

**apts**.ac.uk  
Academy for PhD Training in Statistics

**WEEK 4: UNIVERSITY OF GLASGOW**  
**15th – 19th August 2022**



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# Welcome to Glasgow!

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Please note highlighted text indicates parts of the information pack which are not yet finalised.

**Workshop registration:** Registration on Monday 15th August will take place at the University of Glasgow, in Room 418/420 of the Boyd Orr Building, between 11.30am and 1.00pm.

You will receive your badge from the registration desk. Please wear your badge at all times. This will help with security and help you identify fellow participants.

**IT:** You will be issued with a log in and password from the registration desk. Please keep a note of this for use throughout the week within the Labs in the Boyd Orr Building and for Wi-Fi access on campus.

There will also be wireless internet access in your accommodation; you will be given a flyer when you arrive at the Residences with instructions on how to register.

**Messages:** The telephone number for colleagues or family to leave an urgent message for you during office hours is **0141 330 2940**.

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## Accommodation information

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### **Queen Margaret Residence, Common Services Building, Bellshaugh Ct, Glasgow G12 0PR**

**Travel/location:** Your accommodation is based at the above address. Please click on the attached link for travel directions to the Queen Margaret Residences:

<https://www.gla.ac.uk/undergraduate/accommodation/residenceprofiles/queenmargaretresidences/traveldirectionstoqueenmargaretresidences/>

Off street parking car parking is available at the Queen Margaret Residences.

**Accommodation:** Queen Margaret Residence is situated close to the Botanic Gardens within walking distance of the University and close to transport links and local amenities.

- Rooms are single en-suite rooms with linens and towels provided.
- Internet access provided in each room - please ask at reception for a cable.
- Wi-Fi provided in all rooms and communal areas.
- Laundry facilities are available on site.
- There is a common lounge/social area.
- Please note all areas of the Residences are non-smoking.

Single en-suite rooms have been booked for 4 nights – check-in Monday 15th August and check-out Friday 19th August (unless you have informed us otherwise).

The Queen Margaret Residences are manned 24 hours a day; Keys can be collected anytime and will be issued either by the office or security.

Bedrooms are available from 2pm onwards and rooms should be vacated by 10am on the day of departure.

There are no facilities at this accommodation for luggage storage; however, we will provide a room in the Boyd Orr Building (Room 405), University of Glasgow on Monday 15th and Friday 19th August to store your luggage. Further details will be given at Registration.

Breakfast each day will be provided at the Glasgow University Union from 8.00am to 9.15am, Tuesday - Friday.

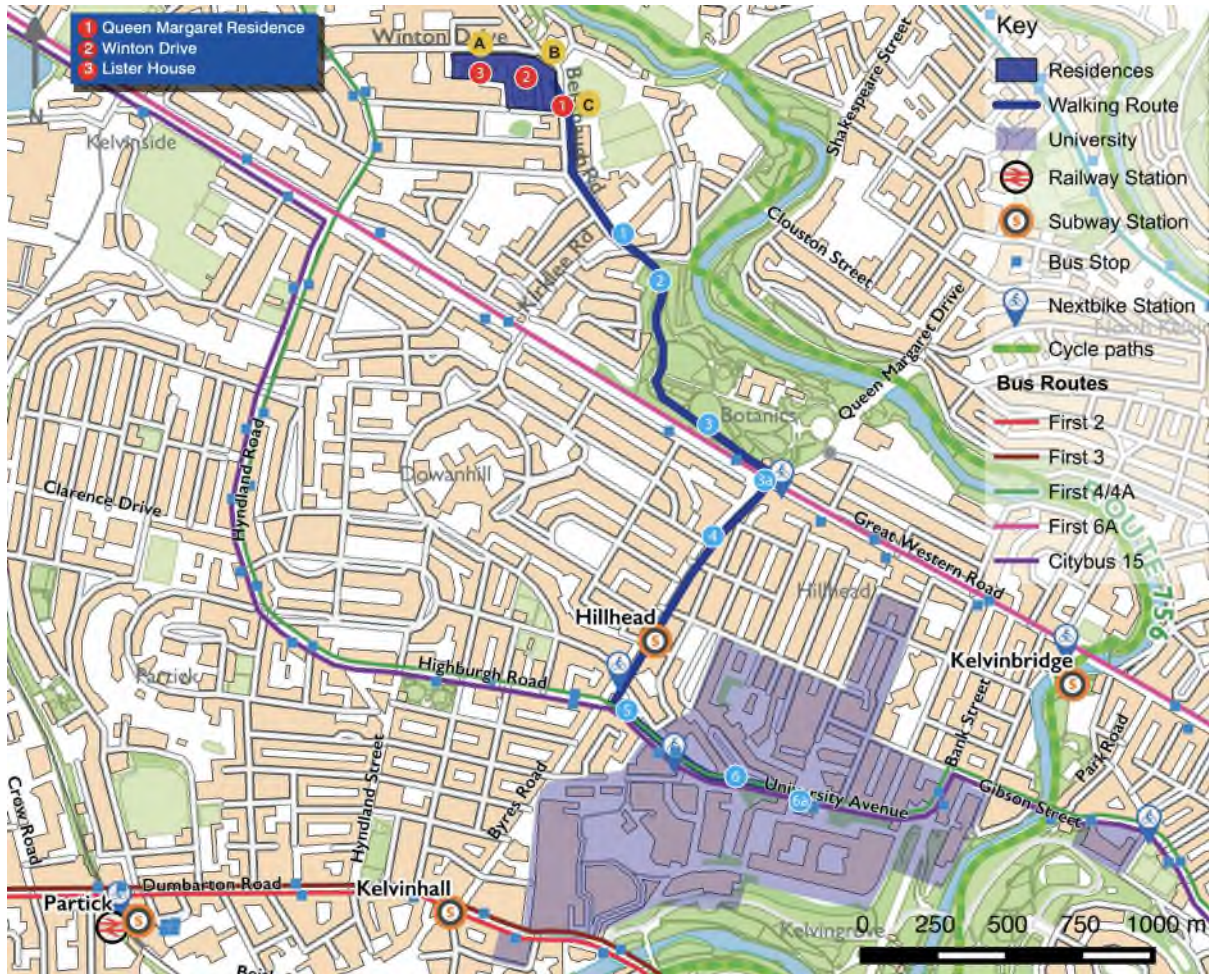
**Email access:** The Residences provide wireless internet access and Wi-Fi is available in all rooms and communal areas. You will be given a flyer when you check in with instructions on how to register.

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## Travel to APTS venue

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The University of Glasgow is a short journey from your accommodation at the Queen Margaret Residences.



The Queen Margaret Residences are approximately twenty-five minutes' walk from the main University campus. The suggested walking route takes you through the leafy Botanic Gardens, and then onto Byres Road, where you'll find a full complement of cafés, restaurants and shops.

Full travel directions can be found here:

[https://www.gla.ac.uk/media/Media\\_481656\\_smxx.pdf](https://www.gla.ac.uk/media/Media_481656_smxx.pdf)

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## Medical and emergency information

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**Emergency Services and Fire Procedures:** For help in an emergency dial **4444** from any internal telephone and your call will be directed appropriately. Visitors are asked to familiarise themselves with the University's fire procedures which are displayed in each bedroom.

*On discovering a fire in other buildings:*

Raise the alarm by breaking the glass in the nearest Break Glass Point.

*On hearing the continuous ringing of the fire bells:*

Stop what you are doing.

Leave by the nearest Fire Exit.

Walk calmly, do not run.

Do not stop to collect personal belongings.

Make your way to the nearest evacuation point, standing well clear of the building.

Do not re-enter the building until told to do so by the Fire Services or the University Security staff.

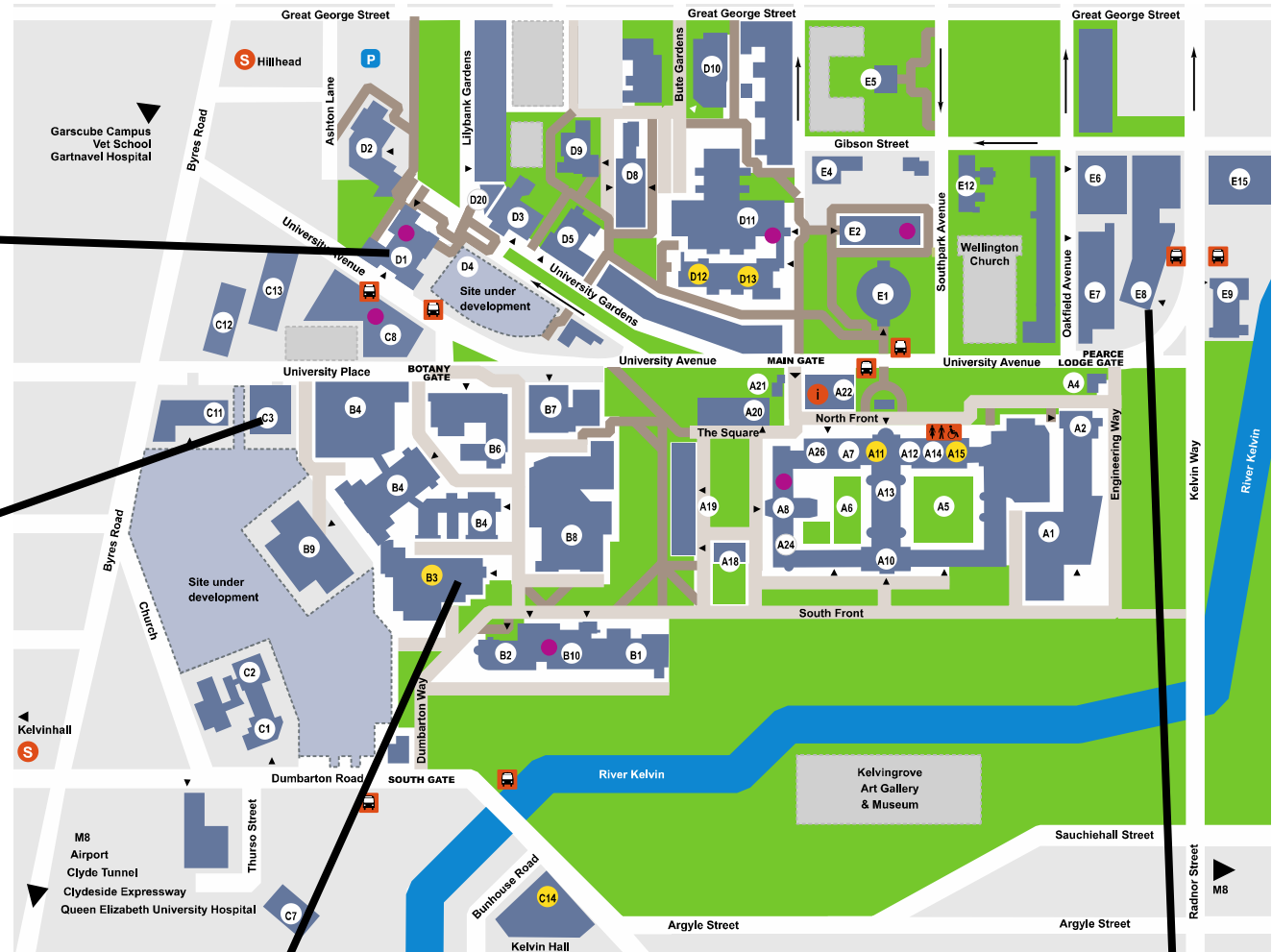
# Campus Map

**D1 Boyd Orr Building**  
(Labs)

**C3 Maths & Stats Building**  
(Registration)  
(Lunches)  
(Tea & Coffees)

**B3 Graham Kerr Building**  
(Lectures)

**E8 Glasgow University Union**  
(Breakfast & Dinners)



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## Design of experiments and studies

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**Module leader:** D Woods

**Aims:** To introduce the fundamental principles of statistically designed experiments, and other modes of data collection, and highlight their important role in the scientific method. A variety of classical and modern methods will be overviewed, connections between them emphasised. and ongoing research challenges introduced.

**Learning outcomes:** An understanding of the major different mechanisms for data collection, their similarities and differences. For designed experiments, an appreciation of the impact of the choice of design on the precision and accuracy of the subsequent statistical modelling and inference. An awareness of the challenges presented to data collection methodologies from modern scientific experiments and studies. Familiarity with some of the practical issues in implementing statistically designed experiments.

**Prerequisites:** Linear and nonlinear/generalised linear modelling. Sampling distributions of parameter estimators, including basic asymptotic results. An understanding of the fundamentals of Bayesian inference. Basic statistical computing, including simple optimisation methods. All these topics, and more, are covered by the APTS Statistical Inference, Statistical Computing and Statistical Modelling modules.

**Topics:**

1. Modes of data collection, experiments and causality, the impact of design on modelling
2. Factorial experiments
3. Bayesian design, and design for nonlinear models
4. Design of computer and simulation experiments
5. Data collection in spatial studies and via sample surveys, and connections to design of experiments

**Assessment:** Exercises, that will include finding and assessing designs for practically relevant examples.



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# Statistical Machine Learning

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**Module leader:** L Aslett

**Aims:** This module introduces students to modern supervised machine learning methodology and practice, with an emphasis on statistical and probabilistic approaches in the field. The course seeks to balance theory, methods and application, providing an introduction with firm foundations that is accessible to those working on applications and seeking to employ best practice. There will be exploration of some key software tools which have facilitated the growth in the use of these methods across a broad spectrum of applications and an emphasis on how to carefully assess machine learning models.

**Learning outcomes:** Students following this module will gain a broad view of the supervised statistical machine learning landscape, including some of the main theoretical and methodological foundations. They will be able to appraise different machine learning methods and reason about their use. In particular, students completing the course will gain an understanding of how to practically apply these techniques, with an ability to critically evaluate the performance of their models. Students will also have an insight into the extensive software libraries available today and their use to construct a full machine learning pipeline.

**Prerequisites:** To undertake this module, students should have:

- at least one undergraduate level course in probability and in statistics;
- standard undergraduate level knowledge of linear algebra and calculus;
- solid grasp of statistical computing in R;
- knowledge of statistical modelling, including regression modelling;
- some basic understanding of optimisation methods beneficial, but not essential.

**Topics:**

- Formulation of supervised learning for regression and classification (scoring/probabilistic, decision boundaries, generative/discriminative), loss functions and basic decision theory;
- Theory of model capacity, complexity and bias-variance decomposition;
- Curse of dimensionality;
- Overview of some key modelling methodologies (eg logistic regression, support vector machines/kernel trick, additive models, trees, boosting, bagging, forests);
- Model selection, ensembles, tuning and super-learning;
- Evaluation of model performance, validation and calibration and their reporting in applications;
- Reproducibility;
- Brief primer on neural networks and deep learning (time permitting);
- Coverage of some key software frameworks for applying machine learning in the real world.

**Assessment:** An exercise set by the module leader involving practical use of some of the machine learning methods covered and critical evaluation of their performance.

## APTS Timetable

	<b>Monday 15th August</b>	<b>Tuesday 16th August</b>	<b>Wednesday 17th August</b>	<b>Thursday 18th August</b>	<b>Friday 19th August</b>
08:00 – 9:15		<b>Breakfast – GUU Dining Hall</b>			
09:30 – 11:00		Design of experiments & studies <b>(Lab)</b>	Design of experiments & studies	Statistical machine learning	Statistical machine learning <b>(Lab)</b>
11:00 – 11:30		<b>Tea &amp; Coffee Break</b>			
11:30 – 13:00	<b>Registration: Maths building (Foyer)</b>	Design of experiments & studies	Statistical machine learning	Statistical machine learning <b>(Lab)</b>	Statistical machine learning
13:00 – 14:00	<b>Lunch – GUU Dining Hall</b>				
14:00 – 15:30	Design of experiments & studies	Design of experiments & studies	<b>Free afternoon</b>	Statistical machine learning	
15:30 – 16:00	<b>Tea &amp; Coffee Break</b>			<b>Tea &amp; Coffee</b>	
16:00 – 17:30	Design of experiments & studies	Design of experiments & studies <b>(Lab)</b>		Statistical machine learning	
17:30 – 18:30	<b>Free Time</b>	<b>Free Time</b>		<b>Free Time</b>	
18:30 – 19:30	<b>Dinner – GUU Dining Hall</b>	<b>Dinner – GUU Dining Hall</b>	<b>Free evening – to arrange own dinner</b>	<b>Dinner – GUU Dining Hall</b>	
Evening		<b>Quiz</b>		<b>Ceilidh (20:00 – 23:00)</b>	

GUU – Glasgow University Union

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## Timetable notes

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- **Lectures** will take place in the Main Lecture Theatre, Graham Kerr Building.
- **Computer labs** will take place in Room 418/420, Boyd Orr Building.
- **Tea and coffee breaks** will be served in the Museum in the Graham Kerr Building.
- **Breakfasts, Lunches & Dinners** will all be served in the Glasgow University Union Dining Hall.
- **APTS Ceilidh:** This will take place in the Glasgow University Union Debate Chamber after dinner on Thursday 18th August.