**University of Management and Technology**

School of Engineering

Department of Electrical Engineering

**Course Outline**

**Course code:** EE 430 **Course title:** Opto Electronics

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| Program | BSEE & BS(H) |
| Credit Hours | 3 |
| Duration | One semester |
| Prerequisites | EE-310 Electromagnetics |
| Resource Person | Khalid Asghar |
| Counseling Timing  (Room# 510) | See office window |
| Contact | [khalid.asghar@umt.edu.pk](mailto:khalid.asghar@umt.edu.pk) |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

Upon completion of this course, students will be able to:-

1. Understand the optical communications
2. Design Optical Transmitter and Receiver
3. Design of Multiplexers and Wavelength Division Multiplexing

**Learning Methodology:**

Lecture, interactive, participative

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Marks Evaluation Marks in percentage**

Quizzes 10

Assignments 10

Mid Term 20

Attendance & Class Participation

Term Project/Paper 10

Presentations

Final exam 50

Total 100

**Recommended Text Books:**

1. Optical Communications 5th Edition by Gerd Keiser, Tata McGraw-Hill (2013)
2. Optical Communications Low Price Edition by Harold Kolambiris, Pearson Education (2004)

**Reference Book:**

1. Photonics By Yariv Oxford University press 2007
2. Optical Fiber Communication 3rd Edition by John M. Senior, Pearson Education Limited (2012)
3. Fiber Optic Communication Systems 3rd Edition by Govind P. Agrawal, Whiley & Sons (2002)

**Calendar of Course contents to be covered during semester**

**Course code:** EE 430  **Course title:** Opto Electronics

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| **Lecture** | **Course Contents** | **Reference Chapter(s)** |
| 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 | LED + LASER Characteristics and Functionality | TB¹ 4.1 –4.6 |
| 16 | **Mid Term Examination** |  |

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| --- | --- | --- |
| 17-19 | 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 |
| 20-22 | Optical Modulations, The mach zehnder interferometer, The mach zehnder modulator, The MZ design process | TB1 10.1 – 10.4 |
| 23-26 | Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing of PCM Signals, Code Division Multiple Access | TB1 11.1 – 11.5 |
| 27-29 | Overview of WDM, Passive Optical Couplers, Isolators and Circulators, Fiber Grating Filters, Dielectric Thin film filters | TB¹ 10.1-10.5 |
| 30 | Basic Applications and Types of Optical Amplifiers, Semiconductor Optical Amplifiers, Erbium-doped fiber amplifiers | TB¹ 11.1 – 11.5 |
| 31-32 | **Final Examination** |  |