AMITY UNIVERSITY
UTTAR PRADESH

**Course Title:OPTICAL TECHNOLOGIES AND NETWORKS**

**Course Level: PG**

**Course Code: CSIT711**
**Credit Units: 4**

| L | T | P/S | SW/FW | TOTAL CREDIT UNITS |
|---|---|---|---|---|
| 3 | - | - | - | 3 |

**Course Objectives:** The objective of the course is to make the student understand

- comprehensive concept of theory and behavior of optical fiber links
- Interaction of optical fiber with others devices
- Basic design principle of digital and analog optical fiber transmission links
- WDM – DWDM and CWDM concepts
- Architecture and performance characteristics of complex optical network and advanced optical communications techniques such as optical CDMA and OTDM.

**Prerequisites:**Data Communication & Computer Networks

**Student Learning Outcomes:** The student will be able to:

- Identify the components of Optical Fiber Links
- Conceptualize of the principles, algorithms and technologies used in transmission information in wireless mobile channels
- Improvise the quality of service by understanding the optical concept of hand-off of voice calls between the cells
- Plan and design Optical Networks
- Derive expressions for error performance and capacity for various transmission schemes
- Analyze the performance of various technologies such as optical CDMA, Exabytes
- Apply research findings on increasing the channel efficiency
- Monitoring and Measuring the efficiency of the capacity links

**Course Contents/Syllabus:**

| | Weightage (%) |
|---|---|
| **Module I: Optical Fibers** | **20** |
| Basic optical fiber communication system; Fibers types: Single Index, Graded Index, Multimode , Single Mode; Fiber waveguides; Modes and Rays; Dispersion and Attenuation; Absorption and Scattering, Fiber Material & Fabrication, Power density distribution; Special Fibers; Dispersion Shifted Fibers, Dispersion Flattened Fibers, Ultra Low Loss Fiber Types; Unguided System; Beam Divergence; Merits: Digital Fiber Optic Link | |
| **Module II: Optical Sources, Transmitters and Receivers** | **20** |
| LEDs, LDs, Semiconductor Devices: Types of lasers, BH cavity, Quantum Wells and Quantum Dot Lasers ;SLM and STM operation; Transmitter Design ; Receiver : PIN and APD devices , Noise sensitivity and degradation ; Receiver Amplifiers; Heterodyne and Homodyne Detection Systems ; ISI and Eye Diagrams; Effects of Noises on Error Probability | |
| **Module III: Optical Amplifiers and Networks** | **20** |
| Basic applications and types; SLA; External pumping and pain ,EDFA: Mechanism and Architecture , Parameters; System Applications , Basic Networks; SONET / SDH ,WDM networks , Optical CDMA ,Ultra High Capacity Networks , Optical Time Division Multiplexing (OTDM) | |
| **Module IV: Optical WDM and Components** | **20** |
| Principles of WDM, Components, Fiber Couplers, Interferometers; Mach-Zehnder and Michalesoninterferometric techniques, Phased Array Based WDM devices, Tunable Sources and Filters, Splicing; Fusion Splicers , Fiber Connectors; FDDI & FC types. | |
| **Module V: Fiber Optic Measurements** | **20** |
| Power Meters, Attenuators; Attenuation Measurement; Dispersion Measurement Techniques, OTDR (Optical Time-Domain Reflectometer) and its applications; Fiber Fault Location,; Optical Spectrum Analyzers (OSA), Characteristics of sources. | |

**Pedagogy for Course Delivery:**

The method of the course delivery will be lecture – based, assisted by power point presentations. The effectiveness of the course will be enhanced by promoting High Order Thinking questions on the various modules. Each student would be given a project on the various topic and asked to present an enhanced model based on the current trends in optical communication and the demand for increased speed and efficiency in the market.

**Assessment/ Examination Scheme:**

| THEORY L/T (%) | LAB/PRACTICAL/STUDIO (%) | TOTAL |
|---|---|---|
| **100** | **NIL** | **100** |

**Theory Assessment (L&T):**

| Continuous Assessment/Internal Assessment | | | | | End Term Examination |
|---|---|---|---|---|---|
| **COMPONENTS (DROP DOWN)** | **ATTN** | **CT** | **PROJECT** | **VIVA** | |
| **Weightage (%)** | 05 | 10 | 10 | 05 | 70 |

**Text & References:**

***Text:***

- G. Keiser, "Optical Fiber Communication", 3rd edition, McGraw Hill, 2000
- Walter Goralski, "Optical Networking & WDM", Tata McGraw Hill, 2001

***References:***

- Franz & Jain, "Optical Communication System & Components", Narvsa Publications 2000
- "Fiber Optical communication systems", 2nd edition, John Wiley & sons, New York, 1997.
- J. M. Senior, Optical Fiber Communications (Principles and Practice), 2nd Edition, Printed Hall India Pvt. Ltd., 2004, (Indian Edition).

**Journals:**

- Journal of Optical Communications and Networking, IEEE & OSA
- Photonic Network Communications, Springer
- Journal of Optics