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| **logoUniversity of Management & Technology**  School of Science & Technology  Department 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](mailto: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. Senior  2.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 – 3.5  R.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)** | | | | | |