|  |
| --- |
| **logoUniversity of Management & Technology**School of Science & TechnologyDepartment of Electrical Engineering |
| **Lecture Schedule**  | Mon, Wed 11:00 – 12:15 (Sec B)  | **Semester**  | Fall 2014  |
| **Pre-requisite**  | EE-310 Electromagnetic  | **Credit Hours**  | 3  |
| **Instructor(s)**  | Zawar Hussain  | **Contact**  | zawar.hussain@umt.edu.pk  |
| **Office**  | Machine Lab, Centre Block (Ground Floor )  | **Office Hours**  | See office window  |
| **Teaching Assistant**  | None  | **Contact**  | N/A  |
| **Course Website**  | <http://moodle.umt.edu.pk/> |
| **Course Description**  | This course is a fundamental course of optical electronics I. It covers following topics. Overview of Optical fiber communication, Optical Structure and wave guiding, Optical Sources, Photo-detectors, Optical Receiving Operations, Optical Modulation, Multiplexing, WDM concept and components, Optical Amplifiers. The course contributes to HEC Electrical Engineering Curriculum **objectives** a, d, e and f.  |
| **Expected Outcomes**  | In accordance with HEC curriculum **outcomes** a, b, d, e, g, h and I, the students at the end of the course should be able to * Understand the optical communications.
* Design Optical Tx and Rx
* Design of Multiplexers and Wavelength Division Multiplexing
 |
| **Textbook(s)**  | **Recommended Text:** Optical Communications Latest Edition by Gerd Keiser, Tata McGraw-Hill” Optical Communications Latest Edition by Harold Kolambiris, Prentice Hall  **Reference:** 1.Optical Fiber Communication by John M. Senior2.Fiber Optic Communication Systems by Govind P. Agrawal  |
| **Grading Policy**  | Final Term: 50% Mid Term: 25% Quizzes & Assignments: 15% Project / Presentations : 10%  |
| **Lecture** | **Topics** | **Textbook (TB) /** **Reference (Ref) Readings**  |
| 1-3 | Motivation for light wave Communications, Optical Spectral Bands, Fundamental Data Communication Concept, Network Information Rate, and WDM Concept. Key Elements of Optical Fiber Systems.  | T.B¹ 1.1 – 1.7  |
| 4-6  | The nature of Light, Basic Optical Laws, Polarization, Optical Fiber Modes and Configurations, Single Mode Fibers, Graded Index Fiber Structure, Fiber Materials, Photonic Crystal Fiber | TB¹ 2.1 – 2.3 T.B¹ 2.5 – 2.8  |
| 7-9 | Attenuation, Absorption, Scattering Losses, Bending Losses, Signal distortion in Fibers, Dispersion, Group Delay, Characteristics of SMF, International Standards, Specialty Fibers  | TB¹3.1 – 3.2 T.B¹ 3.3 – 3.5R.B3 Ch. 3 |
| 10-12 | Topics from Semiconductor Physics, Light Emitting Diodes, Laser Diodes, Line Coding, Light Source Linearity, Reliability Considerations | TB¹ 4.1 –4.6  |
| 13-15 | Physical Principles of Photodiodes, Photodetector Noise, Detector Response Time, Avalanche Multiplication Noise, Structure for InGaAs APDs, Temperature Effects on Avalanche Gain, Comparison of Photo-detector.  | TB¹ 6.1 – 6.7  |
| **Mid Term Exam (8th Week)** |  |
| 16-18  | Fundamentals of receiver Operation, Digital Receiver Performance, Eye Diagrams, Coherent Detection, Burst Mode Receivers, Analog Receivers  | TB¹ 7.1 – 7.6  |
| 17 - 24  | Optical Modulations, The mach zehnder interferometer The mach zehnder modulator, The MZ design process,  | TB2 10.1 – 10.4  |
| 25-27  | Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing of PCM Signals, Code Division Multiple Access  | TB2 11.1 – 11.5  |
| 28-30  | Overview of WDM, Passive Optical Couplers, Isolators and Circulators, Fiber Grating Filters, Dielectric Thin film filters,  | TB¹ 10.1-10.5  |
| 31-32  | Basic Applications and Types of Optical Amplifiers, Semiconductor Optical Amplifiers, Erbium-doped fiber amplifiers Amplifier Noise, Optical SNR  | TB¹ 11.1 – 11.5  |
| **Final Term Exam (Comprehensive)**  |