P4600 Course Syllabus

Course:	Optics and Photonics II	
Instructor:	Dr. Qiying Chen, C-3027, 737-8878, qiyingc@mun.ca	
Class Schedule:	Three times per week, 50 min for each, Monday, Wednesday, and Friday (Slot: 02, 9:00-9:50am), C3067.	
Marking Policy:	Assignments	30 %
	Midterm	30 %
	Final	40 %

Optics and Photonics II will discuss principles of optics and photonics and recent development in this field. Starting from what had learnt in Physics 3600 (Optics and Photonics I), topics in P4600 include review of basic topics in wave optics, electromagnetic waves in anisotropic media, holography, Fourier optics, optical properties of materials, optical resonators, lasers, and nonlinear optics. Recent development in this field, including photonic crystal optics, ultrafast optics, and nano-optics will be introduced. Prerequisites: Physics 3500 (Electromagnetic Fields I) and Physics 3600 (Optics and Photonics I).

Reference books:

1. Frank L. Pedrotti and Leno S. Pedrotti, *Introduction to Optics*, Second Edition, Prentice Hall, 1993.

2. Amnon Yariv and Pochi Yeh, *Photonics*, Sixth Edition, Oxford University Press, 2007.

Topics & schedule:

- Review of geometrical and physical optics
  (2 lectures: 0.5 lecture on syllabus and 1.5 lectures on review)
- The diffraction grating
  (2 lectures, P&P, Chap. 17)
- Fresnel diffraction
  (3- lecture, P&P, Chap. 18)
- Holography
  (1+ lecture, P&P, Chap. 13)
- Theory of multilayer films
  (2 lectures, P&P Chap. 19)
- Fourier optics
  (2 lecture, P&P Ch. 21)
- Optical properties of materials
  (3 lectures, P&P, Chap. 27 with addition)

- Optical detection
  (2 lectures)
- Mid-term exam (tentatively Friday, February 16th)
- Optical resonator
  (2 lectures)
- Laser dynamics
  (3 lectures)
- Physics of nonlinear polarization
  (1 lecture)
- Second-order nonlinear phenomena (electro-optic effect, second harmonic generation, parametric processes and frequency conversion)
  (3 lectures)
- Third-order nonlinear phenomena (Z-scan, four-wave mixing, and third harmonic generation)
  (3 lectures)
- Optical waveguide
  (2 lectures)
- Photonic crystal optics
  (3 lectures)
- Advanced topic 1: ultrafast optics
  (1 lecture)
- Advanced topic 2: nano-optics
  (1 lecture)

Assignments: There will be six assignments during the semester.
Exams: There will be one mid-term exam and one final exam. Both are close book.
Tentative date for the mid-term examination is Friday, February 16th.