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| **Course – 57 Title: Optical Communication Engineering** | |  |
| **Course No.: CCE 323 Credit : 03 Contact Hours: 03** | **Total Marks: 100** | |

**11.1 Rationale:**

A computer engineer will be able to acquire the knowledge of the design and operating principles of modern optical communication systems and networks.

**11.2 Objectives:**

1. To explain the principles of operation of various optical fiber communication systems
2. To analyze the performance of various digital and analogue optical fiber systems
3. To calculate various key parameters of optical fiber systems. These include the system optical power budget and system risetime budget, receiver noise power, Q factor, bit error rate and maximum usable bit rate of a digital optical fiber system
4. To explain/compare the factors affecting the performance of different optical fiber communication systems
5. To communicate laboratory findings through written reports

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| **11.3**  **Learning Outcomes** | **11.4**  **Course Content** | **11.5**  **Teaching Strategy/ Learning Experience** | **11.6 Assessment Strategy** |
| 1. Explain optical fiber | Introduction to optical fiber, History and importance of optical fiber | Lecture | Short question |
| 1. State light properties 2. Evaluate Maxwell’s equation 3. Explain different modes 4. Demonstrate fiber fabrication techniques | Properties of light, Electromagnetic waves, Maxwell,s equations, Propagation mode in a planer guide, LP modes, Multimode and single mode fibers, Different techniques of fiber fabrication. | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Explain different losses | Losses in optical fiber: material absorption loss, linear scattering loss, nonlinear scattering loss, bending loss, coupling loss, | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Identify and explain different dispersions | Intermodal and intramodal dispersion, polarization mode dispersion. Fiber connectors and splices. | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Describe different optical sources 2. Explain optical transmitter | Optical sources: requirements of sources, homostructure and heterostructure LEDs, working princuiple and properties of Laser diode, types of laser, optical transmitter | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Deduce responsivity and quantum efficiency of photodiodes 2. Explain noise in photo didoes and optical receiver | Optical detectors: responsivity and quantum efficiency of photodiodes, properties, noises and types of photodiodes, optical receiver. | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Discuss WDM networks 2. Compare different optical amplifiers | Requirements of transmitter and receiver in WDM networks, types of tunable lasers, optical amplifiers, SOA and FOA, EDFA and EBFA. | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Describe passive components in optical network | Passive components: optical switches, wavelength converter, mux and demux, couplers, circulators, isolators, attenuator, optical filters. | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Organize optical network (transmission, layer protection and restoration methods) | Optical network: basic principle of optical transmission, optical layer, protection and restoration methods. | Lecture  Exercise | Short question  Quiz  Analytical |
| 1. Application of fiber communication at terrestrial and undersea systems | Terrestrial and undersea systems of fiber communications. | Lecture  Exercise | Short question  Quiz  Analytical |

**RECOMMENDED BOOKS AND PERIODICALS**

**Text Books**:

1. Optical communications by John Senior

2. Optical fiber communications by Gerd Keiser