OMNI | RÉUNIS
One Health Modelling Network for Emerging Infections | Réseau une seule santé sur modélisation des infections

FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES

ONLINE COURSE: ONE HEALTH MODELLING FOR EMERGING INFECTIOUS DISEASES

Organized by: Jane Heffernan (York University), Mike Kallos (University of Calgary), and Mark Lewis (University of Victoria) & Deirdre Haskell (The Fields Institute)

PART 1 | FALL 2022 | OCT 11- JAN 27

This course introduces students to the mathematical modelling of infectious diseases in One Health. Infectious diseases models are developed to track infection and transmission in animal, plant, and human populations. Particular attention is paid to infections that can be transmitted between humans, animals and the environment. Public health mitigation, as well as animal and environmental pathogen control are discussed, and the models are extended to include vaccination, drug therapies and population contact control strategies in public health and healthcare. Students will learn to formulate, analyze,parameterize, and validatequantitative models for infectious disease processes and data. Applications include SARS-CoV-2, MERS-CoV, avian influenza, bacterial diseases and antibiotic resistance, and fungal pathogens and antifungal resistance. Approaches involve computer simulation, differential equations, individual-based models,least squares, likelihood, matrix equations, Markovprocesses, and stochastic processes. Computing labs cover simulation and programming methods in specific software programs that are popular in the field of Infectious Disease Modelling. Coursediscussions in model evaluation and appraisal of currentliterature include opportunities for reflection and communication. Students will have opportunity to collaborate with their course colleagues on group projects.

DEADLINE TO REGISTER: OCTOBER 17, 2022

PART 2 | WINTER 2023 | FEB 6- MAY 19

This course is an extension of One health Modelling for Emerging Infectious Diseases Part I. This course introduces students to mathematical modelling of infectious diseases in One Health, including vectorborne diseases, livestock diseases, and waterborne diseases.
Infectious diseases models are developed to track infection and transmission in animal, plant, and human populations. Particular attention is paid to infections that can be transmitted to humans in animals from their environment, including insects, livestock, and affected water sources. Public health mitigation, as well as animal and environmental pathogen control are discussed, and the models are extended to include vector control, treatment and immunization of livestock, other vector and livestock control disease control mechanisms (i.e., culling), and environmental treatment. Students will learn to formulate, analyze,parameterize, and validatequantitative models for infectious disease processes and data. Applications include malaria, zika virus, west nile virus, lyme disease, foot and mouth disease, avian influenza, cholera, Hepatitis A virus, and typhoid fever. Approaches involve computer simulation, differential equations, individual-based models,least squares, likelihood, matrix equations, Markovprocesses, and stochastic processes. Computing labs cover simulation and programming methods in specific software programs that are popular in the field of Infectious Disease Modelling. Coursediscussions in model evaluation and appraisal of currentliterature include opportunities for reflection and communication. Students will have opportunity to collaborate with their course colleagues on group projects.

DEADLINE TO REGISTER: TBA AT A LATER DATE

MEET YOUR INSTRUCTORS!

JULIEN ARINO

Professor and Faculty of Science Research Chair in Fundamental Science with the Department of Mathematics at the University of Manitoba

READ MORE

WOLDEGEBRIEL ASSEFA WOLDEGERIMA

Assistant Professor at the Department of Mathematics, York University

READ MORE

KATIE CLOW

Assistant Professor in One Health in the Department of Population Medicine at the Ontario Veterinary College, University of Guelph

READ MORE

REBECCA TYSON

Associate Professor in Mathematical Biology at the University of British Columbia

READ MORE

MARINA FREIRE-GORMALY

Assistant Professor in Mechanical Engineering Department at the Lassonde School of Engineering at York University

READ MORE

REGISTER HERE!

MEET YOUR TEACHING ASSISTANTS!

MELANIE COUSINS

Postdoctoral Fellow at the University of Waterloo and Public Health Agency of Canada

READ MORE

JONATHON KOTWA

Postdoctoral fellow at Sunnybrook Research Institute

READ MORE

SHIVDEEP SINGH HAYER

Postdoctoral Fellow at the University of Guelph

READ MORE

Please contact the Program Manager of OMNI-RÉUNIS **Natasha Ketter** (nketter@yorku.ca) if you have any questions.

Supported by:

Natural Sciences and Engineering Research Council of Canada | Conseil de recherches en sciences naturelles et en génie du Canada
Canada

Public Health Agency of Canada | Agence de la santé publique du Canada

science | YORK UNIVERSITÉ UNIVERSITY

CDM Centre for Disease Modelling | CMM Centre de la modélisation des maladies

ONLINE COURSE: ONE HEALTH MODELLING FOR EMERGING INFECTIOUS DISEASES

Organized by: Jane Heffernan (York University), Mike Kallos (University of Calgary), and Mark Lewis (University of Victoria) & Deirdre Haskell (The Fields Institute)

PART 1 | FALL 2022 | OCT 11- JAN 27

Course delivery: The online courses will be delivered in both a synchronous or asynchronous (primarily) manner, depending on the module and instructor. This will give students the opportunity to learn in a flexible environment, and allow them to self-pace their learning and access resources and support as needed. Instructors will be available during contact hours for questions and support.

Modules	Instructor	Lesson Week of :
Introduction: Part I		
Review of the basic models of diseases transmission and immunity (3 hours)	Julien Arino	October 11-14
Review of the models of animal, plant and human population growth (3 hours)	Rebecca Tyson	October 17-21
Introduction to coronaviruses (1 hour)	Marina Freire-Gormaly	October24-28
Introduction to zoonoses (1 hour)	Katie Clow	
Theme 1: Coronaviruses		
Introduction to SARS-CoV-2 and MERS-CoV (1 hour)	Marina Freire-Gormaly	October 31-November 5
Introduction to the mathematical modelling of SARS-CoV-2 and MERS-CoV in the human and animal interface (3 hours		
Extension of SARS-CoV-2 and MERS-CoV models to include public health mitigation, population control, and pharmaceutical interventions (3 hours)		November 7-10
Group work and presentations (3 hours)		November14-18
Theme 2: Influenza		
Introduction to avian and swine influenza (1 hour)	Assefa Woldegebriel	November 21-25
Introduction to mathematical modelling of swine and avian influenza (3 hours)		November 28-December 2
Extension of swine and avian influenza models to include public health mitigation, population control, and pharmaceutical interventions (3 hours)		December 5-9
Group work and presentations (3 hours)		

Please contact the Program Manager of OMNI-RÉUNIS **Natasha Ketter** (nketter@yorku.ca) if you have any questions.

Supported by:

Natural Sciences and Engineering Research Council of Canada / Conseil de recherches en sciences naturelles et en génie du Canada
Canada
Public Health Agency of Canada / Agence de la santé publique du Canada
science | YORK UNIVERSITÉ UNIVERSITY
CDM Centre for Disease Modelling / CMM Centre de la modélisation des maladies

OMNI | RÉUNIS
One Health Modelling Network for Emerging Infections | Réseau une seule santé su modélisation des infection

FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES

ONLINE COURSE: ONE HEALTH MODELLING FOR EMERGING INFECTIOUS DISEASES

Organized by: Jane Heffernan (York University), Mike Kallos (University of Calgary), and Mark Lewis (University of Victoria) & Deirdre Haskell (The Fields Institute)

Theme 3: Environmental transmission of bacterial and fungal pathogens		
Introduction to the environmental transmission of bacteria and fungal pathogens and antimicrobial/antifungal resistance (1 hour)	Julien Arino	December 12-16
Introduction to the mathematical modelling of environmental transmission including animals and humans (3 hours)		January 16-20
Extension of environmental transmission models to include public health mitigation, agricultural control, and pharmaceutical interventions (3 hours)		January 23-27
Group work and presentations (3 hours)		

PART 2 | WINTER 2023 | FEB 6- MAY 19

Modules	**Instructor**	**Lesson Week of :**
Introduction: Part II		
Review of the basic models of diseases transmission and immunity (2 hours)	TBA	TBA
Review of the models of animal, plant and human population growth (2 hours)		
Introduction to mathematical models of vector life stages – mosquitoes and ticks (2 hours)		
Introduction to livestock modelling (2 hours)		
Introduction to environmental contamination modelling (2 hours)		
Theme 1: Vectorborne diseases		
Introduction to malaria, west nile virus, lyme disease (2 hours)	TBA	TBA
Introduction to the mathematical modelling of vectorborne diseases without vector lifecycle model structure (2 hours)		
Extension of vectorborne diseases models to include simple models of the vector lifecycle (2 hours)		
Discussion of vector control (1 hour)		
Group work and presentations (3 hours)		

Please contact the Program Manager of OMNI-REUNIS **Natasha Ketter** (nketter@yorku.ca) if you have any questions.

Supported by:

Natural Sciences and Engineering Research Council of Canada | Conseil de recherches en sciences naturelles et en génie du Canada | Canada

Public Health Agency of Canada | Agence de la santé publique du Canada

science | YORK UNIVERSITÉ UNIVERSITY

CDM Centre for Disease Modelling | CMM Centre de la modélisation des maladies

OMNI | RÉUNIS
One Health Modelling Network for Emerging Infections | Réseau une seule santé su modélisation des infection

FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES

ONLINE COURSE: ONE HEALTH MODELLING FOR EMERGING INFECTIOUS DISEASES

Organized by: Jane Heffernan (York University), Mike Kallos (University of Calgary), and Mark Lewis (University of Victoria) & Deirdre Haskell (The Fields Institute)

Theme 2: Livestock diseases		
Introduction to foot and mouth disease, avian influenza (1 hour)	TBA	TBA
Introduction to mathematical modelling of foot and mouth disease and avian influenza in livestock (2 hours)		
Extension of the livestock models to include livestock movement (markets, trading between farms, selling for meat processing (3 hours)		
Discussion of disease control within the livestock movement environment (1 hour)		
Group work and presentations (3 hours)		
Theme 3: Waterborne diseases		
Introduction to cholera, hepatitis A, and typhoid fever (2 hours)	TBA	TBA
Introduction to the mathematical modelling of waterborne diseases (2 hours)		
Extension of the models to include public health mitigation (1 hour)		
Group work and presentations (3 hours)		

Please contact the Program Manager of OMNI-RÉUNIS **Natasha Ketter** (nketter@yorku.ca) if you have any questions.

Supported by:

Natural Sciences and Engineering Research Council of Canada | Conseil de recherches en sciences naturelles et en génie du Canada
Canada

Public Health Agency of Canada | Agence de la santé publique du Canada

science | YORK UNIVERSITÉ UNIVERSITY

CDM Centre for Disease Modelling | CMM Centre de la modélisation des maladies