Outline

• Optical fiber
  – Propagation - total internal reflection
  – Modes
  – Attenuation
  – Dispersion - effects, causes/types, reducing dispersion
  – Non-linearities - types, effects

• Transmission systems
  – Transmitters - laser principles, laser characteristics, types of lasers, modulation
  – Receivers
  – Amplifiers - types of amplifiers, principle of operation, characteristics

• Interconnection devices
  – Couplers
  – Filters, multiplexers demultiplexers
  – Switches - switch technologies (MEMs, etc.)

• Optical Network Architectures
  – Layered models
  – Optical layer network architectures - point-to-point, OADM, circuit, burst, packet switched
  – Optical crossconnect architectures - transparent, opaque
  – SONET

• Wavelength-Routed Optical Networks - Static Design
  – Logical topology design - ILP formulations, logical topology + lightpath routing, heuristics
  – Static routing and wavelength assignment - ILP formulations, routing sub-problem, combined
    routing and wavelength assignment, lower/upper bounds, wavelength assignment sub-problem,
    wavelength assignment heuristics

• Protection and Restoration
  – Protection and restoration terminology
  – SONET ring protection - UPSR, BLSR/2, BLSR/4
  – Optical ring protection - OMS, OCh, SPRing, DPring
  – Optical mesh protection - line (ring covers), path - dedicated/shared

• Dynamic Lightpath Establishment
  – characterization (static/adaptive, global/local state information, source/hop-by-hop routing)
  – topology and resource discovery
  – routing - fixed, fixed-alternate-path, constraint-based (adaptive) routing, deflection routing
  – wavelength assignment
- blocking probability - with independent link assumption, with/without wavelength conversion (understand how to derive these given the link utilization)
- signaling - SIR/DIR

• Photonic Packet Switching
  - synchronization
  - header processing
  - contention resolution
  - buffering

• Optical Burst Switching
  - burst assembly
  - signaling schemes - TAG, JET, delayed reservation, RFD, etc.
  - offset-based priority