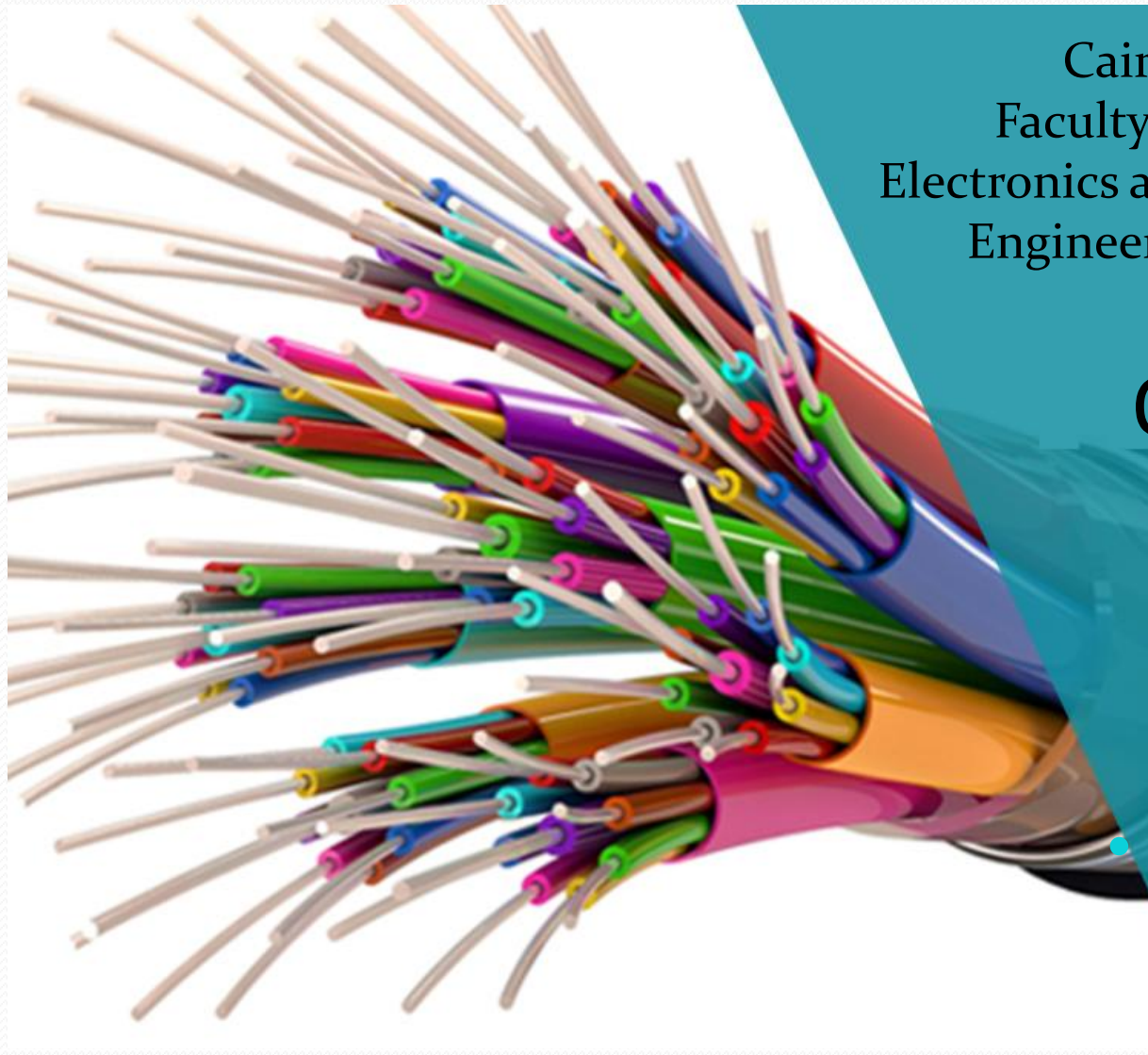


Optical Fibers



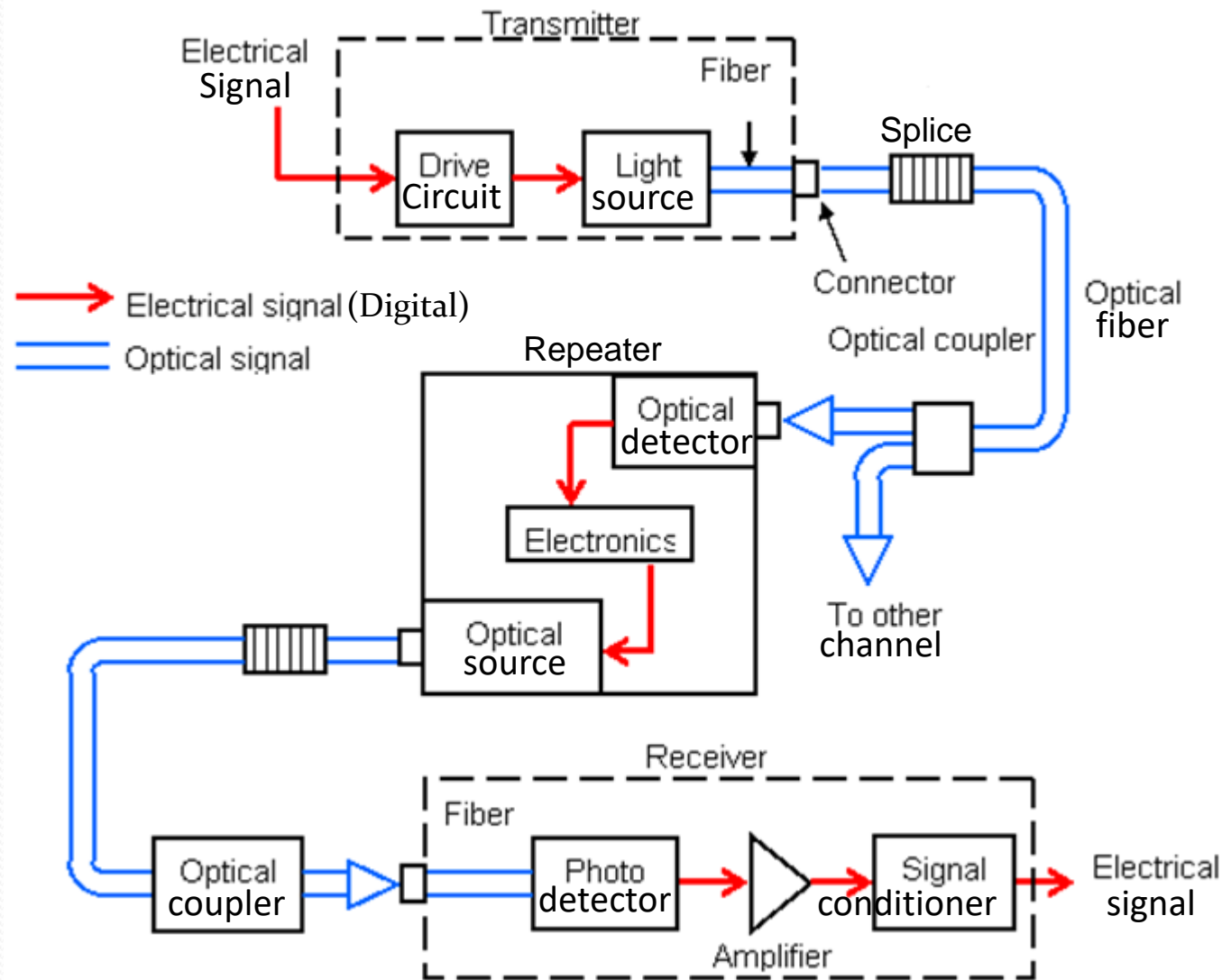
Cairo University
Faculty of Engineering
Electronics and Communications
Engineering Department

Optical Fibers ELC4039 (Elective 4)

• Dr. Hanna A. Kirolous

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Optical Fiber Communication System



Advantages of Optical Communications

- Low transmission loss.
 - Wide bandwidth.
 - Small size and weight.
 - Immunity to interference (EMI & EMP).
 - Electrical insulation (No arcing, sparking, ground loops, hazards).
 - Signal security (banking, computer networks, military systems).
 - Abundant raw material.
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- More data over longer distances
- less repeaters
- less cost & complexity

Course Outline

- Optical versus radio frequency communications.
- Optical fibers.
- Ray representation in optical fibers.
- Modal analysis in step-index optical fibers.
- Signal attenuation and distortion.
- Optical properties of semiconductors Emitters: laser diodes & light emitting diodes.
- Photo detectors: PIN & avalanche photo diode (APD).

Course Learning Outcomes

- Clearly **describe** the **concepts of optical communications** in comparison to traditional electrical systems.
- **Derive** and **analyze** the **physics of light confinement** in multimode fibers using geometrical optics approximations.
- **Derive, analyze and interpret** the physical meaning of the **dispersion formulae** in single and multimode fibers using electromagnetic model.
- **Identify, tabulate and analyze** the **sources of signal distortion and attenuation** in optical fibers.

Course Learning Outcomes

- **Comprehend** the fundamentals of **semiconductor optical sources** (Light-emitting and laser diodes) used in communication systems and be **capable** of **characterizing** there **parameters and drive circuits**.
- **Comprehend** the fundamentals of **semiconductor optical detectors** (PIN and Avalanche photodiodes) used in communication systems and be **capable** of **characterizing** there parameters.
- **Conduct** research and **prepare** presentation on selected topics related to optical communications.