ELEC 864: WDM Fiber Optic Communication Systems
Professor Scott Yam
Fall 2019

Materials
The course will include the following topics:

- **Topic 1:** Introduction: semi-conductor lasers, photodiodes, optical fibers
- **Topic 2:** WDM transmission system, receiver performance, Q-factor, sensitivity
- **Topic 3:** Modulators and transmitter chirp
- **Topic 4:** Dispersion management and compensation, impact on WDM system performance
- **Topic 5:** Fiber non-linear effects (scattering, Kerr)
- **Topic 6:** Interplay between fiber nonlinearities, dispersion, and transmitter chirp.
- **Topic 7:** Optical amplification (doped fiber amplifier, Raman, parametric amplification)
- **Topic 8:** Polarization mode dispersion

Course Evaluation
50% Project, 50% Final

**Project (50% of final grade)**
1. Students can select from a list of suggested topics or any topic in the area of optical communications (with instructor’s consent).
2. Satisfactory completion (passing grade) of project is required for auditing student.
3. Materials that have previously received credit for another course in a previous semester are not eligible.
4. Materials that are expected to receive credit for another course in the current semester are not eligible.

**Project Evaluation (/100)**
1. Background literature investigation (20%)
   a. Thoroughness, suitability, demonstrates understanding of technological trends.
   b. Explain the significance of the referred work and put it in context with current state-of-the-art technology.
   c. Include references.
2. Novelty of proposed research (20%)
   a. Advantage of current research.
   b. Discuss possible trade-offs compared with existing technology.
   c. Discuss innovation.
3. Methodology (40%)
   a. Theory, and/or simulation and/or experiment to demonstrate innovation due to proposed research.
   b. Evaluated based on strength and merits of scientific evidence presented.
   c. Correctness of technical details.
4. Style (10%)
   a. Grammar, and semantic.
   b. Clarity and logical delivery of technical ideas.
5. Oral presentation (10%)
   a. Clarity and logical delivery of technical ideas.
   b. Handling of questions.
   c. Presentation in class on week 12.

Possible Topics
The following is a non-exhaustive list of topics to get students started on the project. In principle, any relevant topic in the general area of optical communications can be used. Please consult with instructor when in doubt.

Transmitter, laser source, light emitting diode, VSCEL, Mach Zehnder modulator, electro-absorption modulators, transmitter chirp, array waveguide grating (AWG), fibers, optical amplifiers (doped fiber amplifier, semi-conductor optical amplifier, Raman amplifier, optical parametric amplifier), short pulse generation, fiber nonlinearity (XPM, SPM, FWM, SRS, SBS), wavelength conversation (PPNL devices, nonlinear fiber loops), photonic crystal fiber, fiber bragg gratings (FBG), dispersion compensation, polarization mode dispersion, soliton, pulse compression, supercontinuum generation, printed lightwave circuits, RF over fiber, photodetector, receiver design modulation formats, single mode fiber transmission, multimode fiber transmission, coherent detection, error correction code, test and measurement methodology and equipment, optical networking,

Journals
Journal of lightwave technology
Photonics technology letter
Electronics letter
Optics letter
Optics Express
Nature Photonics
Journal on selected topics on quantum electronics
(available from Queen’s Library website)

Conferences
Optical fiber communications (OFC/NFOEC)
European conference on optical fiber communications (ECOC)
Conference on lasers and electro-optics (CLEO)

Industry Websites
http://www.lightreading.com/
http://lw.pennnet.com/home.cfm
http://www.fibers.org/
http://www.photonicsspectra.com/
http://www.laserfocusworld.com/
http://www.lightwaveonline.com/