Georgia Southern University
Jiann-Ping Hsu College of Public Health
EPID 9131 – Infectious Diseases Transmitted Via Inter-Personal Contact (3 credits)
Spring 2018

Instructor:	Isaac Chun Hai Fung, Ph.D.
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Office Hours:	Monday – 12.00pm to 5.00pm (Spring semester, 2018). Appointments are highly recommended
Class Meets:	Monday 5pm – 7.45pm, at Hendricks Hall 3001.

SYLLABUS: UPDATED as of January 4, 2018. Subject to further changes.

Disclaimer: Class schedule and module contents may be subject to changes during the semester. Students should attend classes and pay attention to any announcements given by the instructor.

Prerequisites: EPID 7135 Epidemiology of Infectious Disease or equivalent or permission from the instructor.

Catalog Description:

This course covers advanced topics in epidemiology of infectious diseases of direct interpersonal transmission, except sexual and bloodborne transmission. These include infectious diseases that are transmitted via airborne transmission, droplet transmission, or transmission via fomite or touching, etc. Important themes may include emergency preparedness and response (including outbreaks and pandemics), surveillance, as well as interventions that prevent and control transmissions. Computational, mathematical and statistical tools relevant to the practice of infectious disease epidemiology will be introduced.

Required Textbook:

Emilia Vynnycky and Richard G. White (2010). **An Introduction to Infectious Disease Modelling**. Oxford and New York: Oxford University Press. ISBN: 978-0-19-856576-5.

Required Supplementary Lecture Notes:

Andreas Handel (2017). **Infectious Disease Epidemiology - A modern systems approach.**

https://ahgroup.github.io/DSAIDEbook/ (freely accessible online)

Required Software / Programming Language:

Students are required to bring their own laptop computers to the R programming sessions.

The **R** software is freely available at http://cran.r-project.org/ (for Windows, Mac or Linux). **RStudio** is a free and open source integrated development environment for R. RStudio is freely

available at http://www.rstudio.com/. In this course, the **R package 'DSAIDE'** developed by Dr. Andreas Handel of the University of Georgia, will be used as a teaching tool.

JPHCOPH MPH Program Core Student Learning Outcomes:

At the completion of this program the student will be able to:

1. Demonstrate proficiency and effectiveness in the communication of core public health principles and practices, both oral and written.
2. Demonstrate proficiency in the integration of the core public health disciplines (Biostatistics, Epidemiology, Environmental Health, Health Policy/Management, and Social/Behavioral Science) in practice and research.
3. Demonstrate proficiency in problem solving, critical thinking, and public health leadership.

Epidemiology Concentration Student Learning Outcomes:

At the completion of this program the student will be able to:

1. Formulate population-based hypotheses and develop appropriate research designs to test these hypotheses.
2. Collect, analyze, and interpret data derived from population-based research.
3. Create and implement public health surveillance systems for population-based studies.
4. Recommend evidence-based interventions and control measures in response to epidemiologic findings.
5. Communicate epidemiologic principles and concepts to lay and professional audiences through both oral and written communication.

Course Learning Objectives:

At the completion of this course the student will be able to:

1. Understand the methods and approaches to building mathematical models of infectious diseases (Core activity #1,2,3) – Core SLO 3; EPID SLO 1,2
2. Program basic compartmental models of infectious diseases, written in ordinary differential equations, in the R statistical language (Core activity #1,2,3) – Core SLO 3; EPID SLO 1,2
3. Interpret and critique mathematical models of infectious diseases published in the scientific literature (Core activity #1,2,3) – Core SLO 3; EPID SLO 3
4. Discuss the practical applications of mathematical modeling, and the role of mathematical modeling in public health decision-making (Core activity #1,3) – Core SLO 1,2; EPID SLO 3,4,5

Instructional Methods:

Class meetings will be a combination of lectures and practicals. Homework assignments, exams, participation in lectures and practicals, and a project constitute the basis of student evaluation. Students will be taught creating mathematical models of infectious diseases in R via RStudio interface.

Exam Schedule: Exam 1: Jan 29, 2018 (Monday), and Exam 2: Mar 19, 2018 (Monday)

Assignments:

Each assignment is an individual's independent work. No group consultation is allowed.

Core activity 1: A written critique and a PowerPoint presentation of a published mathematical model of an infectious disease specified by the instructor (30% of Final Grade)

Each individual will be assigned to an infectious disease. The student needs to identify a recent paper pertinent to a mathematical model of infectious disease transmission dynamics. The selected paper has to be pre-approved by the Instructor.

The student is expected to write a critique of that paper, and to present a PowerPoint presentation to the whole class at the end of the semester, in terms of their aims/objectives, their model strategies/structures and their parameter values.

Examples of how one can critically review and scrutinize papers of mathematical models of infectious diseases include the following review papers:

Isaac Chun-Hai Fung (2014)**. Cholera transmission dynamic models for public health practitioners.** *Emerging Themes in Epidemiology.* 11:1. DOI:10.1186/1742-7622-11-1.

Drake JM, Bakach I†, Just MR†, O'Regan SM, Gambhir M, Fung ICH* (2015). **Transmission models of historical Ebola outbreaks.** *Emerging Infectious Diseases.* 21(8): 1447-1450. [Dispatch] DOI: 10.3201/eid2108.141613

Course Objectives: 1-4.

Core activity 2: R practicals and assignments (30% of Final Grade)

In-class and take-home practicals are created to enhance the understanding of the materials delivered in the lectures, and to provide opportunities to practise programming in R.

Course Objectives: 1-3.

Core activity 3: Exam 1 (10% of Final Grade) & Exam 2 (30% of Final Grade)

Both exams 1 and 2 will be in-class, pen-and-paper, closed-book.

Course Objectives: 1-4.

Grading:

Weighting of assignments and tests for purposes of grading will be as follows:

Written critique and PowerPoint presentation of a modeling paper……	30%
R practicals and assignments ……	30%

Exam 1	……	10%
Exam 2	……	30%

The following point scale will be utilized in grading:

- A: 90- 100%
- B: 80% - 89.9%
- C: 70% - 79.9%
- D: 60% - 69.9%
- F: < 60.0%

All assignments will be graded and returned promptly so that students may accurately calculate their grades at any point in time during the semester.

Due time:

Electronic copies of assignments are due at 11.59pm on the due date (normally Wednesday), unless otherwise stated in the class schedule.

Late submission:

Reduction of 5% for every 24 hours. For example, for an assignment that is due on Wednesday at 11.59pm, if someone submits it on the coming Friday at 11.59am, then:

Final Grade = Grade * 90%

There are times when extraordinary circumstances occur (e.g., serious illness, death in the family, etc.). In such circumstances, please consult with the instructor within a reasonable amount of time. The instructor will consult the college administrators and verify the reported circumstances before any exemptions or extensions can be granted.

Nota Bene: Extensions are not guaranteed and will be granted solely at the discretion of the instructor.

Extra credit:

Students may earn extra credit by attending the Disease Dynamics Seminars that are held *outside* class time (1% of the Final Grade per seminar), if they are available. Such seminars are hosted solely at the discretion of the Instructor. Students who are unable to attend the seminars may submit a brief summary of the speaker's designated paper (or PowerPoint; according to the specific instructions given by the instructor) in lieu of attendance and earn the extra credit. If a Disease Dynamics Seminar is held within the specified class time of this class, it is considered to be a regular guest lecture for this course, and no extra credit will be given.

For details about the Disease Dynamics Seminars, please visit:
https://sites.google.com/a/georgiasouthern.edu/fung/disease-dynamics-seminars

Academic Misconduct:

As a student registered at this University, it is expected that you will adhere to only the strictest standards of conduct. It is recommended that you review the latest edition of the *Student Conduct Code* book, as well as the latest *Undergraduate & Graduate Catalog* to familiarize yourself with the University's policies in this regard. Your continued enrollment in this course is an implied contract between you and the instructor on this issue; from this point forward, it is assumed that you will conduct yourself appropriately.

Academic integrity relates to the appropriate use of intellectual property. The syllabus, lecture notes, and all materials presented and/or distributed during this course are protected by copyright law. Students are authorized to take notes in class, but that authorization extends only to making one set of notes for personal (and no other) use. As such, students are not authorized to sell, license, commercially publish, distribute, transmit, display, or record notes in or from class without the express written permission of the instructor.

Plagiarism:

According to the Academic Dishonesty Policy of GSU, plagiarism includes but is not limited to:

A. Directly quoting the words of others without using quotation marks or indented format to identify them.
B. Using published or unpublished sources of information without identifying them.
C. Paraphrasing material or ideas without identifying the source.
D. Unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic material.

If you are accused of plagiarism, the following policy per the Judicial Affairs website (http://students.georgiasouthern.edu/judicial/faculty.htm) will be enforced:

PROCEDURES FOR ADJUDICATING ACADEMIC DISHONESTY CASES

First Offense - In Violation Plea

1. If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, the professor should contact the Office of Judicial Affairs to determine if this is a first violation of academic dishonesty. The incident will be reported via the following website: http://students.georgiasouthern.edu/judicial/faculty.htm
2. If it is a first violation, the professor should talk with the student about the violation. If the student accepts responsibility in writing and the professor decides to adjudicate the case, the following procedures will be followed:
    a. The student will be placed on disciplinary probation for a minimum of one semester by the Office of Judicial Affairs.
    b. The student will be subject to any academic sanctions imposed by the professor (from receiving a 0 on the assignment to receiving a failing grade in the class).
    c. A copy of all the material involved in the case (Academic Dishonesty Report Form and the Request For Instructor to Adjudicate Form) and a brief statement from the professor concerning the facts of the case and the course syllabus should be mailed to the Office of Judicial Affairs for inclusion in the student's discipline record.

First Offense - Not In Violation Plea (student does not admit the violation)

1. If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, the professor should contact the Office of Judicial Affairs to determine if this is the first or second violation of academic dishonesty. The student will be charged with academic dishonesty and the University Judicial Board or a University Hearing Officer would hear the case. If the student is found responsible, the following penalty will normally be imposed:
    a. The student will be placed on Disciplinary Probation for a minimum of one semester by the Office of Judicial Affairs.
    b. The student will be subject to any academic sanctions imposed by the professor.

Second Violation of Academic Dishonesty

1. If the professor and the Dean of Students agree that the evidence is sufficient to warrant a charge of academic dishonesty, and if it is determined this is the second violation, the student will be charged with academic dishonesty and the University Judicial Board or a University Hearing Officer would hear the case.
2. If the student is found responsible, the following penalty will normally be imposed:
    a. Suspension for a minimum of one semester or expulsion.
    b. The student will be subject to any academic sanctions imposed by the professor.

NOT RESPONSIBLE FINDING

When a student is found not responsible of academic dishonesty, the work in question (assignment, paper, test, etc.) would be forwarded to the Department Chair. It is the responsibility of the Department Chair to ensure that the work is evaluated by a faculty member other than the individual who brought the charge and, if necessary, submit a final grade to the Registrar. For the protection of the faculty member and the student, the work in question should not be referred back to the faculty member who charged the student with academic dishonesty.

In the case of a Department Chair bringing charges against a student, an administrator at the Dean's level will ensure that the student's work is evaluated in an appropriate manner.

Academic Handbook:
Students are expected to abide by the Academic Handbook, located at http://students.georgiasouthern.edu sta/guide/. Your failure to comply with any part of this Handbook may be a violation and thus, you may receive an F in the course and/or be referred for disciplinary action.

University Calendar for the Semester:
The University Calendar is located with the semester schedule, and can be found at: http://www.georgiasouthern.edu/current.php.

Attendance Policy:

Federal regulations require attendance be verified prior to distribution of financial aid allotments. Regular attendance is expected and will be recorded. *Failure to attend class will negatively impact your participation grade*.

Portfolio Inclusion:

Samples of your work may be reproduced for research purposes and/or inclusion in the professor's teaching portfolio. You have the right to review anything selected for use, and subsequently ask for its removal.

Retaining of Original Work:

All original examinations, papers, etc. may be retained by the instructor for documentation and accreditation purposes. If you wish to obtain a copy of your graded work that has been retained, come by the instructor's office and we will make a copy for your records.

Expectation of hours of work outside class time:

For this course, students are expected to spend **at least 6 hours per week** outside class time, to read their textbooks and other reading materials and to complete their assignments and other required tasks. Some students may need more time, depending on each student's abilities and circumstances.

Office hours:

Students are **highly recommended to make an appointment** with the instructor, even if they plan to meet him during office hours. The instructor may be meeting another student when you arrive at his office. Making appointments allow you to have priority over any students who do not make an appointment. This also allows the efficient use of your time and the instructor's time.

One Final Note:

The contents of this syllabus are as complete and accurate as possible. The instructor reserves the right to make any changes necessary to the syllabus and course material. The instructor will announce any such changes in class. It is the responsibility of the student to know what changes have been made in order to successfully complete the requirements of the course.

Class Schedule (accurate as of January 4, 2018)

(Subject to potential adjustments during the semester)

Week/ Date	Topics of Lecture and Computer Practical	Readings *Additional readings not listed here may be provided.*
Part I: An Introduction to Mathematical Modeling of Infectious Diseases		
W1 Jan 8 (M)	**Introduction** Re-visit basic knowledge of infectious disease dynamics from MPH course EPID 7135	Textbook reading: **Vynnycky and White, pp. 1-12. Chapter 1. Handel. Chapters 1 and 2.** Additional papers for reading: May RM (2004). **Uses and abuses of mathematics in biology**. *Science*. 303:790-793 Lofgren ET et al. (2014) **Opinion: Mathematical models: A key tool for outbreak response.** *PNAS*. 111(51): 18095-18096.
	R: Introduction to R, RStudio and the DSAIDE package	
	At home, please work on: **R: DSAIDE package** **App: ID Dynamics Introduction**	Assignment 1: Complete the tasks and answers all the questions listed in "What to do" in App: ID Dynamics Introduction. Submit R assignment Due on Jan 10 (W) at 11.59pm
W2 Jan 15 (M)	*Martin Luther Jr Day: No Class*	Textbook reading: **Vynnycky and White, pp. 13-40. Chapter 2. Handel. Chapter 3.**
	At home, please work on: **R: DSAIDE package** **Characteristics of ID**	Assignment 2: Complete the tasks and answers all the questions listed in "What to do" in App: Characteristics of ID. Submit R assignment Due on Jan 17 (W) at 11.59pm
W3 Jan 22 (M)	**How are models set up? (VW Ch. 2 & 3)** Density-dependent model and frequency-dependent model (Re-visit Vynnycky and White, pp. 30-32, Panel 2.5)	Textbook reading: **Vynnycky and White, pp. 41-61. Chapter 3.** *Reference:* Begon et al. (2002) **A clarification of transmission terms in host-microparasite models: numbers, densities and areas**. *Epidemiology and Infection*. 129:147-153.
	In class, please work on: **R: DSAIDE package** **App: Direct Transmission**	Assignment 3: Complete the tasks and answers all the questions listed in "What to do" in App: Direct Transmission. Submit R assignment Due on Jan 24 (W) at 11.59pm

W4 Jan 29 (M)	**Exam 1 (1 hour; 5pm – 6pm sharp)** In-class pen-and-paper closed-book exam	
	In class: **R: Programming differential equations** *Exploring R codes behind the DSAIDE package*	
W5 Feb 5 (M)	**Short-term dynamics of acute infections** *The classic epidemic model* *Complications to classic models* *Growth rate and R0 with random mixing*	Textbook reading: **Vynnycky and White, pp. 63-81. Chapter 4.** **Handel. Chapter 5.**
	In class, please work on: **R: DSAIDE package** **App: Reproductive Number (Task 1 to 9)**	Assignment 4: Answer all the questions from Task 1 to Task 9, listed in "What to do" in App: Reproductive Number. Submit R assignment Due on Feb 7 (W) at 11.59pm
W6 Feb 12 (M)	**Long-term dynamics of acute infections** *Understanding cycles of incidence*	Textbook reading: **Vynnycky and White, pp. 82-104. Chapter 4.** **Handel. Chapter 3.**
	In class, please work on: **R: DSAIDE package** **App: ID Patterns**	Assignment 5: Complete the tasks and answers all the questions listed in "What to do" in App: ID Patterns. Submit R assignment Due on Feb 14 (W) at 11.59pm
W7 Feb 19 (M)	**Age patterns – analyzing cross-sectional data** **The effect of vaccination on the dynamics of infections**	Textbook reading: **Vynnycky and White, pp. 105-143. Chapter 5.** **Handel. Chapter 5.**
	In class, please work on: **R: DSAIDE package** **App: Reproductive Number (Task 10 – 16)**	Assignment 6: Answer all the questions from Task 1 to Task 9, listed in "What to do" in App: Reproductive Number. Submit R assignment Due on Feb 21 (W) at 11.59pm
W8 Feb 26 (M)	**Integrating contact patterns in models**	Textbook reading: **Vynnycky and White, pp. 177-222. Chapter 7.** **Handel. Chapter 12.**
	In class, please work on: **R: DSAIDE package** **App: Host heterogeneity**	Assignment 7: Complete the tasks and answers all the questions listed in "What to do" in App: Host heterogeneity. Submit R assignment Due on Feb 28 (W) at 11.59pm
Feb 28 (W)	Choice of article for the article critique and presentation: Due on Feb 28 (W) at 11.59pm. You should inform the Instructor your choice by email.	
W9 Mar 5 (M)	**Contact patterns in an age-stratified model**	Mossong J et al. (2008). **Social contacts and mixing patterns relevant to the spread of infectious diseases**. *PLoS Med* 5(3):e74. Eames KTD et al. (2012). **Measured dynamic social contact patterns explain the spread of**

		H1N1v influenza. *PLoS Comput Biol* 8(3):e1002425. Fung ICH et al. (2015). **Modeling the Effect of School Closures in a Pandemic Scenario: Exploring Two Different Contact Matrices.** *Clinical Infectious Diseases,* 60 Suppl 1:S58-63.
	In class: **R: Programming differential equations** *Exploring R codes behind the DSAIDE package:* ***Host heterogeneity***	
W10 Mar 12-16	*NO CLASS* *Spring break: March 12-16*	
W11 Mar 19 (M)	**Exam 2 (2 hours; 5pm – 7pm sharp)** In-class pen-and-paper closed-book exam	
W12 Mar 26 (M)	***Additional transmission route:*** **Environmental transmission** The environment: what to do with a second transmission route	Fung ICH (2014)**. Cholera transmission dynamic models for public health practitioners**. *Emerging Themes in Epidemiology.* 11:1. Textbook reading: **Handel. Chapter 8.**
	In class, please work on: **R: DSAIDE package** **App: Environmental Transmission App**	Assignment 8: Complete the tasks and answers all the questions listed in "What to do" in App: Environmental Transmission. Submit R assignment Due on Mar 28 (W) at 11.59pm
W13 Apr 2 (M)	***Additional transmission route:*** **Vector transmission** Ross-Macdonald model of malaria transmission	Smith DL et al. (2012). **Ross, Macdonald, and a Theory for the Dynamics and Control of Mosquito-Transmitted Pathogens.** *PLoS Pathogens* 8(4):e1002588 Textbook reading: **Handel. Chapter 9.**
	In class, please work on: **R: DSAIDE package** **App: Vector Transmission App**	Assignment 9: Complete the tasks and answers all the questions listed in "What to do" in App: Vector Transmission. Submit R assignment Due on Mar 28 (W) at 11.59pm
Part II: Using Mathematical Models to Make Informed Policy Decisions		
W14 Apr 9 (M)	**Modeling and policy: Influenza** Modeling efforts in an emergency response in a public health agency	Gambhir M et al. (2015). **Infectious Disease Modeling Methods as Tools for Informing Response to Novel Influenza Viruses of Unknown Pandemic Potential**. *Clinical Infectious Diseases*, 60 Suppl 1:S11-9. doi:

		10.1093/cid/civ083 *Other readings will be provided.*
W15 Apr 16 (M)	**Modeling and policy: Ebola** *"Found in translation":* How to translate modeling results for policy-makers	WHO Ebola Response Team (2014). **Ebola Virus Disease in West Africa – The First 9 Months of the Epidemic and Forward Projections**. *NEJM*. 371(16):1481-95 DOI:10.1056/NEJMoa1411100. Meltzer MI et al. (2014). **Estimating the Future Number of Cases in the Ebola Epidemic – Liberia and Sierra Leone, 2014-15**. *MMWR*. 63: Suppl 3:1-14. Drake JM, Bakach I†, Just MR†, O'Regan SM, Gambhir M, Fung ICH* (2015). **Transmission models of historical Ebola outbreaks.** *Emerging Infectious Diseases.* 21(8): 1447-1450. [Dispatch] DOI: 10.3201/eid2108.141613
		Students' submission of article critique manuscript. Due on Apr 18 (W) at 11.59pm
Wk16 Apr 23 (M)	**Students' presentation and discussion**	**Students' PowerPoint presentation in class**