DEPARTMENT OF ELECTRICAL ENGINEERING
FACULTY OF ENGINEERING
UNIVERSITY OF ALEXANDRIA
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106382: Optical WDM Networks

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I. Outline

- Review
  1. Light Sources
  2. Light Detectors
  3. Optical Fibers
- WDM concepts and components
  1. Operational Principles of WDM
  2. Spectral Width and Optical Bandwidth
  3. Implementation of WDM networks
  4. Design Challenges
- WDM multiplexers
  1. The 2 × 2 Fiber Coupler
  2. Star Couplers
  3. Mach-Zehnder Interferometer Multiplexers
  4. Difraction Gratings
  5. Fiber Bragg Gratings
  6. Waveguide Grating Router (WGR)
- Tunable optical filters
  1. Tunable Fiber Fabry-Perot Filters
  2. Tunable Mach-Zehnder Interferometers
  3. Tunable Multigrating Filters
  4. Acoustooptic Tunable Filter
- Single-hop WDMA optical networking
  1. Broadcast-and-Select WDMA Networks
  2. Wavelength-Routing WDMA Networks
  3. Transmission Protocols
  4. Fixed and Semifixed Assignment Protocols
     a. Source/Destination Allocation Protocol
     b. Destination Allocation Protocol
     c. Source Allocation Protocol
- Random access protocols with no pretransmission coordination
  1. Random Access Protocols with Slotted Aloha
  2. Protection Against Collision
- Random access protocols with pretransmission coordination

1. Aloha/Aloha Protocol
2. Slotted Aloha/Aloha Protocol
3. Aloha/CSMA Protocol
4. CSMA/Aloha Protocol

II. Text Book and References

[1] S. V. Kartalopoulos, *DWDM: Networks, Devices, and Technology.* Hoboken, New Jersey: John Wiley & Sons, 2003.

[2] G. Keiser, *Optical Fiber Communications.* 3rd ed. New York: McGraw-Hill, 2000.

[3] A. Yariv, *Optical Electronics in Modern Communications.* 5th ed., New York: Oxford University Press, 1997.

[4] A. Borella, G. Cancellieri, and F. Chiaraluce, *Wavelength Division Multiple Access Optical Networks.* Norwood, Massachusetts: Artech House, 1998.

III. Handouts and Assignments

- Handouts and assignments can be downloaded from
  http://teaching.alexeng.edu.eg/EE/hshalaby
- Students are not allowed to leave any copy from the handouts at any photocopy center. If this happened, the downloading facility would stop immediately.

IV. Teaching and Assessments

- Teaching hours per week:
  1) Lectures: 2 hrs.
  2) Tutorials and quizzes: 1 hr.
- Distribution of a total mark of 100:
  1) Class works (20 marks): These marks are divided among quizzes, class discussions, and homework. A quiz (possibly oral) is normally performed in each class.
  2) Seminars (20 marks): Every student should present at least one seminar and submit a report on the latest technology in optical networks. Seminars are presented at the last two weeks of the course.
  3) Final exam (60 marks): Closed book exam.
- Attendance:
  1) Attendance is conducted every week.
  2) Students that will be absent more than 25% of total teaching weeks shall not be allowed to enter the final exam.