



## WEEK 2: UNIVERSITY OF SOUTHAMPTON

30 March – 3 April 2020



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# Welcome to Southampton!

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**The City of Southampton:** The city has numerous parks and open spaces, including Southampton Common, situated near our Highfield Campus. The waterfront also provides countless opportunities for sport and leisure with a wide range of water sports to appeal to all abilities.

Southampton is home to one of the UK's top 10 shopping centres, West Quay, and the city centre and waterfront marina both offer a range of independent shops, as well as restaurants, cafés, bars, pubs and clubs. With cinemas, theatres, galleries and museums, the city offers a rich assortment of cultural attractions.

**Surroundings:** Winchester, once the capital of England, has a rich cultural heritage and lively city atmosphere with galleries, museums, theatres, cinema and arts centre, as well as a wide variety of shops, pubs and restaurants. Furthermore, the New Forest National Park is the largest unenclosed area in southern England, where ponies, deer and cattle graze freely, in an environment that remains unchanged by the modern world. It stretches for 145 square miles (375km<sup>2</sup>), with open heaths and beautiful forest landscapes.

**Workshop registration:** Registration for the APTS week will be at the APTS registration desk, situated in the Mathematical Sciences Student Centre (Building 56 on the Highfield Campus map), between 11.15 and 14.00 on Monday 30th March. You will receive your welcome pack and badge from the registration desk. Please **wear your badge at all times**. This will help with security and also help you identify fellow participants.

**Accommodation check-in:** Check-in for accommodation will take place at Highfield Hall reception, and can be done either during the registration period or after lectures have finished on Monday. Secure luggage storage will be available for the afternoon of Monday 30th March and morning of Friday 3rd April.

**Car parking:** Workshop participants staying in the Highfield Hall are able to use the car park but spaces are limited. Car parking in the Highfield Hall is free of charge for residents during the APTS week but a permit is required. Please contact Highfield Hall reception on arrival.

**Messages:** Urgent/emergency messages from colleagues or family should be directed to the main University Switchboard on +44 (0)2380 595000.

**Other campus facilities:** Facilities at the Highfield Campus include a University shop, Post Office, bookshop and several coffee shops. There are Santander and Barclays Banks on campus with cash dispensers. You will be able to use the Jubilee Sports Centre (Building 18 on the Highfield Campus map) on a pay-as-you-go basis.

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## Accommodation information

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**Your room:** Workshop participants requiring accommodation have been booked rooms in Highfield Hall (Omdurman Road, Southampton, SO17 1AW). These will be available from **12.00** on Monday 30th March. Secure luggage storage will be available for the afternoon of 30th March and again on the morning of Friday 3rd April.

**Reception/Keys:** You should check in and collect your keys Highfield Hall reception desk.

**Internet access:** Wireless internet access is available across campus and halls using eduroam. For those without eduroam access, there is also a guest wifi network.

### **Meals:**

*Breakfast:* Breakfast will be served in the Dining Hall of Highfield Hall between 08.00 – 09.00 each morning of your stay.

*Lunch:* A sandwich “working lunch” will be served Monday - Friday in the Mathematical Sciences Student Centre (Building 56) between 13.00 – 14.00.

*Evening:* Evening meals will be served in Garden Court (Building 40, Monday and Tuesday) between 18.30 – 19.30, with a two-course cafeteria-style dinner. On Wednesday you are given the opportunity to visit restaurants in Southampton as part of your free afternoon/evening and some suggestions will be provided on Wednesday morning. The Academy Dinner on Thursday will be held in Garden Court (Building 40). Dinner will be ready to be served at 19.30. A cash bar (also Building 40) will be open from 19.00 which serves a selection of beers, wines, spirits and soft drinks.

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## Emergency information

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### **First Aid and accident reporting:**

In the event of an accident that needs medical attention the nearest first aider should be contacted. The names and locations of trained first aiders are displayed on green and white signs throughout each building.

In the event of a serious accident, the ambulance service should be contacted immediately by dialling **999** (or 91-999 from a University phone) before calling a first-aider and notifying the Central Control Room (CCR) on extension **3311**. The CCR non-emergency contact number is **22811**.

### **Fire safety and emergency procedures:**

*Action in the event of fire:* If you notice a fire you should immediately raise the alarm by breaking the glass of the nearest manual fire alarm call point. This can be done using your elbow or shoe. The alarm is a continuous bell.

*Calling the Fire Service:* The person raising the alarm should ensure that the Fire Service is summoned by either reporting to someone in authority, or by dialling **999** (91-999 from a University phone) from a telephone **remote from** where the alarms are sounding. Following this, the University Control Centre Room (CCR) should be alerted by dialling **3311**.

*On hearing the continuous ringing of 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.

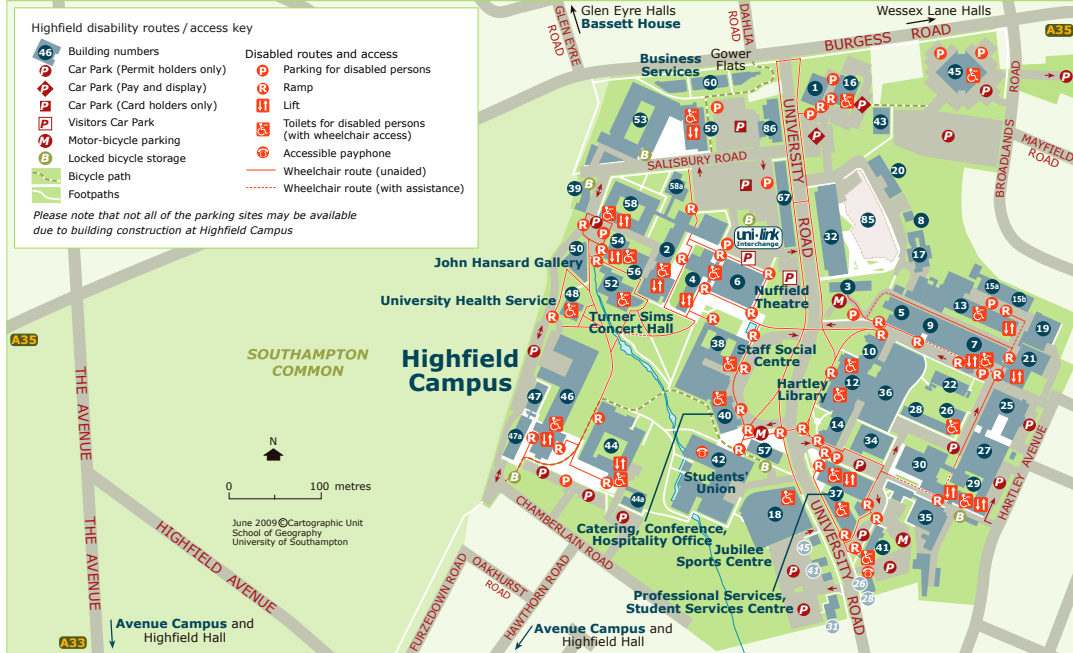
Do not re-enter the building until told to do so by the Fire Service or University Security staff.

# Highfield Campus & Highfield Hall maps

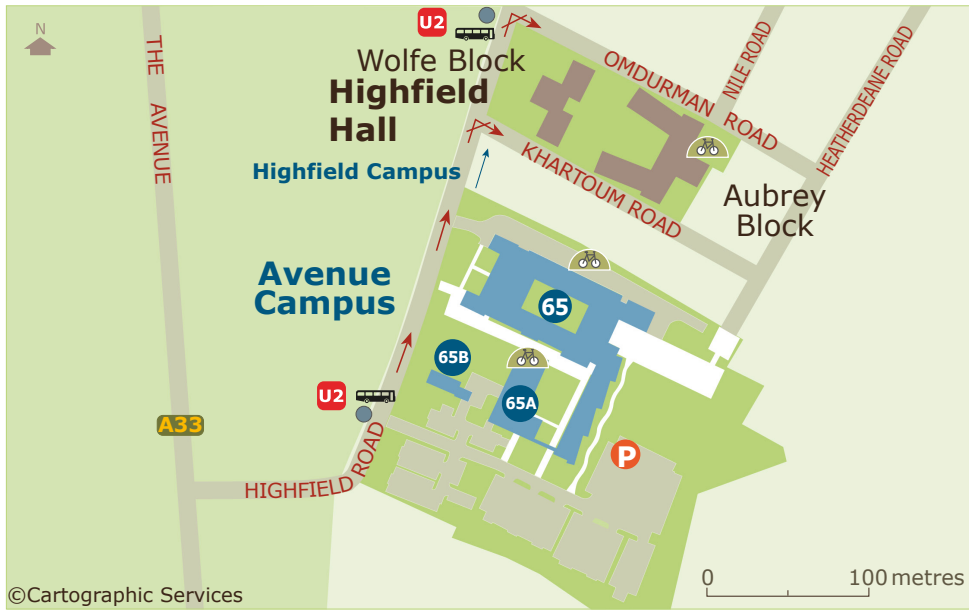
See also <https://maps.southampton.ac.uk>



MAP 5b Highfield Campus parking and disability routes/access



Accommodation Office (Student Services Centre)	37	Maintenance Control Centre	35
Aerospace Engineering	15	Management	2
Archaeology (Avenue Campus)	55	Mathematics	54
Audio Visual Presentation Services	54	Mechanical Engineering	7
Biological Sciences (Boldrewood)	52	Medicine (Boldrewood)	6
Boldrewood Conference Centre (Boldrewood)	53	Modern Languages (Avenue Campus)	65
Bookshop	60	Mountbatten Building	53
Business Services	60	Murray Building	58
Careers Advisory Service	3	Music	2, 4
Cartographic Unit	44	National Oceanography Centre, Southampton (Waterfront Campus)	68
Centre for Language Study (Avenue Campus)	65	Nightingale Building	67
Centre for Learning & Teaching	7	Nuffield Theatre	6
Chaplaincy	2	Ocean & Earth Science (Waterfront Campus)	68
Chemistry	57, 58, 30	Optoelectronics Research Centre (ORC)	46, 37, 44
Civil Engineering and the Environment	7, 21, 22, 46	Philosophy (Avenue Campus)	55
Communications (Student Services Centre)	37	Physics & Astronomy	46
Counselling Service	60 No.28 University Road	Politics	58
Day Nursery	41	Post / Parcel Store	35
Dental Access Centre	50 No.31 University Road	Print Centre	36
Dyslexia Services (LDC)	45 No.45 University Road	Professional Services	47
Economics	56	Psychology	47
Education	51, 24, 56	Purchasing Services	35
Electronics & Computer Science	1, 16, 20, 32, 46, 47, 53, 55, 66	Rayleigh Building	15
Engineering Materials	5	Research and Innovation Services (RIS)	37
Engineering Workshops	9	Research Institute for Industry	7
English (Avenue Campus)	65	R.J.Mitchell Wind Tunnel 11x8 (Engineering Sciences)	17
e-Science Centre	25	Safety Office	26 No.26 University Road
Estates & Facilities	55	Security	35
Eustice Building	4	Shackleton Building	44
Faraday Building	51	Ship Science	26
Fees Office (Student Services Centre)	37	Social Sciences Graduate Centre	38
Film Studies (Avenue Campus)	65	Social Statistics	58
Fitness Studio	45	Social Work Studies	58
EEE Building	32	Sociology & Social Policy	58
Geodata Institute	46	Southampton Statistical Sciences Research Institute	39
Geography	46	Sports Hall, Fitness Centre & Swimming Pool	15
George Thomas Building	57	Staff Social Centre & John Arlott Room	35
Gower Building	60	Student Funds Office (Student Services Centre)	37
Graduation Office (Student Services Centre)	37	Student Services Centre	37
Health Sciences	45, 67	Students' Union	40, 42, 37
Highfield Health	51 No.31 University Road	Temp Bank	37
History (Avenue Campus)	65	Tizard Building	13
Human Performance Laboratory	65	Tony Davies High Voltage Laboratory	20 No.45 University Road
Human Resources	37	Training & Development Unit	45 No.45 University Road
Institute for Life Sciences (under construction)	55	Turner Sims	5
Institute of Sound & Vibration Research	65	Underwater Tank	6
iSolutions	2, 25, 54, 58	University Health Service	48
James Parkes Building (Avenue Campus)	65	Uni-link	57
John Hansard Gallery	50	University Post Office	60
Jubilee Sports Centre	16	West Building & Old Refectory	40
Lanchester Building	7	Wolfson Building	15
Law	4	Wolfson Electrostatics Unit	21
Library	10, 12, 14, 36	Wolfson Unit for Marine Technology and Industrial Aerodynamics (WUMTIA)	15
Main Entrance	10	Year in Industry	15
Goods Entrance, Gurney Dixon Building	10, 46	Zepher Building	50



## APTS Timetable

	Monday 30 March	Tuesday 31 March	Wednesday 1 April	Thursday 2 April	Friday 3 April
09.30 – 11.00		<b>Applied Stochastic Processes</b>	<b>Statistical Modelling</b>	<b>Applied Stochastic Processes</b>	<b>Applied Stochastic Processes</b>
11.00 – 11.30		Tea & Coffee			
11.30 – 13.00	Registration (11.15 – 12.45)	<b>Statistical Modelling</b>	<b>Applied Stochastic Processes</b>	<b>Statistical Modelling</b>	<b>Statistical Modelling</b>
13.00 – 14.00	Lunch				
14.00 – 14.15	Welcome				
14.15 – 15.45	<b>Applied Stochastic Processes</b>	<b>Applied Stochastic Processes</b>	Free afternoon	<b>Applied Stochastic Processes</b>	
15.45 – 16.15	Tea & Coffee			Tea & Coffee	
16.15 – 17.45	<b>Statistical Modelling</b>	<b>Statistical Modelling (practical)</b>		<b>Statistical Modelling (practical)</b>	
18.30 – 19.30	Dinner				
Evening	Wine Reception (19.30 – )	Quiz (20.00 – )	Free evening	Academy dinner (19.30 – )	

(Please see the accompanying notes on the following page.)



## Timetable notes

- **Lectures:** All the lectures will take place in the Murray Lecture Theatre (Room 1067) in Building 58 (Murray).
- **Laboratory sessions:** You are required to bring your own laptop to work on during these sessions. The computer labs will take place in the Mathematical Sciences Student Centre (Building 56).
- **Wine reception:** This will take place in the Mathematical Sciences Student Centre (Building 56).
- **Quiz:** On Tuesday, we will host a quiz in the Mathematical Sciences Student Centre (Building 56), starting at 20.00. Please bring your own snacks and drinks.
- **Lunches, tea and coffee:** These will all be served in the Mathematical Sciences Student Centre (Building 56).
- **Dinners:** All participants who signed up for the food option are booked for dinner at Garden Court (Building 40) on Monday and Tuesday evenings.
- **Academy dinner:** This will take place in Garden Court (Building 40). A bar will be open from 19.00 and dinner will be served at 19.30. Casual dress is recommended. All participants are expected to come to the Academy dinner except if they have mentioned so on the special requirements form filled ahead of the APTS week.

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# Module Details

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## Statistical Modelling

MODULE LEADER: HELEN OGDEN

Aim: The main aim of this module is to introduce important general aspects of statistical modelling, including Bayesian modelling. A broad range of specific, commonly-used types of model will be encountered.

Learning outcomes: After taking this module, students should — for topics listed below which are included in the module — understand the issues (why this is important), the terminology, the statistical principles associated with this aspect of modelling, and sufficient theory to deal with simple examples; and they will have gained some practical hands-on experience in more complex examples.

Prerequisites: Preparation for this module should (re-)establish familiarity with linear and generalized linear models, and with likelihood and Bayesian inference. Students who are familiar with (for example) chapters 4, 8, 10 and 11 of Davison (2003) “Statistical Models” will be very well prepared (and will already know something of the areas to be covered in the module).

Topics:

- Principles and practice of model selection;
- Random-effects/hierarchical/mixed models;
- Non-linear models.

Assessment: Exercises set by the module leader, which will include some practical data analysis and statistical modelling.

# Applied Stochastic Processes

MODULE LEADERS: NICHOLAS GEORGIU & MATTHEW ROBERTS

Aims: This module will introduce students to two important notions in stochastic processes—reversibility and martingales—identifying the basic ideas, outlining the main results and giving a flavour of some of the important ways in which these notions are used in statistics.

Learning outcomes: A student successfully completing this module will be able to:

- describe and calculate with the notion of a reversible Markov chain, both in discrete and continuous time;
- describe the basic properties of discrete-parameter martingales and check whether the martingale property holds;
- recall and apply significant concepts from martingale theory (indicative list: optional stopping, martingale convergence);
- explain how to use Foster-Lyapunov criteria to establish recurrence and speed of convergence to equilibrium for Markov chains.

Prerequisites: Preparation for this module should include a review of the basic theory and concepts of Markov chains as examples of simple stochastic processes (transition and rate matrices, irreducibility and aperiodicity, equilibrium equations and results on convergence to equilibrium), and with the definition and basic properties of the Poisson process (as an example of a simple counting process).

Further reading: Various useful textbooks at increasing levels of mathematical sophistication:

- Haggstrom (2002) “Finite Markov chains and algorithmic applications”,
- Grimmett and Stirzaker (2001) “Probability and random processes”,
- Breiman (1992) “Probability”,
- Norris (1998) “Markov chains”,
- Ross (1996) “Stochastic processes”,
- Williams (1991) “Probability with martingales”,

Some useful texts that are free on the web:

- Doyle and Snell (1984) “[Random walks and electric networks](#)”
- Kelly (1979) “[Reversibility and stochastic networks](#)”
- Kindermann and Snell (1980) “[Markov random fields and their applications](#)”
- Meyn and Tweedie (1993) “[Markov chains and stochastic stability](#)”
- Aldous and Fill (2001) “[Reversible Markov Chains and Random Walks on Graphs](#)”

Topics:

- Reversibility of Markov chains in both discrete and continuous time, computation of equilibrium distributions for such chains, application to important examples.
- Discrete time martingales, examples, application, super-martingales, sub-martingales.
- Stopping times, statements and applications of optional stopping theorem, martingale convergence theorem.
- Recurrence and rates of convergence for Markov chains, application to important examples.
- Statements and applications of Foster-Lyapunov criteria, viewed using the language of martingales.
- Statistical applications and relevance (highlighted where appropriate throughout).

Assessment:

- Complete appropriate exercises that are simple developments or extensions of aspects of the results in the module.



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