombs Lecture Theatre	2D	8A
Healthy Lecture Theatre	4B	59
Innovations Lecture Theatre	3C	104
Law Link Lecture Theatre	3C	7
Law Theatre	3C	5
Manning Clark Theatre	3F	163
Milk Theatre, (Old Canberra House)	2A	73
Midnight Theatre	2A	112
Robertson Lecture Theatre	4E	49E
SRES Lecture Theatre	4E	18A
Weston Theatre	2A	12E
Libraries		
Art and Music Library	2E	115
Chilly Library (Humanities and Social Sciences)	3F	105
Harcock Library (Science and Technology)	4E	43
Merzles Library (Asia-Pacific)	3D	2
Law Library	3D	5
Student Associations		
ANU Students Association	3F	154
Postgraduate & Research Students Association	3F	154

Blg. No. and Building Name	Grid Reference	Description
1	University House	2C
1A	Madly Huckle Building	2C
1B	St Balmain Concess	2C
1C	St Balmain Concess	2C
2	HC Coombs Building	2D
2A	HC Coombs Building - Extension	2D
2B	HC Coombs Building	2D
2C	Chancery	2D
2D	Chancery Building 10A	2D
2E	Chancery Building 10B	2D
2F	Chancery Building 10C	2D
2G	Chancery Building 10D	2D
2H	Chancery 10E	2D
2I	Chancery 10F	2D
2J	Chancery 10G	2D
2K	Chancery 10H	2D
2L	Chancery 10I	2D
2M	Chancery 10J	2D
2N	Chancery 10K	2D
2O	Chancery 10L	2D
2P	Chancery 10M	2D
2Q	Chancery 10N	2D
2R	Chancery 10O	2D
2S	Chancery 10P	2D
2T	Chancery 10Q	2D
2U	Chancery 10R	2D
2V	Chancery 10S	2D
2W	Chancery 10T	2D
2X	Chancery 10U	2D
2Y	Chancery 10V	2D
2Z	Chancery 10W	2D
3	College of Business and Economics	3G
4	ANU College of Engineering and Computer Science	4G
5	ANU College of Law	3D
6	ANU College of Physical and Mathematical Sciences	2F
7	ANU College of Asia and the Pacific	2D
8	ANU College of Arts and Social Sciences	2F
9	ANU College of Medicine, Ecology and Environment	3F
10	ANU College of Health, Behaviour and Society	3F
11	ANU College of Education	3F
12	ANU College of Design	3F
13	ANU College of Architecture	3F
14	ANU College of Fine Arts	3F
15	ANU College of Music	3F
16	ANU College of Business and Economics	3G
17	ANU College of Engineering and Computer Science	4G
18	ANU College of Law	3D
19	ANU College of Physical and Mathematical Sciences	2F
20	ANU College of Asia and the Pacific	2D
21	ANU College of Arts and Social Sciences	2F
22	ANU College of Medicine, Ecology and Environment	3F
23	ANU College of Health, Behaviour and Society	3F
24	ANU College of Education	3F
25	ANU College of Design	3F
26	ANU College of Architecture	3F
27	ANU College of Fine Arts	3F
28	ANU College of Music	3F
29	ANU College of Business and Economics	3G
30	ANU College of Engineering and Computer Science	4G
31	ANU College of Law	3D
32	ANU College of Physical and Mathematical Sciences	2F
33	ANU College of Asia and the Pacific	2D
34	ANU College of Arts and Social Sciences	2F
35	ANU College of Medicine, Ecology and Environment	3F
36	ANU College of Health, Behaviour and Society	3F
37	ANU College of Education	3F
38	ANU College of Design	3F
39	ANU College of Architecture	3F
40	ANU College of Fine Arts	3F
41	ANU College of Music	3F
42	ANU College of Business and Economics	3G
43	ANU College of Engineering and Computer Science	4G
44	ANU College of Law	3D
45	ANU College of Physical and Mathematical Sciences	2F
46	ANU College of Asia and the Pacific	2D
47	ANU College of Arts and Social Sciences	2F
48	ANU College of Medicine, Ecology and Environment	3F
49	ANU College of Health, Behaviour and Society	3F
50	ANU College of Education	3F
51	ANU College of Design	3F
52	ANU College of Architecture	3F
53	ANU College of Fine Arts	3F
54	ANU College of Music	3F
55	ANU College of Business and Economics	3G
56	ANU College of Engineering and Computer Science	4G
57	ANU College of Law	3D
58	ANU College of Physical and Mathematical Sciences	2F
59	ANU College of Asia and the Pacific	2D
60	ANU College of Arts and Social Sciences	2F
61	ANU College of Medicine, Ecology and Environment	3F
62	ANU College of Health, Behaviour and Society	3F
63	ANU College of Education	3F
64	ANU College of Design	3F
65	ANU College of Architecture	3F
66	ANU College of Fine Arts	3F
67	ANU College of Music	3F
68	ANU College of Business and Economics	3G
69	ANU College of Engineering and Computer Science	4G
70	ANU College of Law	3D
71	ANU College of Physical and Mathematical Sciences	2F
72	ANU College of Asia and the Pacific	2D
73	ANU College of Arts and Social Sciences	2F
74	ANU College of Medicine, Ecology and Environment	3F
75	ANU College of Health, Behaviour and Society	3F
76	ANU College of Education	3F
77	ANU College of Design	3F
78	ANU College of Architecture	3F
79	ANU College of Fine Arts	3F
80	ANU College of Music	3F
81	ANU College of Business and Economics	3G
82	ANU College of Engineering and Computer Science	4G
83	ANU College of Law	3D
84	ANU College of Physical and Mathematical Sciences	2F
85	ANU College of Asia and the Pacific	2D
86	ANU College of Arts and Social Sciences	2F
87	ANU College of Medicine, Ecology and Environment	3F
88	ANU College of Health, Behaviour and Society	3F
89	ANU College of Education	3F
90	ANU College of Design	3F
91	ANU College of Architecture	3F
92	ANU College of Fine Arts	3F
93	ANU College of Music	3F
94	ANU College of Business and Economics	3G
95	ANU College of Engineering and Computer Science	4G
96	ANU College of Law	3D
97	ANU College of Physical and Mathematical Sciences	2F
98	ANU College of Asia and the Pacific	2D
99	ANU College of Arts and Social Sciences	2F
100	ANU College of Medicine, Ecology and Environment	3F