

Course Description Summary

Course number: ECE 476	Course name: Optical Communications
لغة تدريس المقرر : English	Pre-requisites: ECE 371, ECE 220
Credit hours: 4 (3+2+0)	Course level: Elective

Course Description

وصف المقرر :

The course covers underlying and fundamental light characteristics concepts and demonstrates components, types, and communication of fiber optics which support modern wireless communication systems and networks. Some of the basic knowledge of some networks (SONET/SDH) has been described in this course. The focus for optical networking fundamentals is on the physical layer of the network protocol stack. The optical line terminal and optical line amplifier of WDM networks is studied in this course.

Course Outcome

مخرجات التعليم:

Upon completing the course, the student should be able to:

1. describing light as an electromagnetic wave
2. describing the polarization of light wave
3. explain the interference effects on light wave
4. Explain the basic elements of optical fiber transmission link
5. Explain the fiber modes
6. Stating the basic operating principles of single mode and multimode fibers.
7. Describe the different Transmission constraints
8. Compare between different types of propagation
9. Stating the difference between the couplers, isolators and circulators
10. Explain the principle of operation of multiplexers and filters
11. Stating the advantages and disadvantages of optical amplifiers
12. Compare between the different types of optical amplifiers
13. Explain the different components of digital communication optical system
14. Explain the transmitters and detectors, switches, wavelength converters.
15. Explain the switches and wavelength converters.
16. Describing the interaction between optical components and IP
17. Explain light path routing solution,
18. Explain the OSPF enhancements
19. Stating the different types of IP links
20. Discriminate between the control channels, data channels,
21. Explain the integrated optical networks
22. Recalling the modulation
23. Explain the subcarrier modulation and multiplexing
24. Stating spectral efficiency
25. Explain the spectral efficiency

26. Explain the error detection and correction.
27. Explain the time division multiplexing,
28. Differentiate between the VCAT and LCAS,
29. Describe the SONET/SDH layers,
30. Explain the SONET frame structure,
31. Explain the SONET/SDH physical layer,
32. Discriminate the elements of a SONET/SDH infrastructure
33. Explain the optical line terminal.
34. Distinguish between the different types of optical line amplifiers.
35. Explain the Add/Drop multiplexers
36. Explain the cross-connects.

المواضيع

Topics

- Light Characteristics: light as an electromagnetic wave, polarization, interference
- Fiber Optics: Modes, Transmission constraints (fiber-optic cable modes, fiber optic glass, plastic optical-fiber, fluid-filled fiber optics, transmitting light on a fiber, light propagation in multimode fiber, single mode propagation)
- Fiber Optics Components: couplers, isolators and circulators, multiplexers and filters, optical amplifiers, transmitters, detectors, switches, wavelength converters.
- Optical networking fundamentals: interaction between optical components and IP, light path routing solution, OSPF enhancements/ IS-IS, IP links, control channels, data channels, integrated optical networks
- Fiber Optics Communications: modulation, subcarrier modulation and multiplexing, spectral efficiency, demodulation, error detection and correction.
- SONET/SDH Networks: multiplexing, VCAT and LCAS, SONET/SDH layers, SONET frame structure, SONET/SDH physical layer, elements of a SONET/SDH infrastructure
- WDM Networks: optical line terminal, optical line amplifiers, Add/Drop multiplexers, cross-connects.

Textbook and references

الكتاب المقرر والمراجع المساندة:

Textbook:

- Rajiv Ramaswani ,Kumar N. Sivarajan, Galen H. Sasaki, "Optical Networks. A practical perspective" , Morgan Kauffman publishers, 3rd Edition.

References:

- Optical Fiber Communication, Gerd Keiser, Mc-Graw Hill, Last edition. John R. Vacca, " Optical Networking. Best practices Handbook" , John Wiley & Sons publisher, 2007