National Taiwan Normal University Course Outline
Fall , 2022

I.Course information

Serial No.	2791	**Course Level**	Undergraduate / Master
Course Code	MAC9046	**Chinese Course Name**	流行病學的數理模型 (一)
Course Name	Mathematical Models in Epidemiology (I)		
Department	Department of Mathematics		
Two/one semester	1	**Req. / Sel.**	Sel.
Credits	3.0	**Lecturing hours**	Lecture hours: 3
Prerequisite Course			
Comment			
Course Description	This course would like to attract students who are interested in mathematical models and its applications to various mathematical models of infectious diseases. The mathematical models provide approaches to study how mathematical concepts could help us in investigating the spread of infectious pathogens (e.g., viruses, bacteria) through dynamic populations. There are three main objectives: (1) Basic principles of mathematical models in infectious disease epidemiology (2) Mathematics and methods required as studying these mathematical models in epidemiology. (3) Applying mathematical models to existing data as little projects/experiments (e.g., math. models vs. growth of HIV, Covid-19 infectious population respectively).		
Time / Location	Tue. 2-4 Gongguan S2-02		

Curriculum Goals	Corresponding to the Departmental Core Goal
1. Our main course outcomes include the topic: How mathematical models of disease transmission and human policy interventions affect the spread of viruses in social groups.	College: 1-2 Being able to reason and induct with mathematical logic 1-3 Being able to think mathematically and critically 1-5 Being able to use mathematics as tools to learn other subjects 3-2 Possessing the abilities to think independently, criticize, and reflect 3-4 Having insights, intuitions, and senses of mathematics Master: 1-2 Being able to reason and induct with mathematical logic 1-3 Being able to think mathematically and critically 1-5 Being able to use mathematics as tools to learn other subjects 3-2 Possessing the abilities to think independently, criticize, and reflect 3-4 Having insights, intuitions, and senses of mathematics
2. In this course, we will guide and learn the mathematical theory needed to model the spread of diseases.	College: 1-2 Being able to reason and induct with mathematical logic 1-3 Being able to think mathematically and critically 1-5 Being able to use mathematics as tools to learn other subjects Master: 1-2 Being able to reason and induct with mathematical

	logic 1-3 Being able to think mathematically and critically 1-5 Being able to use mathematics as tools to learn other subjects
3. We will help the students to promote and develop the problem-solving skills with applied mathematics in the behaviors of spread of viruses.	College: 2-1 Being able to communicate and express mathematically 2-3 Being able to lead or collaboratively work with peers 3-2 Possessing the abilities to think independently, criticize, and reflect 3-3 Being willing to work collaboratively 4-3 Possessing a variety of beliefs regarding mathematics values and mathematics learning Master: 2-1 Being able to communicate and express mathematically 2-3 Being able to lead or collaboratively work with peers 3-2 Possessing the abilities to think independently, criticize, and reflect 3-3 Being willing to work collaboratively 4-3 Possessing a variety of beliefs regarding mathematics values and mathematics learning

II. General Syllabus

Instructor(s)	CHERN, Jann-Long/ 陳建隆

Schedule

Weeks 1-10:
Part I. Basic Concepts of Mathematical Epidemiology
1. Introduction to Mathematical Epidemiology
2. Simple Compartmental Models for Disease Transmission
3. Endemic Disease Models
4. Epidemic Models
5. Models with Heterogeneous Mixing
6. Models for Diseases Transmitted by Vectors
7. Discussions of Exercises and Reports

Weeks 11-14
Part II. Models for Specific Diseases
8. Models for Tuberculosis.
9. Models for HIV/AIDS
10. Discussions of Exercises and Reports

Week 15-16: Project Studies (in Working Groups)

Lecturing Methodologies

Methods	Notes
Formal lecture	In this course, we will teach the basic principles and knowledges of related mathematical models and algorithms with examples.
Group discussion	The key points of the related studying topics are discussed in groups by students.
Lab/Studio	The students of the course will report in groups the related algorithms for each selected mathematical models.
Case studies	The students of the course will report in groups the related algorithms and computer programs for each selected topics.

Grading assessment

Methods	Percentage	Notes
Assignments	30 %	The students will need to do the home works of mathematical models and its applications to various mathematical models of infectious diseases.
Midterm Exam	30 %	We will give an exam. to test the students for the study of basic related mathematical models and knowledges.
Case study reports	40 %	For each group students will read and give a report of selected exercises and related

	topics of mathematical models of infectious diseases.
Required and Recommended Texts/Readings with References	Brauer, Fred; Castillo-Chavez, Carlos; Feng, Zhilan Mathematical models in epidemiology. With a foreword by Simon Levin. Texts in Applied Mathematics, 69. *Springer, New York*, 2019. xvii+619 pp.