#### COURSE TIMETABLE

**Monday 17th April 2023 – Management School (Marked MAN on the map)**

***12.00 – 1.30 pm*** ***LUMS (Management School) Breakout space outside LT2***  
*Registration will take place here and a light lunch will be provided. We will also direct you to the luggage room from here.*

**1.30 – 2.15 pm** **LT19 WPB002**

**RS/JB/LN** Introduction and welcome from Rob Shone (Course Director), John Boylan (NATCOR Director) and Lindsay Newby (Administrator)

**RS** Probability and random systems; probability puzzles; systems evolving under uncertainty; Markov chains (discrete time)

**2.15 – 3.00 pm** Transition matrices; long-term behaviour; steady-state distributions;

**RS** periodicity; transience and recurrence

***3.00 – 3.30 pm*** **LUMS Hub Café***Tea/Coffee*

**3.30 – 4.15 pm** Continuous-time Markov chains; exponential distributions; transition

**RS** rates; steady-state calculations; uniformisation

**4.15 – 5.00 pm** Modelling a queueing system as a continuous-time Markov process;

**RS** Kendall’s notation; Poisson processes; birth-death processes

**5.00 pm** **LUMS Hub Café Area – Accommodation keys will be distributed and luggage collected. Please bear in mind there will be a 5-10 minute walk to your accommodation.**

**6.30 pm** **Perimeter Road Outside LUMS Reception**  
[**Woodland walk**](https://portal.lancaster.ac.uk/ask/physical-wellbeing/) **around campus. If you wish to join us on the woodland walk, please ensure you have suitable footwear and clothing.**

**7.30 pm** **Hot buffet to be served at the Sky Café, situated on D floor of the Info Lab Building.**

**Tuesday 18th April 2023 – LT16 WPA019**

**9.15 - 10.00 am** Introduction to queue modelling. Markovian queues (e.g. M/M/1,

**CK** M/M/S, queues with blocking); Networks of queues (Jackson networks, decomposition approaches), Little’s Law.

**10.00 – 10.45 am** Multiclass queueing models, including scheduling and priority policies.

**CK**

***10.45 – 11.15 am* LUMS Hub Café** *Tea/Coffee*

**11.15 am –**  Control of queueing systems (optimal routing and scheduling policies)

**12.00 pm**

**CK**

***12.00 – 1.30 pm*** *Lunch*

**1.30 – 2.15 pm** Non-exponential queues, M/G/∞, M/G/1 (insights into drivers of

**DW** congestion), M/Ek/S and/or M/PH/S.

**2.15 -3.00 pm** Time-dependent behaviour of queues – Newell’s Graphical approach,

**DW** Simple Stationary Approximation (SSA), Pointwise Stationary Approximation (PSA), Discrete Time Modelling (DTM), M(*t*)/G/∞, Networks of M(*t*)/G/∞ systems.

***3.00 – 3.30 pm*** **LUMS Hub Café***Tea/Coffee*

**3.30 – 4.15 pm**  **Science and Technology Bldg – Hannaford Computing Laboratory** -

**DW/CK/RS** Introduction to package, and assessment requirements.

**4.15 – 5.00 pm** Start of assessment in Computing Laboratory

**DW/CK/RS**

**Wednesday 19th April 2023 – LT16 WPA019**

**9.15 - 10.00 am** Guest Speaker: Richard Wood (NHS)

**10.00 – 10.45 am** Inventory Control I: continuous review models

**AL**

***10.45 – 11.15 am*** **LUMS Hub Café** *Tea/Coffee*

**11.15 am –**  Inventory Control II: Periodic review models

**12.00 pm AL**

***12.00 – 1.00 pm*** *Lunch*

**1.00 – 1.45 pm** Jake Clarkson (INRIA, France)

**1.45 – 2.30 pm** Revenue Management 1

**DL**

***2.30 – 3.00 pm*** **Breakout space outside LUMS LT2** *Tea/Coffee*

**3.00 – 3.45 pm** Revenue Management 2

**DL**

**3.45 – 4.30 pm** Revenue Management 3: Case Study

**DL**

***4.30 – 5.30 pm*** *Free time*

**5.30 pm** **Travel to Lancaster City Centre for our course dinner. This has been booked at** [**the Bombay Balti**](https://bombaybalti-lancaster.co.uk/) **restaurant where a selection of mixed starters and mains will be served. Please note, no drinks are included in this.**

6.00 pm Meet at restaurant with food to be served at 6.30 pm  
  
**Travel to Lancaster**

Getting into the city centre will require you catching the local Stagecoach bus from the underpass on campus. Buses may be busy so please bear in mind that you may have to wait for the next bus to come along. Buses (Nos 1, 1A, 100, 4 or any bus stating “Lancaster Bus Station”) run every 10 minutes from the underpass, all of which will stop at the **bus station**.The bus journey will take approximately 20 minutes so please allow enough time for your journey. Please note you will be required to pay the bus fare yourself.

From the bus station you will have a short walk up the hill, towards the castle, to the restaurant which is situated on 16 China Street, Lancaster LA1 1EX.

At the end of the evening, you will need to return to the bus station, or Common Garden Street, where you can catch a bus back onto campus. Buses (Nos 1, 1A, 100, 4, or any bus stating “Lancaster University”) run every 10-15 minutes so you shouldn’t have long to wait. Alternatively, you could share a taxi from the taxi rank also situated at the bus station.

**Thursday 20th April 2023 – LUMS LT 6**

**9.15 - 10.00 am** Replacement & Maintenance 1

**SMW**

**10.00 – 10.45 am** Replacement & Maintenance 2

**SMW**

***10.45 – 11.15 am*** **LUMS Hub Café***Tea/Coffee*

**11.15 am –**  Replacement & Maintenance 3: Case Study

**12.00 pm**

**SMW**

***12.00 - 1.00 pm*** *Lunch*

**1.00 – 1.45 pm** Inventory Control III: multi-item and newsboy models

**AL**

***1.45 – 2.00 pm*** **LUMS Hub Café***Tea/Coffee*

**2.00 – 5.00 pm** **Science and Technology Bldg – Hannaford Computing Laboratory**

**DW/CK/RS** Finalisation of Computing Assessment.

**Friday 21st April 2023 – LUMS LT6**

**9.00 – 9.15 am** Check out and leave luggage in the designated luggage room by LUMS Reception. **Please do not forget to leave your accommodation key, or you will be charged.**

**9.15 - 10.00 am** Guest Speaker Slot 3

**10.00 - 10.45 am** Guest Speaker Slot 4

***10.45 – 11.15 am*****LUMS Hub Café** *Tea/Coffee*

**11.15 am –**  **Assessment**

**12.15 pm**

**12.15 – 1.00 pm** Discussion, reflections, announcement of Group Assessment prize

**RS/DW** winners, input from students and completion of student feedback questionnaires.

**1.00 pm** *End*

**Contributors**

**LN – Mrs Lindsay Newby (Administrator, Lancaster)**

**JB – Professor John Boylan (Lancaster, NATCOR Director)**

**RS – Dr Rob Shone (Lancaster, Course Director)**

**CK - Dr Chris Kirkbride (Lancaster)**

**DW - Dr David Worthington (Lancaster)**

**AL - Professor Adam Letchford (Lancaster)**

**DL – Dr Dong Li (Loughborough)**

**SMW - Professor Shaomin Wu (Kent)**