ECE440: Optical Communications Systems

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on leave from Alexandria University

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Outline

1 Aim of Course

Goals

- We start by introducing the effect of receiver noise in IM/DD optical communications systems.
  - ☹ System performance in terms of both signal-to-noise ratios and bit-error rates are determined.
- Next, wavelength-division multiplexing (WDM) techniques are presented and discussed.

1 Aim of Course

Goals

- Advanced modulation techniques that increase the spectral efficiency are introduced and their performances are determined.
  - ☹ We also discuss the enabling technologies of high-speed optical systems utilizing electronic digital signal processing (DSP).

2 Course Outline

- Introduction and Review.
- Receiver Noise and Direct Detection.
- Optical Ring Modulators.
- Concepts of Wavelength-Division Multiplexing.
- Wavelength-Division Multiplexing Techniques.
- Advanced Modulation Techniques.
- Coherent Detection.
- Coherent Detection with Receiver Noise.

3 Text Books and References

- R. Hui, *Introduction to Fiber-Optic Communications*, 1st ed. San Diego, CA: Academic Press, 2020.
- G. Keiser, *Optical Fiber Communications*, 4th ed. New York: McGraw-Hill, 2011.
- G. P. Agrawal, *Fiber-Optic Communication Systems*, 4th ed. New York: Wiley, 2010.

4 Handouts and Assignments

- Handouts and assignments can be downloaded from
  - http://www.eng.alexu.edu.eg/∼hshalaby/

5 Teaching and Assessments

- Credit hours = 3 hr.
- Teaching hours per week: Total = 5 hr.
  1. Lectures: 2 hr.
  2. Tutorials: 1 hr.
  3. Laboratories: 2 hr.
- Exams and their durations:
  1. Midterm exam: 1.5 hr.
  2. Final exam: 3 hr.

5 Teaching and Assessments

- Distribution of a total mark of 300:
  1. Class work (assignments and quizes): 15%.
  2. Midterm exam: 15%.
  3. Lab assessment and term project: 30%.
  4. Final exam: 40%.